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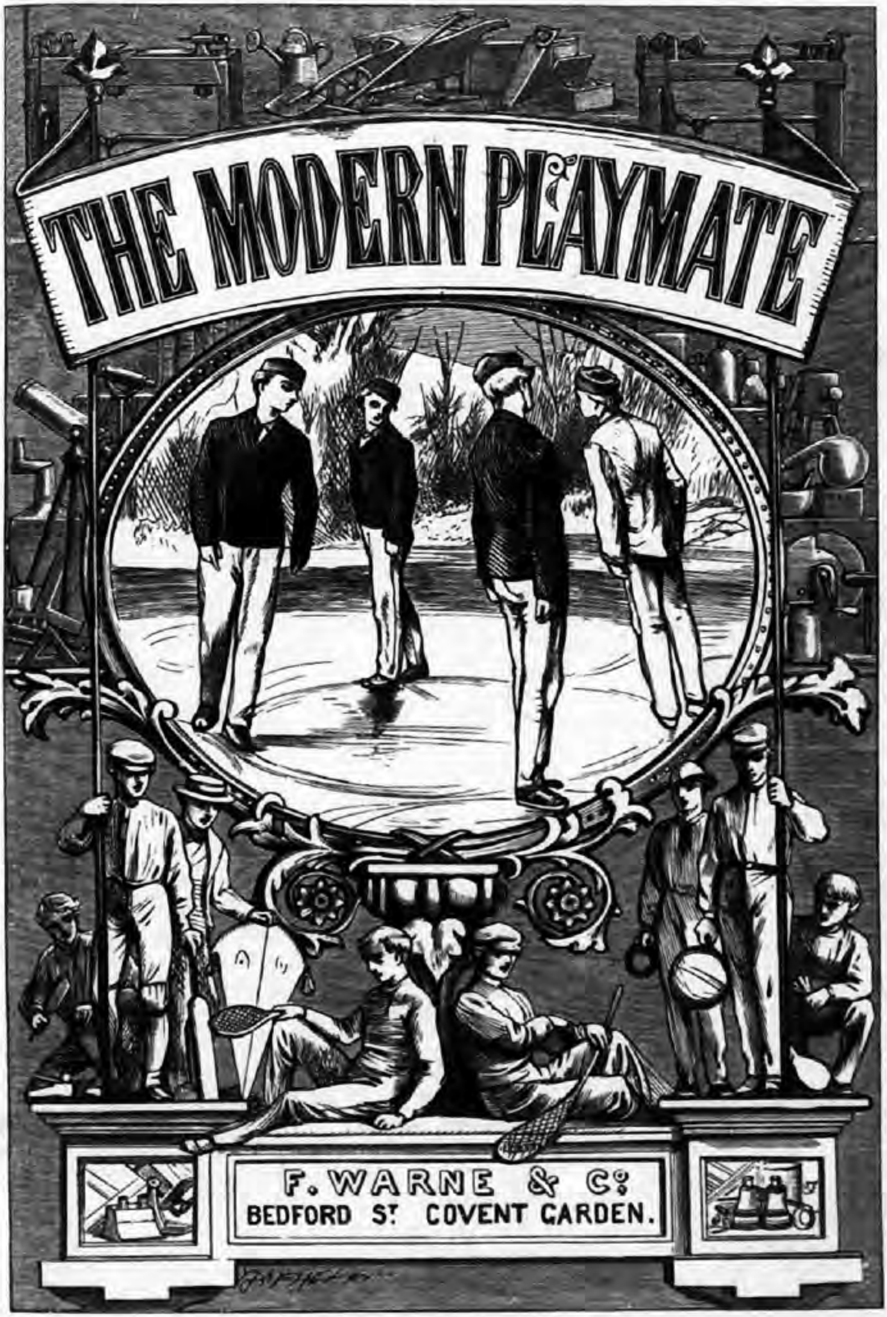
THE MODERN PLAYMATE.

Front. *ACCOMPLISHMENTS.*


THE MODERN PLAYMATE
F. WARNE & Co.
BEDFORD St. COVENT GARDEN.

THE

MODERN PLAYMATE

A BOOK OF

GAMES, SPORTS, AND DIVERSIONS

FOR BOYS OF ALL AGES.

COMPILED AND EDITED BY

THE REV. J. G. WOOD, M.A., F.L.S.,

AUTHOR OF THE "ILLUSTRATED NATURAL HISTORY," ETC., ETC.

WITH SIX HUNDRED ORIGINAL ILLUSTRATIONS,

ENGRAVED BY DALZIELS, HODGKIN, ETC.

London:

FREDERICK WARNE AND CO.,

BEDFORD STREET, COVENT GARDEN.

NEW YORK: SCRIBNER, WELFORD, AND CO.

1870.

DALZIEL BROTHERS
Camden Press
ENGRAVERS & PRINTERS

PREFACE.

IN a work of this character, but small preface is needed, the title of the book being its own preface.

The Editor believes that in the pages of the "Modern Playmate" are found the rules and modes of playing every game which is in vogue at the present day, besides those of games which have yet to make their way, and of those which have been neglected, but will assuredly resume the position which they once occupied. For example, the simple and almost abandoned game of "Rounders" has risen to a science under the name of "Base Ball;" while such as Croquet, Football, Cricket, and La Crosse, are given as they now exist after many years of practice have reduced their varied rules to a common standard.

Such accomplishments as Archery, Boating, Sailing, Shooting, Fishing, Swimming, Skating, and Pedestrianism, have been entrusted to Authors equally skilful in practice and theory; while the whole of the series entitled "The Young Workman" has been written by gentlemen who have been trained to their various subjects.

The department which includes Science has been executed by gentlemen who have obtained a wide reputation by their practical and theoretical knowledge; such names as Adams, Cherrill, Cooke, Drayson, Preece, and Rowsell, being a sufficient guarantee for the excellence of their work.

The entire volume has been superintended by those who have had very many years' experience of English boys and their games, and the Editor confidently trusts that a book of this nature—original in every possible point—will supply a hitherto existing want, and become the constant companion of every one who desires to become a

MODERN PLAYMATE.

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THE

MODERN PLAYMATE.

A BOOK OF

Games, Sports, and Diversions for Boys of all Ages.

Outdoor Games.

PLAY-GROUND GAMES.

HARE AND HOUNDS.

IN playing this game one boy (or in a long course two), represents the Hare, and the rest the Hounds. The hares carry with them bags full of paper torn up very small, which they scatter behind them as they run, to represent scent, and by this the hounds trace them up and endeavour to capture them. The hares, of course, endeavour to mislead them by all sorts of doublings and twistings, or by going over difficult country.

A very good plan, if the hares have time, is to get among gorse or thistles, to make two or three feints of starting off in different directions, and then returning on their tracks some way back, to make a fresh start in quite another direction; or, if they wish to be very clever, to come round again to one of their false starts, and go on from thence. There is no limit to the dodges a skilful hare will try to bother the hounds. If there be two hares, they must not separate under any circumstances: for all the purposes of the game they are to be considered as strictly only one individual.

The hounds will find a little organization and discipline a wonderful assistance to them in baffling the tricks of the hare. A captain and whipper-in should be chosen, the former to lead and direct, and the latter to bring up the rear. As long as the scent is strong, the whole band will go somewhat in Indian file, merely following their captain; but when he is at fault he must sound the horn, which he carries *ex officio*, and call a halt. The whipper-in thereupon takes up his post at the point where the scent is broken, and the others sweep round in a great circle, covering every inch of ground, to discover the lost trail. Sometimes the captain and whipper-in carry white and red flags respectively, and use them to mark the points where the scent is broken.

The hares should not be the swiftest runners, or they would never be caught. Endurance, pluck, and a readiness of invention are the great points in a hare. The more he trusts to his head and the less to his legs, the better the chase. The hares are generally allowed ten minutes or a quarter of an hour's law, according to circumstances. They should take care to survey their ground before they go over it, or they may get themselves into all sorts of difficulties. A pocket compass will be found an invaluable companion both to hares and hounds. From twelve to fourteen miles is a good run; but some little training and practice are requisite before such a long course can be covered.

At first some considerable difficulty will be experienced in keeping up even a moderate pace; but after a time the pace will come of itself; that is, with practice, and a little care in the article of food—avoidance, for example, of too great indulgence in puffs and tarts, and similar anti-condition comestibles.

Pace is one of the first requisites for a good run, but it should not be carried to extremes: a good slinging trot of from five to six miles an hour over good ground, and something less on bad, is quite enough to try the endurance of the best runners. Above all, too much pace should not be put on at first: if there be any to spare at the finish, put it on by all means, but for the first mile or so steady going should be the order of the day.

If at the end of the day's sport a boy feels himself feverish, knocked up, and unable to eat, he may be sure he is getting harm rather than good, laying up for himself sickness rather than health by his exercise. Either the pace has been too much for him, or he is not in proper condition. In the former case he must restrain his ardour for a time at least, and be content to take a little longer time over the work; if the latter, in nine hundred and ninety-nine cases out of a thousand, it will be from over-indulgence in food; and he must make up his mind either to be a little more temperate, or a little less athletic.

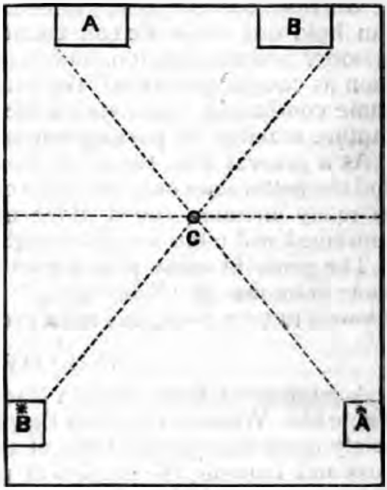
Many boys are under the impression that light boots are the best for these long runs; but this is a great mistake: the feet get terribly beaten on hard soil, and in mud or over ploughed fields light boots are almost worse than none at all. A pair of good solid broad-soled lace boots, with thick worsted socks, are the only wear for the feet. Short six-inch gaiters—unless knickerbockers, which are distinctly preferable to trousers, be worn—will be found a great protection, and will serve to confine the flapping ends of the trousers, and make them play a little looser at the knee, a matter of vast importance in a long distance. One more word of advice. Let no sense of fatigue, however great, prevent your changing boots and socks at least, directly you get home. You will find it well worth the extra exertion.

PRISONERS' BASE.

Very few preliminary preparations are needed for this game. Two bases or homes must be marked out on the ground, as A B in the accompanying diagram, each large enough to contain half the players; and two similar but smaller bases, called prisons, at some distance off, as at A* and B*: a mark must also be made somewhere about the centre, as C, for "Chivy." These may all be roughly traced out in a very few minutes, accuracy in dimensions and distances not being requisite. The diagram may, however, be taken as a guide to approximate dimensions.

Two captains are chosen, and they choose their respective sides by selecting in turn each a player, until all have been chosen.

Having tossed up for homes and taken their posts, the game begins by one side sending out one of the inferior players to C, who cries "Chivy!" and then makes for home. If one of the opposite side can touch him before he gets home, he has to go to prison; if belonging to A side to A*, if to B side to B*, until one of his own side can fetch him.



The pursuing player is, of course, not allowed to chase the "chivy" unmolested, one of "chivy's" side being commissioned to pursue and touch him, and this latter becomes in his turn an object of pursuit; and thus the game waxes warm, each player pursuing and being in turn pursued.

A player may only touch that opponent who has left the home *before* himself, and can of course only be touched by him who has left *after* him. When a player has achieved a capture, he has the right of returning home unpursued--he cannot be touched until he makes a fresh sally. The same immunity is enjoyed by those bringing home prisoners.

A player once touched gets quickly to his prison, and waits with outstretched arm the advent of some deliverer—one of his own side who can run the gauntlet of the enemy, and reach him untouched. The prisoner is required only to keep a part of his body within the prison, and, granting that, may reach out as far as he can; even with two or three prisoners, all that is required is that the connection with the prison should be touched by one, and the others may form a chain, hand in hand, with as many links as there are prisoners.

The whole spirit of the game lies in the operations for the relief of prisoners, and it is here that a good captain makes his generalship felt, marking down and cutting off the best of his opponents, until the residue cannot muster even one player capable of eluding the strong body of pursuers ready to be launched after him, and thus must succumb one by one before the superior prowess of their opponents.

In some places a rule prevails that prisoners may only be released in order of their capture; but this, though it is apparently fairer for the worse players, is really a great disadvantage to them, for a good player released out of turn will soon make up for it by releasing several more—far sooner than they would otherwise have a chance of getting out.

A local rule which allows the game to be claimed by either party if they can get into their opponents' home while untenanted, is perhaps not to be deprecated where there are many players on each side; but it undoubtedly cramps the game very much where there are few.

BLACKTHORN.

Blackthorn is a very good game, but rather apt to be destructive to the clothes. A base is marked off at either end of the play-ground, leaving a space in the middle. One of the players volunteers for, or is chosen, "Fox," and takes up his position in the middle between the two bases; the rest run across from base to base, while he endeavours to catch and hold them. If he can hold one while he can count ten, it is considered a fair catch, and the prisoner becomes fox too, and assists in the capture of more—all of whom, as soon as caught, go to swell the number of foxes. Thus it will be seen that the game continually increases in life and interest up to the final capture, each capture making the passage across more hazardous.

As a general rule, the worst runners and weakest players are caught first, and the better ones only succumb one by one, overwhelmed by numbers. With so many enemies, speed alone must soon give in; but speed and weight combined will often break through a whole crowd of opponents.

The game in many places goes by the name of "Fox and Geese," and in some is known as "King Senio." A player, when he has once started, is not allowed to turn back, but must cross to the other base.

FOLLOW MY LEADER.

A number of boys select a leader, who sets off with them at his heels in single file. Whatever he does they must do also; the whole game thus depends solely upon the qualifications of the leader: if he be a lad of some sprightliness and humour, the game will prove a source of considerable amusement; if he be not, and there be no such leader forthcoming, the game had better not be attempted.

It is usual to exact some forfeit from those who fail to follow their leader, and to offer some small reward to those who better succeed. One way is for each player to pay into stock a certain number of marbles or nuts. The players are ranged in line by toss before the game begins, and then after each feat those who have failed have to go behind those who have succeeded. At the expiry of the time previously agreed upon, the players halt, and share the nuts or marbles according to their place in the ranks. Thus, supposing there were ten players besides the leader, each would pay in *six* marbles or nuts; at the end of the game these sixty would be divided as follows: the first would take ten, the second nine, the third eight, and so on; the five that remained would go to No. 1, if he has not failed in a single trick; if, however, he has, they go to the leader.

I SPY.

This is a game at hide and seek, and can only be played where there are plenty of nooks and corners for concealment. The players divide into two parties. The hiding party set off to conceal themselves, giving a signal when they are ready, and the seeking party remain in the home. Upon hearing the signal they sally out in search of their opponents. As soon as they see one of the hiders, they cry out, "I spy" to him, giving his name and hiding-place; he must then come out, and while the seeking party run for home, he pursues and tries to touch one or more of them; and so on with each player of the hiding party.

The player is not obliged to wait to be discovered, but may come out at any time he sees fit, of course at the risk of gaining nothing by it. He *must* come out when properly called; but if the name or the hiding-place called be incorrect, he is not bound to show himself.

If, when all the hiders have been found, they have succeeded in touching four or five, according to previous agreement, of the seeking party, they hide again; if not, the two parties change places.

This is an admirable game where circumstances are favourable, but it is greatly dependent upon a good supply of suitable hiding-places. In favoured localities there is no limit to the amusement to be got out of this game: there is so much room for the exercise of ingenuity and invention on both sides that it never palls.

The hider, in selecting his place of concealment, must bear in mind that he has not only to conceal his body from the searchers, but must be able to start out in pursuit at a moment's notice. A judicious player will often hardly trouble himself about any effective concealment if he can find a place from which he can burst out with advantage.

The seekers should always keep to one golden rule—*to take nothing for granted*—to test every place thoroughly before they trust themselves too near it, above all, before they pass beyond it; for if once cut off from the home, their case is desperate. It is a very common *ruse* of the hiding party to take advantage of the rush for home to slip into a place previously unoccupied and nearer the home, hoping thus to catch the searchers unawares; the latter, therefore, on their part, must be ever suspicious: for that a corner has been found unoccupied twice affords no guarantee that it will be so a third time. Even a place unsuitable for concealment should not be trusted in too implicitly: a crafty player will sometimes take advantage of this over-confidence, and effect a touch simply by hiding in too obvious a place, so obvious that no one dreamt of his hiding there.

The game is sometimes played with local modifications, but the most orthodox way is the one described.

WARNING.

A really capital game. A home is marked out in one corner of the playground; one of the players is chosen "Warner," and takes possession of the home; hence he sallies forth, after crying "Warning!" three times, with his hands clasped in front of him, and strives to touch one of the others without unclasping his hands. If, before he can effect this, he unclasp his hands, or be made to do so by the others pulling at his arms, he must run home as fast as he can, subject, if caught, to be compelled to carry his captor home. Once home, he is safe.

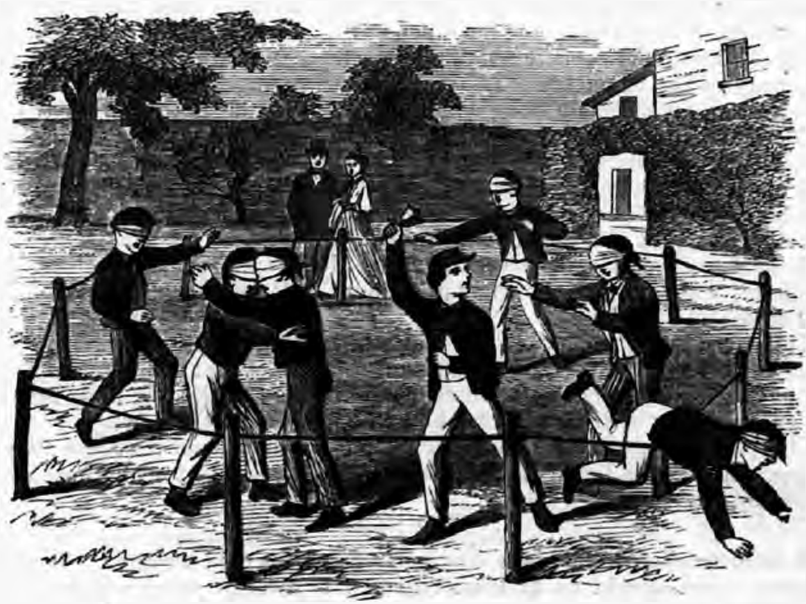
If, however, he can touch any one without unclasping his hands, they both scurry home as above, and then sally out afresh, hand in hand, after duly calling "Warning!" and try to make a fresh capture without breaking hold. After each capture they hurry home, and sally forth afresh after admitting the new comer into their ranks; thus the line of warners is constantly increasing, and the difficulty of escaping it increasing in almost equal ratio. Its very length, however, makes it not only unwieldy, but more likely to be broken in the middle; so that a player hard pressed will often make his escape by a frantic burst through the weakest part of the line. As, of course, only the players at either end have a hand a-piece at liberty, they are the only two who can touch, and this gives the runner a certain advantage in breaking through.

A great deal of the success of the warning party depends upon the arrangement of their men: two weak players should never, where it can be avoided, be allowed to hold hands together; a strong player should always be placed between them.

This game *must* be played within tolerably strait boundaries. The only chance of the warners is to pen the fugitives up: running them down in an open field is simply out of the question.

The warning party are only allowed to resist their opponents passively; no kicking or similar mode of offence is permissible. The first warner is generally allowed to retire after catching two or three, and the last man untouched goes warner for a fresh game.

In some parts of the country this amusing game is called "Widdy Widdy Way."



JINGLING.

A ring is staked and roped out upon a piece of turf, and inside this the players take their places. One of them is armed with a small hand-bell, which he is bound to keep going; all the rest are closely blindfolded. The "Jingler," or bell-man, tries to escape from the blind men; while they, guided by his bell, do their best to catch him. If the number of players be duly apportioned to the size of the ring, or *vice versâ*, there is positively no end to the fun that may be got out of the game: a good jingler will lead the blind men into all sorts of scrapes, of course without compromising himself—into each other's arms, over the ropes, or over some luckless companion who has come to grief in labouring after the jingler, or a hundred other devices equally effective and amusing.

Perhaps the most absurd scenes occur when two or more blind men rush into each other's arms and grapple frantically, each persuaded that the other is the jingler, and ready to drag or be dragged anywhere rather than relax their grasp.

In a match the winner is either the jingler himself, if he can contrive to keep clear of his pursuers for the requisite time, or, if he be caught, the blind man who catches him.

Jingling matches are very popular at country feasts and fairs, and attract great crowds of spectators to see the fun.

A somewhat similar though rougher game is played in some parts of the country. A pig is substituted for the jingler, and the blind men are all armed with cart-whips. He who hits the pig gets him.

At first the players are very cautious and try to find out the pig before they strike; but they soon find that does not pay, and begin slashing about recklessly right and left, and the fun gets fast and furious: their heads and faces are protected from the blows, but the way they belabour each other, especially about the legs, is enough to make the spectator die with laughter. The utter absurdity of the whole scene is beyond description. The spectacle of ten, or a dozen burly men belabouring each other handsomely in the blind endeavour to hit an unlucky pig is ludicrous enough; but when to that is added the sight of the pig himself, the Helen, as it were, of all this strife, charging in and out of the struggling throng in hopeless attempts to escape, upsetting his persecutors right and left, grunting the while his discontent and dismay, the situation becomes almost painfully ridiculous.

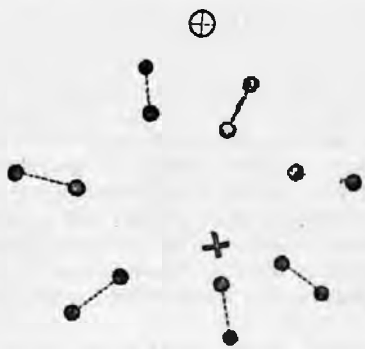
Sometimes two players strike the pig at the same time, in which case they divide his value, or come to some agreement. An umpire decides who is the real striker of the pig.

This sport is dying out fast, but may still be seen occasionally. It is not so cruel as might be thought, unless perhaps to the *men*, for the pig seems to have rather the best of it, all his sorrows being confined to the one blow that wins the game, unless distress of mind be numbered amongst his woes.

This is hardly a game for boys, even if they could muster the requisite plant of pig, whips, &c.; but it is undoubtedly very good fun for all that—to the spectator.

TIERCE.

If smartly played, this is a very good game for cold weather. To play it properly there should be at least eighteen or twenty players, who arrange themselves thus:



all in pairs, except one set of three, and the game is as follows: the outside player, marked *, runs round the circle, and tries to catch three or a "tierce" together in a line. If he can do this, and touch the outsider, he takes his place in the circle, and the player just touched becomes outsider.

The outermost man of the tierce, therefore, when he sees the outsider coming his way, slips from his place into the middle of the ring, and stations himself in front of some other pair at a distant point in it, thus making a fresh tierce, to which the outsider has to hasten, only, perhaps, to be disappointed in like manner.

Where there are many players, and the ring is consequently large, there should be two or more tierces, and thus the game will be made more lively by making it more difficult to avoid being caught. The game must be kept up with spirit or it soon falls tame, but with lively players it is excellent fun.

SLING THE MONKEY.

This is a capital game, and can be played anywhere where there are trees. One player, who is chosen by lot, takes the part of Monkey, and is fastened to a tolerably high branch of a tree by a strong cord knotted in a "bowline" loop and passed round his waist. The other players now baste the monkey with knotted handkerchiefs, and he, armed in like manner, endeavours to retaliate. If he succeeds in striking one of them, he is at once released, and the other takes his place as monkey. He must make haste in doing it, or he may be basted until he is fairly in the loop. With players who don't mind a little buffeting this game becomes exceedingly lively: an active monkey is very difficult to approach with safety, and of course gives much more life to the game.

The cord should be just so long as to enable the monkey to reach the ground comfortably under the branch. Half the fun of the game lies in actual *slinging* of the monkey, one of whose most effective *ruses* is to throw himself forward on the rope, pretend to start off in one direction, and then come back with a swing in the other.

The branch to which the cord is attached should be some considerable height from the ground, or there will not be play enough in the rope; and it need scarcely be impressed upon the reader that both rope and branch must be strong enough to bear the strain put upon them by the weight and movements of the monkey.

This is a favourite game on board ship.

DICKY, SHOW A LIGHT.

This game can only be played on a tolerably dark night, and is a kind of combination of "Hare and Hounds" and "I Spy" in the dark.

One or two players, armed with a policeman's dark lantern, undertake the part of "Dicky," and start off to conceal themselves, while the rest, also with a lantern, after allowing a few minutes' law, proceed in search of them.

When the Dicky is ready, he flashes his light in the direction of the searchers and "makes tracks," while the searchers come after him in full cry. If they are at fault they may cry, "Dicky, Dicky, show a light," when he is bound, unless dangerously near, to flash his light; so that, if they see the light, they get a fresh start; if not, they know that they are close upon him.

A good Dicky, however, will scarcely ever give them an opportunity of doing this, but will lead them, especially if he knows the country thoroughly as he ought, a regular will-o'-the-wisp dance, through hedges, over ditches, and into quagmires, without ever allowing them to catch him; flashing his light, now far, now near, now here, now there; disappearing for a moment in one direction, and flashing out again suddenly in a totally different quarter; ever leading them on, but always keeping a wary distance; or, most annoying of all, allowing them to come nearly up with him, only to find themselves brought up by some impassable obstacle—a deep river, for instance, with the Dicky laughing at them from the other side.

The Dicky has many advantages over his pursuers, amongst which not the least is his knowledge of their movements, while they are ignorant of his: this, as it makes mere avoidance so easy, renders it desirable to fix beforehand some not very extended boundaries within which the game shall be played; otherwise, with any very considerable area of operations, the pursuers might "whistle" for their Dicky.

A Dicky when hard pressed will sometimes effect his escape by turning sharp upon his pursuers and blazing his bull's-eye in their faces; before they have time to recover from their surprise, the Dicky is off into the surrounding darkness, and may contrive, if favoured by the ground, to be *non est* by the time their eyes have got over the sudden glare.

Whatever time of year the game be played, all the players should be warmly clad, and the Dicky should be especially careful when hiding not to lie down on the damp ground, however dry he may believe it to be: the game, however great may be its attractions, is not worth the risk of a bad cold, much less of rheumatism or a chest complaint.

There should not be too much standing about, either, when heated with running: the same liberties, it must be remembered, cannot be taken in the night as in the day-time.

FOX.

All the players are armed with knotted handkerchiefs; the one chosen "Fox" has a den marked out, in which he is unassailable.

When prepared for action, he hops out of this on one leg, with his handkerchief ready to strike; the other players immediately gather round and attack him with their handkerchiefs.

If he can strike one of these assailants with his own handkerchief, and without putting his other foot to the ground, the player thus struck is basted by all into the den, and takes fox's place, the original fox going free.

If he cannot succeed in doing this, he endures as long as he can, and then hops into his den to recruit; if, however, while outside, he puts both feet to the ground, he is at once basted back remorselessly into his den, without the power of reply.

BASTE THE BEAR.

This is a game very similar to the last; only the Bear, instead of defending himself, as the monkey, entrusts his defence to a second party.

A circle about five feet in diameter is marked out on the ground, and a rope is tied round the waist of the bear, who is chosen by lot, leaving a loose end about four feet in length. His Keeper holds this in one hand and a knotted

handkerchief in the other. Thus prepared, the bear goes down on his hands and knees inside the circle, calls "Ready!" and the game begins.

The other players baste him as in "Sling the Monkey," under the same penalties if struck by the keeper. The bear may aid his keeper in any way, so that some portion of himself remains inside the circle, and he preserves his position on all fours; he may even hold any of the players he can contrive to catch. Each bear is allowed to choose his own keeper.

In some places the bears stipulate for an extra coat or similar protection from their assailants, but that is an effeminacy to which no encouragement should be given. There is no occasion, however, for the handkerchiefs to be knotted to an abnormal degree of hardness; a little regulation in this matter would not be unreasonable.

TIG.

This is the simplest of all games. Out of a number of players one, goes "Tig," and tries to catch and touch any of the others indifferently: the player so touched becomes tig in his turn until he touches some one else. The player touched cannot touch back until he has first chased another player.

This is a capital *impromptu* game for cold weather: the running soon warms up even the most chilly. It must, however, to be played with success, be played within tolerably narrow boundaries, or the game will become too scattered, and in consequence desultory.

CROSS TIG.

This is a mere modification of the preceding. Tig calls out the name of the player he intends to chase, and sets off after him; the other players then run across between tig and the fugitive. Each time a player crosses between the two, tig must leave the original chase and follow the player who has crossed, and so on, perhaps chasing in turn every individual player before he can effect a capture.

The same remark as to space holds good here as in the preceding.

TIG TOUCH-WOOD.

Another modification. A series of posts or trees is selected; as long as the player is touching one of these authorized posts, tig cannot touch him: his only chance is to catch him while flitting from one post to another. Two players are not allowed to touch the same post: if tig can catch two so situated he may touch the last comer, who thus becomes tig.

The life of this game depends upon the pluck and spirit of the runners, for tig can do nothing until they expose themselves by running. A constant interchange of posts should be kept up, or the game flags and loses its interest. It may be played either like "Puss in the Corner," with only one station for each runner, so that running can only be effected by exchanging posts, which is perhaps the preferable game; or with a number of posts in excess of the number engaged. This is, however, a mere matter of detail, to be settled by agreement before commencing.

KNIGHTS.

Two sturdy boys take each a smaller boy on their backs and engage in a mock tournament, themselves acting as horses, while the youngsters grapple and strive to unseat each other.

The real brunt of the fighting falls on the horses, upon whose strength and dexterity, much more than upon that of their respective "Knights," depends the ultimate issue of the combat. The horses may shove and jostle one another, but must not kick, trip, or use their hands or elbows.

The victor is he who gains most falls in three rounds. The game should only be played upon turf, for safety's sake; for sometimes, when horse and man go down together, the fall might prove a nasty one on hard ground, and at any time the rider is liable to be brought off backwards with a jerk, under which circumstances he will be thankful to measure his length on the soft turf, instead of lumpy gravel or unyielding pavement.

COCK-FIGHTING.

Two players are made to sit on the ground, draw their legs up, and clasp their hands together over their shins. A stout stick is then passed through under their knees, and over their arms at the bend of the elbows, as in the cut, and there they sit trussed like a couple of fowls.

Thus prepared, the two combatants are placed face to face, their toes touching, and are left to fight it out. This they do by striving to knock each other down, each to overbalance the other without losing his own equilibrium.

Two falls out of three decide the game: if both fall it is no "round," and does not count.

As the player may not unclasp his hands even when down, he is quite helpless, and must be assisted by his friends.

This game had a wonderful run of popularity once at one of our naval ports. A foreign man-of-war had put in to refit after a severe gale; her officers of course received the hospitality of the local authorities, and one evening after mess, skylarking being in vogue, cock-fighting was introduced. This so took the fancy of the foreigners, that next day, when some of their hosts of the preceding evening went to call upon them, they found them earnestly engaged, several pairs of them, in this their new pastime, and were called upon with pride to see what proficiency they had attained in a short time.

For the rest of their stay the game still maintained its popularity amongst them, and no doubt they carried it with them to their own home.

One authority declares that the last thing seen of her when far out to sea, was the captain cock-fighting with the first lieutenant on the quarter-deck, and the parson with the doctor; but he has always been famous for telling "a good story," and perhaps this, like most others of its class, owes something to extra embellishment.

FRENCH AND ENGLISH.

A number of players divide into two parties, each under the command of a leader. A line is marked out on the ground, and the two parties, laying hold of either end of a stout rope, try to drag each the other across the line.

Simple as the game may appear, the party which is physically most powerful does not necessarily have it all its own way; a smart captain will often make up by superior *finesse* for any deficiency of his side in strength and weight.

The two captains stand facing each other at the line, and measure wits as well as strength.

One very common but very excellent *ruse*, especially with a side somewhat over-weighted by its opponents, is to put a heavy drag on the rope, not attempting to pull up the opponents—in extreme cases even allowing them to gain ground inch by inch—then suddenly, when, flushed with success, they are unprepared, to let the rope go by the run: if this be done neatly, down they must all go on their backs in a struggling, helpless mass. The instant they are down the successful party must clap on and run away with them, which they will now easily do, clean over the line.

The success of this manœuvre depends chiefly upon the captain's seizing the right moment for its execution; but the whole of his side must obey instantly when the signal is given, or the attempt will prove futile: one hand on the rope after the others have let go is sufficient to ruin the whole affair; nothing but instantaneous and simultaneous action has a chance of success.

There are many other "dodges," but this is certainly the most sure and most effectual, and may be taken as a sample of the rest.

LEAP-FROG.

Leap-frog may be played by any number of players, and at a moment's notice, for it requires no preparation.

One player offers to give the first "back," and stands with his back to the rest, his head bowed down and his shoulders elevated; he then stoops more or less according to the height of the back required, and the "back" is ready.

One of the other players now takes a short run, "overs" him, helping himself over with his hands, as the street boys do over a post, and running on a few yards, stops, and offers his own back in turn. The next then "overs" both, and, going on, offers his back, and so on until they have all gone over; the giver of the first back then has his turn over the lot; then all begin again as before; and thus they go on alternately "overing" and "offering backs" until the game is concluded.

A player who fails to make a clean "over" is out, and stands aside until the end of the game, he who lasts out longest being the winner.

The leaper must be careful to avoid pressing too heavily upon the shoulders of the player giving the "back," and the latter must most scrupulously avoid any shrinking or shirking at the moment the leap is attempted: the sudden failure of the expected support is nearly certain to bring the leaper heavily and helplessly to the ground, to the imminent peril of his arms and shoulders. Broken bones, or sprained and dislocated joints, are a sad termination to a game of play.

The mode of standing for offering the back varies in some places. In and near London the plan is to stand sideways, whereas in the country the back is usually turned to the jumper. The latter plan is in our estimation by far the better of the two, as all danger of knocking the head with the knee is avoided.

SPANISH FLY.

A variation upon the last; a kind of combination, in fact, of leap-frog and follow my leader.

A player is chosen by lot for leader, and another for "first back." The leader "overs" in all sorts of eccentric fashions, and the rest are bound to imitate him, even to the minutest particular, under penalty, in case of failure, of relieving the "first back" until relieved in turn by some one else.

A leader with a ready invention may hit upon innumerable variations in the method of "overing;" such as, for instance, putting a cap on the back, and "overing" without knocking it off, or even making a pile of two or three, and "overing" without touching; taking the one cap off, and leaving his own behind—a very neat trick; throwing his cap up before "overing," and catching it after, before it touches the ground; and so on almost to infinity.

FLY THE GARTER.

Another variation. A line, or, as it is technically termed, a "garter," is marked out on the ground: the "first back," chosen by lot as before, stands a foot from the "garter," and sets a "back;" the rest "over" him in succession, springing from *inside* the "garter." He then advances one foot more, and they "over" him again as before; then another foot, and if now all succeed in "overing" him, he takes a close-footed leap forward as far as he can, and sets a fresh "back" where he alights. If they still succeed in "overing" him, the game begins again, and he starts from the "garter" afresh. If, however, at any time one fails to "over" him, they change places, and the game begins anew.

KING OF THE CASTLE.

A good game to get warm with when there is no time for any more set amusement. One player stands upon a mound or piece of rising ground, crying, "I am king of the castle," and the others try to pull him down and supplant him. Any agreement may be entered into previously as to what use of the hands, &c., shall be allowed. The game works better when nothing but pure pushing is allowed—no holding or dragging.

The writer once saw a lot of lambs play this game in splendid style, using a large stone about a yard in diameter as their castle. There must have been about forty of them, and they played the game just like a parcel of boys, showing a wonderful individuality of character amongst them—some very plucky and not to be denied, some making a great parade of charging, but doing next to nothing, and others merely prancing and frisking about, and making no attempt to get on the stone at all.

The wag of the party was a rather slightly built but wiry black lamb: he was here, there, and everywhere, all at once: at one moment gallantly storming the castle; at another scouring madly off, with a lot after him in their usually gregarious fashion; then coming back equally suddenly, with a rush and a spring clean on to the stone, driving his head into the ribs of the unfortunate king, and sending him flying over and over. After this, perhaps he would execute a war-dance on the stone in triumph, but it was equally likely that he would jump down again for another scamper, or would suddenly stand still in a meditative manner, and regard the prospect with an air of the most profound abstraction from all sublunary considerations. This game went on for weeks: the lambs never seemed to tire of it, and the black lamb kept up his spirits to the last. He went the way of most black lambs at last; but he enjoyed life to the end, and what more could he desire?

MOUNT HORSE.

This game is best played with from four to five players on a side. The side that loses the toss are the Horses, the winners Riders.

The horses arrange themselves as follows: No. 1 stands with his face to a wall, supporting himself against it with his hands and elbows; No. 2 stands behind No. 1, and stooping forward, puts his head in the small of No. 1's back, steadying himself by holding on to his supporter's trousers at either hip. No. 3 does the same to No. 2, and No. 4 to number 3, and so on.

When the horses are ready, the best jumper of the riders takes a run and leaps as far forward on the backs of the horses as he can, helping himself with his hands. The next best then follows him, and so on until they are all seated. No rider may move forward after he has once alighted on the backs of the horses; and if there be not room for all upon the horses, from failure on the part of either of the riders in jumping, the innings is lost, and the horses and riders change places.

As soon as all are firmly seated, the captain cries "Ready!" and counts twenty, while the horses attempt to wriggle him or one of his followers off. If they can succeed in doing so before he has counted twenty, the parties change places; if not, or one of the horses breaks down, the riders have another innings.

A rider is considered off if his foot or any part of his body touch the ground; but a fall does not count if the horse in effecting it touch the ground with hands or knees. Each rider, before he takes his leap on to the backs, must cry "Warning!" to prepare the horses to receive him.

Another name for this game is "Jump, little Nag-tail," so called because the words "Jump, little Nag-tail" are repeated thrice, instead of counting twenty; otherwise there is no difference in the game.

BUCK, BUCK.

Not a very exciting game, but very passable when nothing better is to the fore, or as a change from other pastimes. It can only be played by three players, called severally "Buck," "Frog," and "Umpire."

Buck is blindfolded, and resting his head against a wall, supporting himself at the same time with his hands, sets a back; the frog jumps up on his back, and holding up one or more fingers, cries, "Buck, buck, how many fingers do I hold up?" If buck guesses rightly, they change places; if not, he sets another back and tries again. The umpire decides as to the correctness of the guess.

Some arrangement is usually made beforehand for the umpire to take his turn in the game. One very simple and equitable way is for the buck, when he guesses right, to go umpire, the frog buck, and the umpire frog; thus each has his turn in rotation.

FIVES.

Fives may be played, in a rough way, almost anywhere: the only absolute requirements are a tolerably smooth and lofty wall, fronted by a reasonably smooth and level piece of ground. With these and an india-rubber or tennis ball a game may be got up at almost a moment's notice.

The wall and ground require some little preparation, which need not, however, take more than a few minutes. A line must be drawn horizontally along the wall with chalk or other suitable substance, at about thirty inches from the ground; and three lines *on* the ground, two extending parallel from the wall, about fifteen feet apart, to a distance of some eighteen or twenty feet; and one parallel with the wall and about six feet from it. The line on the wall is called simply "the line," the two long ones on the ground "the boundaries," and the cross line "the scratch." The ball when in play must be made to strike the wall above the line, and must fall to the ground inside the boundaries.

The number of players may be two or four. As there is no material difference between the game with two and that with four players, the description of the one will do for the other; for simplicity's sake, therefore, the game with two players will be described.

The theory of the game is as follows: One player strikes the ball with his hand up against the wall above the line, making it fall beyond the scratch, and the other is then bound to meet it, and before it touches the ground a *second* time, to return it again to the wall for the first player to meet it in like manner, and so on alternately, only that after the ball is "served" it is not requisite that it should fall outside the scratch. The players toss up for first lead off, and the winner serves or delivers the ball as above described; if he himself is first to fail in properly returning the ball to the wall, he is out, and player No. 2 becomes server; but if the second player so fails, the server counts one towards his game, and serves the ball afresh for a new bout. The game is mostly eleven or fifteen, the former number being perhaps the more common.

The real art of the game, as in the next game, "Rackets," after the knack of striking the ball fairly with the hand is once mastered, lies in the serving. The server, as will be perceived, has every advantage: in the first place, if he fails, he only loses his turn, while if his opponent fail, he loses one to his score, which is no slight advantage, especially near the end of the game. In the next place, the server takes his own time in delivering the ball, and is left perfectly cool and collected to make it as difficult as possible to his opponent to play it, while the latter must take it as it comes, and very often be only too glad if he can get it duly back to the wall, without any consideration of the chance it may offer to the former; so that the server may often have a series of easy balls to play, while he is enabled to return them in such a manner that his opponent must strain every nerve to keep the ball up. This cannot but tell in his favour, and in this way a first-rate server will very often get the better of a much more active and brilliant, though less crafty, player.

When four play, they play two against two, and the game proceeds exactly as above, it only being necessary that the ball should be played by one of either side alternately. Usually they divide the ground between them, one of either side standing near the wall and the other well back.

It will be seen that the game is very simple in theory, encumbered by few rules, and therefore very easily learnt; it is, nevertheless, a game of the first class, and one that can be very strongly recommended to all who are fond of athletic exercises. It brings into play every muscle of the body, and from its constant variety never palls or becomes monotonous.

We would advise the beginner, unless his hands are blessed with palms of a peculiarly horny texture, to wear at first a pair of stout leather gloves until his hands have become accustomed to the work, or they will get so beaten and bruised as to be a source of much discomfort for many days after; a very short perseverance in tolerably constant practice will soon give the hands the required measure of hardness and insensibility.

Another piece of advice, too, he will find valuable,—not to play too long or too hard the first few days. If he is in good general training he may, of course, venture further than would be otherwise desirable; but even then he will find so many muscles brought into active use that never did much hard service before, that even he must not be surprised at developing no inconsiderable amount of general stiffness the next day; and as for the unfortunate who, not being in the habit of taking much violent exercise, should go in without preparation for a hard bout of fives, words can hardly convey an idea of the extremity of soreness and stiffness to which every muscle of his body will be reduced. A little moderation, however, at first, will entirely obviate all chance of stiffness, and practice will soon inure the hitherto unaccustomed muscles to almost any amount of work to which they may be put.

Regular fives-courts are very general now wherever there is sufficient population to make them pay, but they differ from the ground above described only in a greater elaboration of fittings and detail, and so require no particular notice.

It may be, perhaps, well to add a few words upon points in the game not considered above. If the ball when served strike the wall *below* the line, or in rebounding falls without the boundaries, it is "no ball," and the opponent need not take it, and it must be served again.

If one player in playing at the ball is obstructed by the other, and the ball is let fall, there is no score, and the ball is called a "let ball," and served afresh. If the ball in the course of play falls without the boundary, the striker pays the same penalty as if he had missed it. In some places the server delivers the ball under the same conditions, but the rule given above is the more general. In any case an agreement should be come to beforehand in the matter.

A bat is sometimes used instead of the hand, and the game is then called "Bat-fives," but the hand game is the more common.

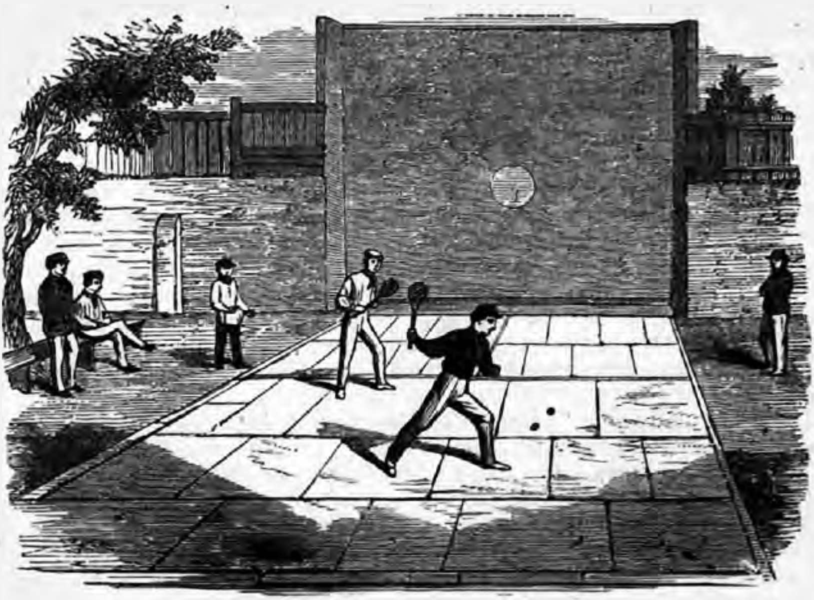
RACKETS

This is a game very similar to the above; indeed, it is in all its leading features, its rules and general theory, almost identical. The only variations arise from the use of a racket instead of the hand, which necessitates an increase in the size of the court in which the game is played, and some slight modifications of the rules. Rackets *may* be played in the open air, like fives, an enlarged fives-court answering the purpose very fairly; but the game is generally played in a specially constructed court, which is indeed absolutely necessary for the development of the full beauties of the game.

The ball used in rackets is smaller and harder than that used in fives; it barely exceeds an inch in diameter, and is as hard as the nature of the materials will allow, the two qualities specially required of it being that it shall be perfectly spherical and shall possess extreme elasticity.

The bat, or racket, must be familiar to most of our young readers; those, however, who are unacquainted with its shape and construction will find it accurately figured in the accompanying illustration. The cross network is composed of strong gut, and the total length of the bat is about thirty inches.

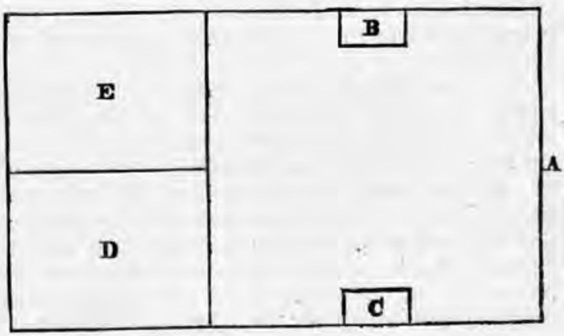
The wall against which the ball is struck is marked out as in fives, with the addition of another line about ten feet from the ground, above which the



ball must strike when served. The floor is marked out into five divisions, as in the accompanying diagram, which will be fully explained below. There is usually a kind of gallery at the back for spectators and the marker. The walls should be covered with a smooth hard plaster, and the floor should be of some firm concrete and perfectly level, and both floor and walls should be painted *black*, as a background for the white ball, which even at the best it is often hard enough to follow.

The players may be either two or four. When two play, having tossed for the lead off, the server stands in the small compartment marked B, while his opponent takes his stand in the large one marked D. In serving, the ball must be made to strike the wall at A, above the upper line mentioned above, and must fall *within* the compartment D.

If the player in D succeed in hitting the ball at the first hop, and driving it



fairly back to the wall, striking above the lower line, the game goes on, each striking it alternately until one fails, the ball now being only required to strike the wall above the lower line, and being quite unrestricted as to the place where it takes the ground. If the server fail, he loses his turn, and his opponent takes his place; if the second hand fail, the server counts one to his game, which is reckoned in all things just as in fives. The serving takes place alternately from B and C—the second hand standing at D for B, and E for C.

The ball may strike the side and end walls either before or after striking the playing wall at A; but the roof and the gallery, if there be one, are considered out of bounds, and count to the striker for a miss. A good player makes great use of the walls, and will utterly confound and bewilder the novice by driving the ball into corners, where it either flies about in the most incomprehensible manner or falls most disappointingly dead to the ground. Thus it will be seen that in rackets more even than in fives a player's real strength lies chiefly in the power of serving a series of difficult or actually impossible balls.

There are many other "dodges" which a good player practises, which time would fail us to enumerate, and which, indeed, hardly come within the scope of these short notices, which are not intended as exhaustive treatises on the various games for the use of experts, but as an introduction to their theory and practice for the use of learners and unformed players.

The young reader will find it will take all his time to become expert even at the simple straightforward game, and will certainly only retard his progress if he attempts the refinements of the game before he has mastered its first principles.

One trick of the racket may, however, be mentioned as not very difficult to acquire and yet extremely valuable in play. By a quick action of the wrist as the ball takes the racket, drawing the network across the ball, a very considerable spin or bias may be imparted to it, which will cause it not only to fly off the walls at unexpected angles, but to prove so erratic in its rebound from the ground as to put all calculation at defiance and baffle the most expert player.

The first thing a beginner has to learn in handling a racket is to stand far enough away from the ball; it is the almost invariable fault of a novice to get too near for fair striking. The second, perhaps, is to keep cool and not be in too great a hurry to strike. This is perhaps a too common fault with most players; they fly about and dash frantically at almost every other ball; whereas a really fine player, as a rule, takes the ball as late as possible, and hardly ever seems to be in a hurry, generally taking the whole affair with the most provoking calmness and deliberation. To this point of perfection, however, it is only given to the few to attain—we point it out as the real standard of excellence.

Some attention to dress is necessary: light flannel jersey and trousers, and canvas shoes, is the regulation dress. Ordinary cricketing habiliments will do for the first, and any pair of close-fitting light shoes or slippers will do for the second; but the regular shoes are very inexpensive, and need not be a cause of alarm at home. Ordinary boots and shoes with thick soles and heels are simply inadmissible; first, because they would cut the paving of the court to pieces; and secondly, because they are sure to bring their wearer to grief sooner or later, by slipping up and letting him down after a fashion to which a heavy fall on the ice is mere child's play, and to the imminent danger of breaking half the bones in his body.

The racket is very liable to warp, and so to play untruly: it should always be kept, if possible, under a weight. When a racket has warped so much as to become troublesome, it can always be restored by being pressed in a frame made for the purpose; but a little care will render this unnecessary for a long time.

HOCKEY OR BANDY.

This is perhaps, next to football, the best of our open-air winter games, and is strongly recommended to our young readers, as a very efficient substitute for that nobler sport. The spirit of the game is pretty much the same as that of football, the object being to strike a ball through a goal marked by two

uprights, the principal difference being that the instrument of propulsion is a stick instead of the foot, and that the ball is smaller and of a different make.

The game *may* be played by a very few, but at least six or eight are necessary to give it any real interest. From ten to a dozen on a side can play with advantage if the space be not too confined; but a game with only six or eight on a side gives more room for individual skill, and is therefore preferable. Under all circumstances a *crowded* game is to be avoided, for the game then ceases to be a contest of skill, and degenerates into a mere chance medley, in which all refinement of play is rendered impossible by the sheer press of numbers, and brute strength and reckless hard pounding bear down all opposition. Another objection may be mentioned—of more weight, perhaps, with parents than with boys themselves, but which the latter might well take into some consideration—that is, the extremely dangerous nature of the game thus played.

In the midst of a grand scrimmage, where a score or so of players are plying their hockeys vigorously in the confined space of a few square yards, it cannot but be that some blows more or less awkward must be inflicted upon the heads and faces of those engaged. Broken limbs may be set, and their owner be little the worse, and as for injured shins, of them a schoolboy recks not at all; but the head and face are by far too critical portions of the frame to be rashly imperilled. With only six or eight on a side accidents of this kind are almost unknown, and all that a player has to guard against is an occasional rap over the shins; and even for that he will only be indebted to his own clumsiness.

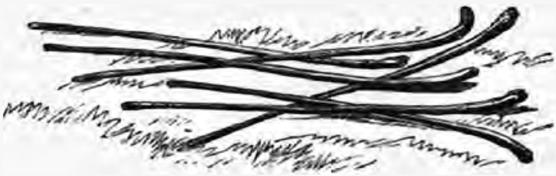
The game is played with a solid india-rubber ball from two to two and a half inches in diameter; and the players, each with a hooked stick or "hockey," take opposite sides, and try to drive the ball through each other's goals. The goals, which should be marked each by two poles about ten feet apart and eight feet high, with a cord joining their tops, may be placed at from eighty to a hundred yards apart, and boundaries should be marked at the sides by flags or posts as in football, leaving a space between of about forty yards. To put the matter more exactly, the ground for a game with a dozen on a side should be about a hundred yards long by forty broad, while for numbers less than this it should be proportionately contracted.

There is much variety of opinion as to the best form of hockey-stick, nearly every player of any pretensions having his own fancy; but all kinds of hockey may be classed under two heads—those with a small hook and those with a large one, the difference between them being much the same as that between a rapier and a cavalry broadsword. As may be supposed, the better players mostly prefer the lighter and more wieldy though less powerful weapon, just as a first-rate fencer would prefer a light straight sword to a cutlass.

In choosing a hockey, the young player should be careful not to overweight himself: all the real work of the game is done by pure *wrist-work;* the hockey, therefore, must not be of a greater weight than he can easily manage. The heavier and long-hooked hockeys are generally employed to make up by mere weight and size for the deficiency in address of their owners—the long hook makes it almost impossible to miss the ball, and the great weight is of itself sufficient to drive the ball, however clumsily it may be handled. Of two-handed hockeys, the less said the better: they are only serviceable in crowded games, and there they are so dangerous that their use ought to be prohibited. Certainly in a close scrimmage, a big two-handed hockey, wielded by competent arms, will hew its way through the fray in a most marvellous fashion, by mere weight of metal driving the lesser and slighter sticks before it like very reeds; but when Greek meets Greek, when two-handed hockeys are opposed to two-handed hockeys, then comes the tug of war indeed, very exciting, but apt, indeed almost certain, to entail a considerable number of casualties both to the sticks and to their owners.

With a good player the hockey is scarcely ever lifted above the shoulder, the ball being driven along by a succession of taps, and is guided in and out between the opposing ranks of hockeys by the mere action of the wrist; and it is only occasionally, even where it is necessary to drive the ball, that the stroke is made with the full sweep of the arm. With this style of play it is evident that *no* risk is incurred of receiving or inflicting serious injury.

But with really heavy sticks wrist-play is impossible: they can only be wielded to any purpose with the full sweep of the arm, and thus introduce an element of danger which would not otherwise exist. In a game with from six to a dozen on a side, and light one-handed hockeys, which is the really scientific game, the danger may be set down as *nil;* but if there be twenty or thirty on a side, with two-handed hockeys, the chance of untoward accidents becomes a matter of very serious consideration.



For these and other reasons which he will soon discover for himself, the young player will do well to adopt the lighter and short-hooked hockey, as figured, rather than any other.

The hockey should be of some tough wood, ash perhaps for preference, and should be well seasoned before use; its length should be a little more than is necessary to reach the ground with comfort when grasped by its upper extremity; that is to say, when in play there should be a couple of inches or so left above the grasp.

The rules of the game are few and simple; those for play are as follows:

1. The choice of goals shall be decided by tossing, and the side winning the toss shall start the ball from a spot ten yards in front of their goal.
2. The ball may only be *played* with the hockey; it shall, however, be lawful to stop the ball with the body or legs, but not with the hands.
3. A goal is gained when the ball is *played* through between the posts and under the cord by the opposing party, or in any way passed through by the side owning the goal.
4. No player may strike the ball backhanded; in every case the player must play facing the opponent's goal.
5. A player is not permitted to loiter near the adversary's goal, but may be required to retire, while not playing at the ball, to a distance of at least twenty-five yards.

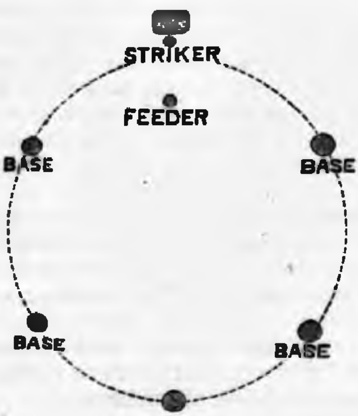
These rules, if honestly carried out, will be found amply sufficient for all the purposes of the game. There are some local varieties, but in the main the game is much the same all over England. The rule against the use of the hands is in some places not enforced, and the method of starting varies much. With regard to the former, we can only assure our young readers, from much experience, that it is on the whole a mistake; and for the latter, so long as the ball gets a fair start, it is of no material importance what is the precise method employed.

In some places attempts are occasionally made to make it illegal to run the ball along in the manner commonly called "sniggling"—a term that every schoolboy will understand—fortunately mostly without success. It is in this "sniggling" that the whole *science* of the game lies, and the attempt to suppress it is generally nothing more than the unreasoning and unreasonable protest of the herd of "duffers" against the one or two skilled players, with whom they feel themselves unable to cope in skill and address, and so try to reduce them down to their own dead level of mere undisciplined muscularity.

The game of hockey has fallen much out of repute of late years, partly through the immense advance in popularity of cricket, and football, and other athletics; but chiefly, it it is to be feared, from the introduction into the game of a too savage and reckless style of play, by which so many serious accidents have been brought about, that the authorities have become shy of encouraging a game in which teeth and eyes run no small danger of being knocked out, and face-wounds leaving permanently disfiguring scars are not unfrequent. It is, however, such a thoroughly good game, and, under the conditions above indicated, so perfectly free of all danger, that it *ought* to occupy, as we said above, a place next only to football; and we shall consider the space here allotted to it well bestowed, if it induce only one or two of our larger schools to take it up in earnest, and place it on the list of recognized games. We see no reason why hockey matches should not take the same place in winter that cricket does in summer. Football rests under the disadvantage of having no generally recognized code of rules, and is, indeed, such a radically different game in various localities, that inter-school matches are few and far between. Different schools, moreover, are not so wedded to their own systems as in football. But hockey, wherever it is played, is almost identically the same, the divergence of practice in the various centres of the game being so slight as to be quite unimportant, and therefore inter-school hockey matches could be arranged and carried out almost as easily as in cricket. It is a comforting reflection to an enthusiast in hockey, that it is not an impossibility, perhaps not an improbability, that this game may, before the end of the next decade, assert its proper position amongst our school games. It is by far too good a game to be suffered to pass into the limbo of forgotten sports; a destiny that seems in store, if the experience of the last five and twenty years be any guide to the future, for many of our national games; and indications are not wanting that, unless hockey gains a fresh lease of popularity, this is indeed the end that awaits it, and that at no late period: which may the Fates avert!

ROUNDERS.

This is a very interesting game, not difficult to learn, yet offering ample opening for almost any amount of personal skill and address. Its requirements are not numerous, a ball being the only one absolutely indispensable, so that it is a capital game to get up at short notice, when time and circumstances make the more set games, such as cricket or football, out of the question.



The ground may be conveniently prepared as follows: The home is marked out by four sticks or stones, or by a line scratched on the ground, and the five bases are marked, at a distance of about fifteen yards apart, each by a stick or stone. The players, having now divided into parties, toss up for innings, the winning side takes possession of the home, while the rest go out into the field. The captain of the outing side, having disposed his men in the field according to their several abilities and the requirements of the game, takes the ball, and places himself as feeder, in readiness to throw the ball to, or "feed," the successive strikers of the inning side. All being thus arranged, the game commences by one of the inning side coming to the front of the home, in readiness to strike the ball as it is "served" to him by the feeder. Sometimes the ball is struck with the hand only, but this can be recommended only when nothing better is immediately available. The more common practice is to use a short bat, similar to that used in trap-ball, and sometimes a cricket stump is employed. Of all these the cricket stump is perhaps the best: the use of the bat, since it makes it almost impossible to miss the ball, deprives the game of much of its interest; yet the stump, unless all the players be proficient, is open to the opposite objection of making the game too difficult. The kind of bat that best suits the requirements of the game is something between the two—a round stick like a constable's staff, from eighteen to twenty inches in length, and from two to two and a half inches thick, thinned down at one end into a handle. This is technically named a "dogstick."

Armed with this, the several members of the inning side present themselves in succession in the front of the home to receive the ball from the feeder. Each striker is allowed to pass by as many balls as he likes without striking, until he gets one that suits him; if in striking he miss it, or tip it behind the home (*i. e.*, behind the front line), or if it be caught by one of the field before touching the ground, he is out, and stands on one side; if, however, he succeeds in hitting it safely away, he throws down the bat and runs for the base nearest to him on his right, and thence, if he has time before the ball is thrown up, to the next, and so on, striving, if possible, to get completely round and home again before the ball is fielded and returned. If he succeed in doing this—in getting a *rounder*—his side scores one towards the honours of the game, the side scoring most rounders in an innings being considered the victors. If, however, while running between the bases he is struck by the ball, he is out, and stands on one side as before.

When all the inning side but two are thus out, they may call for "rounders." The better player of the two then takes the bat, and is allowed three chances at the ball for the "rounder;" that is, he is allowed to strike three times at the ball instead of only once, and may make his own choice as to which he will run for. Having once run, he must accept all the chances of the game as before. The "rounder" is not allowed unless the run is made clear. If the ball be sent up and put in the home, or if the runner be hit by the ball at any part of his passage round—the bases afford him no protection—then the inning side is out, and the outing side take their place, and the game proceeds as before. If, however, the "rounder" be achieved, the whole of the inning side are in again, and have a fresh lease of the bat, and so on until their opponents can finally dispose of them.

With accurate and hard hitting on the inning side, and active fielding on the outing, this is a very exciting and interesting game. The striker has little to do but to hit the ball forcibly away in that direction where the field is most open; it is in the fielding that the real art of the game lies: a strong party out in the field will leave their opponents but a short lease of the bat, and "rounders" will be scarce indeed.

A fieldman, besides looking out for a catch off the bat, must be always on the alert to back up when the feeder or another fieldman is having a shy at the runner; this will not only save many "rounders," but will in many cases be the occasion of getting out a runner who would have otherwise escaped: the thrower, too, will throw with all the more accuracy and precision that he is not nervous about the consequences of missing. As in cricket, the ball when thrown up should be returned hard and sharp to the feeder, without any hesitation or dallying.

The runner is not allowed to leave a base and return, except he leave it before the ball is out of the feeder's hand. If so, he must return to it, subject to the chance of being hit by the ball, and so being put out; and in running from base to base he is not allowed to deviate—that is, of course, within reasonable limits—from the straight line between the bases. His clothes are considered part of his person, and therefore if the ball strike them, even if it be a loose part of his jacket, he is out. This is often a matter of dispute where the rule, which is the only possible one, is not clearly understood beforehand. Of course, no fieldman may in any way, or under any pretence, obstruct a runner in passing from base to base.

As the ball has to be thrown at the players, it must not be hard and heavy like a cricket ball, nor, as it has to be driven by the bat, must it be too soft and light; those white leather balls, about an inch and a half in diameter, which are sold in the shops under the name of tennis balls, are about the best for the purposes of this game. There should not be too many on a side, or the game becomes tedious: from six to nine or ten on a side will be found most suitable.

TRAP-BALL.

This is a game that used to be very popular in some parts of the country, but, like so many others of our old national games, it has fallen latterly into disuse, and is very seldom seen now, even amongst boys. It is, however, by no means a bad game, as it gives quite opening enough for skill to make it interesting and worth playing. The players divide into sides—two can play, but sides of four or five each make a better and more lively game: one side handles the bat, while the other goes out into the field.

The apparatus required are a ball such as described above in "Rounders," a short bat, like a young cricket bat, and a trap in the shape of a shoe, having a tongue or trigger hung on a pivot, with one end shaped like a spoon to hold the ball. (See cut.)

The inning side handle the bat in succession, and try to score as many for their side as they can before they are put out, an event which the outing side endeavour to bring about as soon as possible.

The game is played thus: The striker, bat in hand, stands in readiness by the trap, with the ball in it, and touching the lever end of the trigger with his bat, causes the ball to fly up in the air: this he hits hard away into the field. If he miss his stroke, or if he strike the ball outside certain boundaries marked out on either side, or if one of the fielders catch the ball before it touches the ground, he is out, and the next player takes his place.

If none of these happen, the fieldman who stops the ball bowls it towards the trap, which must be brought round at right angles, so as to give a fair shot. If he succeed in hitting it, or in bringing the ball to rest within one bat's length of it, the striker is out. If, however, he fails in doing this, the striker measures the distance with his eye, and calls a number of bats' lengths: if upon measurement this number proves to be within the actual distance, he

scores it towards his gam^e but if it exceed it he is out, and makes room for the next.

When all the players of one side are thus out, the sides change places, and when each has played out its innings, the respective scores are added up, as in cricket, and the highest score wins the game.

In some parts of the country, Essex and Suffolk for example, a cudgel or bludgeon is used instead of the bat, but the game is essentially the same in all other respects as that described above.

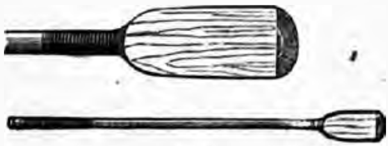
In some parts of England the place of the trap is taken by a piece of wood shaped like the trigger of the trap, and placed in a little hole beaten in the ground by the bat. The piece of wood is called the "splent;" and much skill is needed in shaping the hole properly, so that the ball may rise fairly.

KNURR AND SPELL.

This game, otherwise known as Northern Spell, is only to be seen in the northern counties, and is hardly known even by name in the southern parts of the island. It is a very simple game, and does not offer many difficulties to the learner, who, if he have a good eye and a ready hand, may easily and quickly acquire even considerable proficiency in it. It is wanting, however, in the interest of personal antagonism; the whole gist of it lies in driving a ball in a given number of strokes over as many yards of ground as possible. As each man tries his hand in turn, quite independently of his opponent, and takes his own time, being as leisurely as he sees fit, it becomes too cold-blooded an affair to excite much enthusiasm even in the players themselves. In the north, however, it has a certain popularity.

Any number may join in the game, but it is essentially a contest between individual players. The requisites for the game are a bat, a trap, and a ball. The ball, about one and a half inches in diameter, is made either of wood or of white porcelain, the latter being, perhaps, preferable. The trap is the same as that used in "Trap-ball;" but a piece of wood this shape is often employed:

SUBSTITUTE FOR TRAP.



BAT.

and answers the purpose admirably. The bat consists of a piece of wood like a half-pint bottle split longitudinally, firmly attached to a long handle of stout cane; this handle varies in length from four to five feet, according to the height of the player.

The player, holding this bat by the extremity of the handle in both hands, touches the trigger, and whirling the bat round his head, catches the ball in the centre of his bat, if possible, and drives it far afield. The spot where the ball pitches is marked down, and its distance from the trap measured—in a regular match by a long cord knotted off into yards, but in ordinary games in any rough-and-ready way that happens to be most convenient. His opponent then tries his hand, and so on alternately, until the agreed number of strokes have been made; the number of yards each has covered are then added up, and he who shows the highest total is declared the winner.

A good player will drive the ball to a most astounding distance, more by knack, however, than by brute force. This knack is, to a certain extent, not difficult to acquire by practice and personal instruction, nor is considerable proficiency beyond the reach of even ordinary capacities; it is, however, quite indescribable on paper, and therefore the learner must, if instruction be unattainable, e'en set to work and acquire it for himself.

One piece of advice, though, may not be misplaced; that is, to hit *high:* when a stone or ball is to be hurled to any distance, it is wonderful how few give the missile sufficient elevation. The elevation that gives the best results is an angle of 45° with the plane of the horizon, and this angle may be roughly ascertained thus: Stretch out the arm at right angles to the body, then lift it straight above the head, now let it drop to a position exactly midway between these two positions, and you have the angle required. Hit your ball up at this angle—never mind its looking like sky-scraping—and you will get as much out of each hit, even to the last foot, as is possible.

PITCH STONE.

This is a very good game to play along a country road or across a common, where other objects of interest are not plentiful, and when it is not a matter of importance to get over the ground very rapidly. It is a game only for two, and is played as follows:

Each player arms himself with a roundish smooth pebble: one of them leads off by throwing his pebble forward some ten yards or so, and the other tries to hit it with his own; if he succeed, he counts one towards the game—which is mostly eleven, but may be any number previously agreed upon—and the first player has to lead off again; if, however, he miss, the first player picks up his stone, and standing where it rested, takes aim at the stone of No. 2, and so on alternately. Accuracy of aim is almost the only point in which special skill can be displayed.

In pitching his stone, the player must take care to do so with sufficient force to carry it, in case of missing, well beyond the one he is aiming at, or he will give too good a chance to his opponent. There is a game very similar to this played with marbles, which is very popular still in some parts of the country.

DUCK STONE.

A very lively game for any number of players from four or five to a dozen. Each player procures a smooth, somewhat flattened pebble, and a large stone about ten inches or so in diameter, with a flat top, is set up to serve as "mammy." A "home" is marked out about ten yards or so from the "mammy," and from this the players "pitch for Duck," that is to say, they try to pitch their pebbles as near to the "mammy" as possible: the one who makes the worst shot goes "duck." He puts his pebble upon the "mammy," and the rest of the party in succession stand at the home, and endeavour to knock the "duck-stone" off the "mammy."

So far there is not much life in the game, but the player, having pitched his pebble, has to get it back again for his next shot: the instant he touches his stone he lays himself open to be touched by the duck, in which case he has to take duck's place; duck, however, has this power of touching the other players only as long as the "mammy" is crowned—that is, as long as his pebble rests on it—so that the displacement of this is the signal for a general scurry homewards, and duck must be very quick in replacing the stone, to get even a chance of touching one of the players.

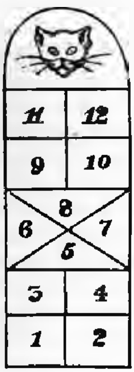
When the players are well matched this is a very lively game, and all sorts of arts are employed on both sides, on the one side to effect a safe retreat, and on the other to cut it off. As a general rule the duck should stand near the "mammy," ready to replace his stone in a moment; he will also find it a good plan to devote his attention, not, of course, too openly and exclusively, to those who have pitched some way beyond the "mammy:" he will be nearly certain, sooner or later, to cut one of them off on his way home. If the play is at all good, he must not reckon on too much spare time in catching a fugitive, or perhaps—and this is not at all uncommon—just at the critical moment, as his hand is stretched out to effect the "touch," away will fly his stone, and he will have to return ignominiously to replace it. If the place in which the game is played be of any extent, it is well to confine it within arbitrary limits, or it loses all its life: if a player may run to any distance laterally, it is almost hopeless for the duck to touch him before the "mammy" is discrowned. The best way is to mark out boundaries at the sides and ends, about ten yards distance each way from the "mammy," making it, in fact, the centre of a square, twenty yards each way; this will be found to afford ample room, but will not be too wide to give the duck a fair chance. If a runner, in trying to elude the duck, overpasses either of these boundaries, except into home, he is considered to have been touched, even though, at the moment of doing so, the "mammy" be discrowned, and must change places with duck accordingly.

NINE HOLES.

Strictly, this game should be played by nine players, and nine only, but the actual number is not material to the spirit of the game, and the number of holes may be modified at will, to suit the number of players. To play it, nine holes, about six inches wide and three deep, are dug near a wall, and a line is drawn opposite these at a distance of five or six yards. Each of the players takes one hole, and one of them, standing at the line, pitches a ball, which should be similar to the one described in rounders, into one of these holes. The player to whom the hole belongs snatches the ball out and throws it at one of the others, who have meanwhile scattered in all directions. If he hit him, the player just struck becomes "pitcher;" if he miss him he loses one, and himself becomes "pitcher." When a player has thus missed three times, or technically has "lost three lives," he is considered "dead," and stands out until the conclusion of the game. The winner is he who holds out to the last. Caps are sometimes used instead of holes, and serve the purpose equally well, though perhaps they would be better on the heads of their respective owners.

HOP-SCOTCH.

This is very good practice for balancing the body and acquiring steadiness on the legs. Chalk or otherwise mark out on the ground a figure like the accompanying diagram, on a scale of about four feet to the inch.



Not more than two or three should play at one figure, or there will be too long a time between the turns. The players "pink" for first turn, that is, they pitch the stone or piece of tile with which they are going to play at the cat's face at the rounded extremity, sometimes also called and drawn as "the pudding." He who gets nearest leads off.

Standing at the square end, he throws his tile into compartment 1, hops in and kicks the tile out—still hopping—to the starting-point. He next throws the tile into No. 2, hops into 1, thence to 2, and kicks the tile out as before. He next goes on to 3, and so on until he reaches 8, which is called the "resting-bed;" having reached this he may rest himself by putting his feet into 6 and 7, resuming his hopping position, however, before he goes on with the game, in which he proceeds as before. Until he reaches the "cat's face" or "pudding," he may have as many kicks as he likes in kicking the tile out, but when he reaches that he must kick it through all the other divisions at one single kick, the successful achievement of which crowns the game.

If the tile be pitched into a wrong number, or rest on one of the lines, either in pitching or kicking, or it be kicked over the side lines, the player loses his innings; if he put down both feet while in the figure, except at the resting-bed, or set his foot, in hopping, on either of the lines, he suffers the same penalty. Some players who are particular, and cultivate the refinements of the game, are in the habit of using a circular disk of lead, instead of the usual irregular, and therefore uncertain, piece of tile.

BATTLEDORE AND SHUTTLECOCK.

This game must be so thoroughly familiar to all our readers, however young, that there can be little need for prolonged comment. It may be played by one person or several, but the single-handed game is apt to become very tedious and uninteresting, however ingenious the player may be in varying his style of play. To get any real amusement out of the game at least two should play.

The whole art of the game consists in keeping the shuttlecock in the air as long as possible. As a stimulus to extra exertion it is well to set a number as the standard of attainment, counting one for each flight from the battledores, and try to keep up the "cock" until you have reached it. Two good players will not find five hundred too many for them, but at first even twenty will be found

a long figure. The more players there are the more difficult does it become to keep the cock up.

If the game be played with any spirit, it will be found to afford very good exercise, and will prove very good training for other sports of a more advanced character, such as rackets and fives and the like.

The best kind of battledores are those called "drum," with parchment heads. The shuttlecock should be rather long and the feathers not too wide-spread, otherwise it is apt to be slow of flight, and to require very hard hitting to drive it at all.

The Chinese are great adepts with the shuttlecock, only with them the cock is driven by the upturned sole of the shoe, instead of with a battledore as with us. The players stand in a ring, and each as the cock comes to him spins smartly round, catches it on the sole of his shoe, and so passes it on to his neighbour.

TIP-CAT.

This is played with a cylindrical piece of wood, about five inches long, sharpened at both ends, as in figure, and a *bâton* or stick. A small ring is marked out on the ground, and at a distance of about twelve feet from it is drawn a line called the "offing."

Two players toss up for innings, the winner takes the stick and stations himself by the ring, while his opponent stands at the scratch or offing, and tries to pitch the "cat" into the circle. If he succeed, the first player is out and takes his place at the scratch, and becomes "pitcher," while the pitcher in his turn takes the *bâton*. If, however, he is not successful in his cast, that

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is, if the whole of the cat does not rest within the ring, the first player proceeds as follows: He stands by the cat, and tipping one end of it smartly with his *bâton*, causes it to fly up in the air, and then hitting it while in mid-air, drives it as far as possible. If the cat, or any part of it, rest on or over the ring, he is allowed only one turn at the cat, but if it be altogether outside, he is allowed three. Having struck the cat as far as he can, he measures with his eye its distance from the circle, and calls a certain number of sticks. If on measuring the distance it prove to be less than so many sticks' lengths, he is out, but if more he scores the number called to his game, and the cat is pitched to him again as before.

In some places the measurement is made by close-footed jumps, but this is not so certain as the other method by sticks, and it possesses the further disadvantage, too, of leaving a great opening for sharp practice if either party is so disposed.

If the striker in hitting at the cat while in the air miss it altogether, or if the cat be caught by his opponent, he is out, and loses his innings. After each player has had two innings, or any other number previously agreed upon, the scores are added up, and the larger wins.

There are several other ways of playing tip-cat in vogue in various parts of the country. One way is for the striker to stand in the midst of a large

ring some ten yards in diameter, and tipping the cat from thence, strikes it as before. He is liable to the same penalties as before, with this in addition, that the cat must be hit over the ring, or it counts as a miss and he is out. If he strike the cat fairly beyond the ring, he counts the game as before; the distance being reckoned from the centre of the circle, not the circumference, as before.

A third method requires at least eight or ten players: these divide into two sides, and four or five bases, according to the number on a side, having been marked in a circle, one party takes the field, while the other, each armed with a *bâton*, station themselves at the several bases. One of the outing side now, standing at a scratch marked opposite one of these bases, and about three yards from it, "serves" the cat to the player at the nearest base, who strikes at it, subject to the same conditions as in rounders, which game, by the way, this method very much resembles. Directly the cat is struck or even tipped, the whole "in" side run from base to base, keeping their right shoulders inward, and continue to run as long as they consider it safe to do so. Every base they thus make counts one to their score. The striker is *out*, and with him the whole side, if he miss the cat, if he tip it behind him into the circle, if it be caught by one of the fieldmen, or if while a player is running the cat be thrown between the base he has left and the one he is making for.

Tip-cat should always be played with caution, and *never* where there are many people about. It is impossible to keep the cat under perfect control as one can a ball: at any moment it may fly into the face of a passer-by, and inflict an unsightly wound, or even blind him—such things have been; for a sharply-struck cat, as it comes spinning and whirling through the air, makes a most formidable missile, especially when it takes one unawares. Therefore we would reiterate our exhortation to caution and circumspection.

AUNT SALLY.

This game when it was first introduced had a tremendous run of popularity; even in the very highest ranks of society there was a perfect rage for the new game. For a season Aunt Sally was the reigning queen of society, the goddess of fashion, at whose shrine it behoved all persons who aspired to position *in* society to come and bow themselves down. If report says true, Cabinet Ministers and even great foreign potentates did not disdain at one time to number themselves amongst the votaries of this popular pastime. But the glory of its early days has departed; Aunt Sally's little day as a fashionable pastime is over; the game has dropped out of fashion almost as quickly as it came in, and with nearly as little reason, for it certainly has its good points, and is a game from which a good deal of fun may be extracted.

In providing the necessary appurtenances there is no occasion to go to any considerable expense. Take a round block of wood about eighteen inches long and eight or nine in diameter, and rough-hew it somewhat into the shape annexed. If there be any carving talent easily accessible, the head and features may be got up with any amount of elaboration consistent with solidity and strength: all really fine work is simply thrown away, and is, indeed, out of place; if not, flatten and smooth over one side for a face, and give the whole two or three coats of black paint, allowing one to dry thoroughly before the next is laid on. If beauty unadorned will serve your turn, the features may be marked out with a mere dab or two of white paint, and as far as adornment is concerned Aunt Sally is complete. A little extra adornment, however, certainly adds to the spirit of the game; a little extra time and trouble, therefore, spent on getting the old lady up to better advantage, will not be thrown away; and with very little pains, backed by a little ingenuity and invention, you may turn her out "beautiful for ever."

Procure some canvas or stout calico, make this up, or get it made up, into something of a cap shape, the more fanciful the better, and nail it securely on to the head with brass-headed nails, covering all but the face. A frill, which will be found a great addition to the good lady's attractions, may be made by looping up a strip of the same, or better still, of some coloured stuff, between the nails. The features should be marked out in white paint with a judicious shading of red, and a liberal allowance of the latter for the lips, which should be very full and wide apart, showing a rather defective set of teeth of Brobdingnagian proportions.

Make three gimlet-holes at least two inches deep, one in the centre of the nose and one in each ear, and with an augur make a hole at least two and a half inches in diameter and four or five deep up the neck, to receive the head is, if the whole of the cat does not rest within the ring, the first player proceeds as follows: He stands by the cat, and tipping one end of it smartly with his *bâton*, causes it to fly up in the air, and then hitting it while in mid-air, drives it as far as possible. If the cat, or any part of it, rest on or over the ring, he is allowed only one turn at the cat, but if it be altogether outside, he is allowed three. Having struck the cat as far as he can, he measures with his eye its distance from the circle, and calls a certain number of sticks. If on measuring the distance it prove to be less than so many sticks' lengths, he is out, but if more he scores the number called to his game, and the cat is pitched to him again as before.

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This game when it was first introduced had a tremendous run of popularity; even in the very highest ranks of society there was a perfect rage for the new game. For a season Aunt Sally was the reigning queen of society, the goddess of fashion, at whose shrine it behoved all persons who aspired to position *in* society to come and bow themselves down. If report says true, Cabinet Ministers and even great foreign potentates did not disdain at one time to number themselves amongst the votaries of this popular pastime. But the glory of its early days has departed; Aunt Sally's little day as a fashionable pastime is over; the game has dropped out of fashion almost as quickly as it came in, and with nearly as little reason, for it certainly has its good points, and is a game from which a good deal of fun may be extracted.

In providing the necessary appurtenances there is no occasion to go to any considerable expense. Take a round block of wood about eighteen inches long and eight or nine in diameter, and rough-hew it somewhat into the shape annexed. If there be any carving talent easily accessible, the head and features may be got up with any amount of elaboration consistent with solidity and strength: all really fine work is simply thrown away, and is, indeed, out of place; if not, flatten and smooth over one side for a face, and give the whole two or three coats of black paint, allowing one to dry thoroughly before the next is laid on. If beauty unadorned will serve your turn, the features may be marked out with a mere dab or two of white paint, and as far as adornment is concerned Aunt Sally is complete. A little extra adornment, however, certainly adds to the spirit of the game; a little extra time and trouble, therefore, spent on getting the old lady up to better advantage, will not be thrown away; and with very little pains, backed by a little ingenuity and invention, you may turn her out "beautiful for ever."

Procure some canvas or stout calico, make this up, or get it made up, into something of a cap shape, the more fanciful the better, and nail it securely on to the head with brass-headed nails, covering all but the face. A frill, which will be found a great addition to the good lady's attractions, may be made by looping up a strip of the same, or better still, of some coloured stuff, between the nails. The features should be marked out in white paint with a judicious shading of red, and a liberal allowance of the latter for the lips, which should be very full and wide apart, showing a rather defective set of teeth of Brobdingnagian proportions.

Make three gimlet-holes at least two inches deep, one in the centre of the nose and one in each ear, and with an augur make a hole at least two and a half inches in diameter and four or five deep up the neck, to receive the head of the stake on which she is to stand; then with a petticoat of strong but bright-coloured material tied round her neck, perch the head on the stake, which should stand about five feet out of the ground, and Aunt Sally "stands confessed in all her charms."

You will further require a good supply of tobacco-pipes, and ten or a dozen stout cudgels, from twenty inches to two feet in length. The pipes are placed

in the gimlet-holes in the nose and ears of Aunt Sally, and the cudgels are employed to throw at them, and knock them out and break them. The players stand at a mark about ten paces from the figure, and the game is counted by the number of pipes broken in a given number of throws; the ear pipes counting one each and the nose two. If possible, it is desirable to have some loose sacking or other material stretched at the back of Aunt Sally, to stop the sticks, otherwise the labour of fetching them is something considerable, and considerably detracts from the enjoyment of the game.

KNOCK-'EM-DOWNS.

This is a game very similar to the last, or rather the last is a modification of this. A number of holes, generally three, about six inches in diameter, and set in a triangle, are dug in a loose sandy soil, and in each is set up a slender stick about five feet high, on the top of which is set some article of no great value, such as a snuff-box, tobacco-box, a cocoa-nut, &c., and the game consists in knocking off these articles with sticks similar to those used in Aunt Sally. It is no use striking the stick that supports the snuff-box or other article—it will only fall away and let the snuff-box itself fall perpendicularly into the hole, in which case the hit does not count, and the stick has to be replaced. The only possible way of knocking the things off so as to fall clear of the holes is by striking them themselves full and fair with the throwing stick, the knack of doing which is by no means easy of acquirement.

Knock-'em-downs is always in great request at fairs and races, where it is chiefly in the hands of the gipsies, who allow so many sticks a penny, taking good care that the value of the articles set up on the sticks shall not be too great to leave them a margin of profit on each transaction. Where the soil is not suitable, light baskets of sand are employed, in which the sticks are placed.

GAMES IN THE SNOW.

SNOWBALLS.

The best way to play snowballs is to form sides, draw a couple of lines across the play-ground ten yards apart, marking out the neutral ground, into which no combatant may enter, prepare as many snowballs as you like, and then fight it out with fair throwing.

This is a much better plan than mere desultory throwing, which after a time nearly always degenerates into rubbing snow into each other's faces and necks, and so to bullying and quarrelling.

SNOW CASTLE.

Additional zest may be given to snowballing by constructing a castle or fort of snow, and the players dividing into attacking and defending parties. The walls must be made very solid, and considerably thicker at the base than the top; if the fort is of any height, five or six feet will not be too thick for the base of the wall.

In constructing this fort, the first thing is to select the site; the commanding engineer—it is always well to put the whole management, in this and similar cases, under the undivided control of one individual, who shall be responsible for the results—must look about him not only for the most suitable place, strategically, for his fort, but for the place where his materials will be most ready to hand. If possible, he should choose an angle of the play-ground wall, as this narrows the front upon which he can be attacked, and at the same time diminishes the amount of material required, which latter is a very important item in the account, for no one who has not tried has the least idea of the enormous mass of snow required to build even the most unpretending snow castle. Having selected his ground, and got together his party of labourers, armed with spades and other requisites—a wheelbarrow or two will be found very useful—the engineer must set some to clear the ground ready for his foundation, while others employ themselves in rolling up vast snowballs in different parts of the play-ground.

As soon as one of these snowballs attains to a diameter of about a yard it must be brought up to the place prepared for it, and there squared off with spades into a tolerably accurate cube; another is then placed alongside it, and then another, until the whole line of wall is complete; the interstices are then filled up with loose snow well rammed down. This being thoroughly compacted, a fresh line is made a foot or more inside the first, and the vacancy filled with loose snow trodden in. In this way a good solid foundation is obtained and about two feet of wall raised. By proceeding in the same way the wall may be raised to any requisite height. If the snow is deficient in binding power, or indeed under any circumstances, a few sticks planted along

at intervals will prove of great service in binding the several layers of the wall together.

The walls being thus raised to the desired height, which should be at least five feet, but better six, all is done so far as defence is concerned; but the defenders not only require to be protected from the fire of the enemy, but must be enabled to reply effectively to it. For this purpose a good solid ledge or platform must be constructed inside, of sufficient height to allow the besieged the full use of their arms in throwing—that is, when standing on it the outer wall should be about breast-high.

Of course the means of ingress and egress must not be forgotten. A narrow doorway should be cut, with the sill about four feet from the ground; and this during the siege must be barricaded in any rough-and-ready way that may prove most effective.

Everything being thus solidly constructed —by the way, a bucket or two of water thrown over the whole, just before leaving it for the night, will have a wonderful effect in compacting it all together—the players divide into two parties under separate leaders, the smaller party to defend, the larger to attack the stronghold, and forthwith commence their preparations, which, especially on the part of the besieged, should be rather extensive.

The besieged gather together into the fort a great mass of snow as raw material, and pile up many score of snowballs as service ammunition, while the besiegers are equally busy outside piling up heaps of snow and snowballs, many and frequent, in a great circle round the walls.

At last the signal is given: the defenders retreat into the fort and barricade the entrance, the flag is mounted on the walls under a royal salute of all arms, three cheers, and hard to work they go, hammer and tongs.

The captain of the besieged will, if he is wise, remind his troops that with them ammunition is limited, whereas their opponents have an inexhaustible supply to fall back upon, and that nothing but a *sortie*, always a most dangerous expedient, can give them the means of replenishing their stock when once exhausted, and consequently that they must economize in every way, and make every shot tell.

The besiegers, on the other hand, will follow exactly the opposite tactics, and, being under no apprehension of failing ammunition, will ply their opponents to the full extent of their powers, leaving them no rest and no relief from the storm of missiles.

If the attacking party be large, numbering say forty or fifty, the captain should work them like skirmishers, one party firing while the others are loading. A boy of any ability will find plenty of room, as captain, to exercise his abilities in devising plans for offence or defence.

A good heavy vertical fire will often be found very effective. A party, armed with huge snowballs six inches or so in diameter, advance in open order under cover of a well-sustained fire, and pitch them in a volley or in rapid succession well up into the air, so as to fall almost perpendicularly within the fortification. These shells are dreadfully annoying: one or two are of no use, but half a dozen or so at a time coming tumbling in, compel the unfortunates within to give up everything else and bestow almost their whole time and attention to watching and avoiding them. Woe betide the unfortunate who, trusting to the walls and dreaming not of shell practice, shall be stooping down working up snowballs, if one of them comes—thump!—on the nape of his neck: go down he must; and what with the explosion of the shell, the consequent thorough saturation of his head and shoulders with snow, and the sudden blow, he may be considered fairly *hors de combat* for some time—at least, his snowball manufactory will be not a little interrupted.

Many more artifices and inventions might be mentioned, but enough has been said to put a boy of ordinary intelligence in the way of making the best use of his opportunities in this line.

One thing we must protest against—that is the cruel practice of compelling the little boys to make the snowballs while the big ones throw them. Snowballing is very pretty work for those who get the exercise; but the utter misery of standing still, working up with bare hands the bitter cold snow, with all the blood freezing in one's veins, and no hope of warming it—that indeed none but those who have experienced it as little boys can understand. Little boys ought to be made to serve their seniors; it is good for them that they should; but the seniors ought also to have kind consideration for the little fellows over whom they hold a rule so despotic, and in a large measure so irresponsible.

SNOW GIANT.

This is an amusement very inferior to the above; almost the whole fun lies in the construction of the giant. Once made, there is very little to be done with him but to shy at him and knock him to pieces again, a process that has always a certain attraction, but can hardly compare with the invigorating dash of the attack on a snow fort. The perfect passiveness and helplessness of the giant takes away more than half the pleasure of attacking him; the snow fort would be nothing without its defenders.

The first process in this, as in all large constructions in snow, is to roll up large snowballs; two large ones are wanted for the body, and one of lesser dimensions for the head. The site, if the giant be intended to be at all permanent, should be on rising ground, not in a hollow, or it will be in a pool of water when the thaw comes, and will disappear twice as rapidly as it otherwise would. Having selected a suitable site, one of the great snowballs must be rolled thither, and firmly set in its place by mounding up and ramming the snow all round it, and the top flattened off to receive No. 2. Now comes the difficulty how to lift No. 2 into its place. A hand-barrow, shutter, or hurdle are the best things, but if none of these be available, a very effectual substitute may be extemporized out of a few stout sticks lashed crosswise. Snowball No. 2 must, of course, be flattened at one side to fit No. 1, and the cohesion of the two will be greatly promoted by sprinkling a little water over the surfaces before bringing them into contact.

No. 2 thoroughly and rightly settled into its place, No. 3 must be set up in like manner, and the block now stands ready for the sculptor. The elaboration of detail must, of course, depend upon the genius of the carver; but the nature of the material will entirely baffle any attempt at boldness of execution, and the best that can be done is a massive indication of the features and limbs—a style of sculpture, in fact, closely resembling the gigantic Egyptian figures in the Crystal Palace.

The most satisfactory tool to work with is a pointed mason's trowel: with this the whole of the carving, however elaborate, may be done. If a trowel be not obtainable, a very good substitute may be made with a piece of thin board. Cut it into the shape required, leaving a good strong handle, sharpen off the edges, and there is as good a tool as any one could desire for the work. By the way, it is quite useless to attempt to stick limbs or features on—they must all be cut out of the solid mass.

Your snow giant complete, the more eccentric the accessories with which you can provide him the better, such as a shocking bad hat, a long pipe, a besom for a sceptre, or, best of all, a good big dilapidated umbrella; and having got him you may do what you like with him; but decidedly the very worst use you can put him to is to knock him to pieces.

COASTING OR SLEDGING.

This is a grand sport, and may be played on almost any hill-side after a good fall of snow. In England it has as yet attained to no higher rank than one more among our many boys' games; but abroad, where the winter is both more prolonged and more severe than with us, this game is, under various names, one of the most popular recreations for all classes and all ages.

Coasting is simply sledging without horses. The sledges are taken to the top of a hill, and allowed to slide down, the force of gravitation doing the work that horses are required to do on the level.

For all the purposes of the game the sledges may be of the most simple description: a plain piece of board, so it be large enough to accommodate its rider, will serve its turn at a pinch, if nothing better be procurable. With us in England it is seldom worth while in any given winter to provide an elaborate sledge, and this, perhaps, has militated against the more extended introduction of the game amongst us, but a very serviceable one may be made for a few pence from the lid of an old packing-case.

Get the blacksmith to make you a couple of good strong angle-irons, with an angle of about 45°, and the limbs about four and eight inches in length respectively, with a suitable allowance of screw-holes. Screw the longer limbs of these firmly to one end of your board, about four inches from either side, leaving the shorter limbs projecting in front. To these projecting limbs screw a piece of two-inch board—elm is perhaps the best—in length equal to the width of your sledge, and in breadth about five inches; the lower and inner edge, where it meets the floor of the sledge, must be bevelled off to fit it accurately, or at least fairly so; and the outer edge, which will now project some way below the level of the floor, must be rounded off in a gradual curve; and the sledge is complete, ready for service. The object of this raised footboard is to lift the sledge over obstacles into which, if not thus defended, it would cut its way, and so be brought up standing.

If the expense can be undertaken, it is well to defend the forefoot of the sledge where it begins to curve up with a piece of thin iron securely fastened along, and bent to the requisite curve; or in default of this, a few pieces of hoop-iron, nailed lengthwise at short distances, will add much to the life of the construction: in extreme cases they might be carried the whole length of the floor, an expedient which would not only materially increase the strength and endurance of the sledge, but also considerably improve its speed. A sledge very similar to the one above described is much used by the boys at Marlborough in Wiltshire.

No definite code of rules or instructions can be laid down for the game. A party of boys, each provided with a sledge, with a good hill-side and plenty of snow, will soon work out plenty of amusement in sliding down.

The most ordinary way is to go down sitting, feet first, the feet resting on the footboard, the steering being effected by means of a stout stick; and the novice at the sport should acquire some experience in this way before he attempts any of the higher flights.

The more experienced players not only race their sledges one against another, but also contend who shall eclipse the other in devising eccentric methods of making the course—head foremost, on the back, kneeling, and the like. Some of the bolder and more adventurous spirits will now and then attempt some such feat as making the course standing, or even go so far as to try to make it on their heads; but in either case the result is pretty sure to be the same: after a few yards the sledge gathers velocity, and shoots hopelessly from under the would-be acrobat.

Sometimes the sledges are made large enough to accommodate two or more, but perhaps most fun is to be got out of the single ones, though for racing purposes the long sledges beat the short ones hollow.

If there be plenty of snow, very little danger is to be apprehended from falls and similar mischances. In case of an upset, the chief source of danger lies in the too rapid succession of sledges, unless under experienced guidance: the mere upset is scarcely likely to be anything but a cause of laughter even to the victim himself; but another sledge coming thundering down upon him while he lies sprawling in the track might chance to prove exceedingly disagreeable. There is, however, little chance of this with the exercise of even ordinary care, and under any circumstances the casualties of a whole week's coasting are scarcely likely to approach, either in number or severity, the average of an ordinary football match.

A hill-side with a good number of coasters in full swing is a very animated sight: the rapid succession of sledges with their excited occupants dashing down the hill, and the long line of "returns" toiling up with their sledges behind them, together form a picture which for interest might compare with even our most popular pastimes.

HOOPS.

RACING.—A great deal may be done with Hoops: the mere trundling of a hoop is good fun in itself, but a great deal more fun and amusement may be got out of a hoop than that. A well-contested hoop race is very exciting. The hoop, when driven at full speed, requires a good deal of management, and the race does not always fall to the swiftest runner. The hoops in a race should be nearly the same size; a large hoop has an immense advantage over a smaller one, so if there be any material difference, the smaller hoops should have so many yards' start according to their comparative size.

TOURNAMENT.—The tournament is managed by driving two or more hoops

against each other at full speed, the hoop that does not fall being the conqueror. When there are a dozen or more hoops engaged, the tournament gets very exciting, the hoops go flying off in all directions, their masters after them like dismounted cavaliers after their horses.

TURNPIKES.—A very good game; as is also the following, when hoops are less plentiful than players. Supposing ten players with only five or six hoops: lots are drawn for the hoops, and those who fail to get them become Toll-keepers. A large circle, thirty or forty yards across, is marked out as the road, and at equal distances on this each toll-keeper places a couple of big stones three or four inches apart, according to previous agreement; this is his toll-gate or turnpike, and the Trundlers are bound to drive the hoop through every turnpike on the road. If the hoop shirk a turnpike, or touch the stone on either side in its passage through, the trundler changes places with the toll-keeper, who takes his turn with the hoop. It is surprising how much skill is required to keep a hoop up in this way for any length of time.

POSTING.—Suppose the same conditions as in the above; stations are marked out on the course by stones set at regular distances. At each of these stations a player stands armed with a stick and ready for action. The hoops are now started, and the game proceeds thus: when the trundler arrives at the first station or posting-house, he gives the hoop a slight additional impetus, and hands it over to the player stationed there, meanwhile taking his place in readiness for the next hoop; the next trundler does the same, the players constantly interchanging the hoops, so that each player has his fair share of the game. The hoops must never be allowed to fall, the player who commits this fault being required to stand out one whole round. The stations should be some distance apart, or the hoops will circulate too rapidly.

STEEPLECHASE.—This is great fun. A course is marked off across country, trees or any other landmarks serving for the boundaries; a fair start is made, and the player who reaches the goal first with his hoop is declared winner. The race must be won by fair trundling, no carrying being allowed, unless over hedges and the like. A large and heavy hoop is the best for this game.

FEATS WITH HOOPS, &c.—There are many other ways of getting amusement out of hoops. Some boys will drive their hoops at full speed, and suddenly pass through it from side to side as it runs, without checking its course; this requires a large hoop, and is a really difficult feat, requiring much dexterity, quickness, and decision. A small hoop may be driven through a large one in similar manner. In some parts of England, where smooth hill-sides are available, it is a favourite pastime to start large and strong hoops down the slope, racing one against the other. After the first start the hoop soon acquires such an impetus that it clears the ground like a race-horse, rushing and bounding down the slope like a veritable live thing, and leaves its master toiling a long way behind. The sight of the hoops in their impetuous course is exciting enough, but still more so is the headlong rush of the anxious owners, careering at full speed, each intent only upon his own hoop. A few hoop chases like this make all other games seem singularly flat and void of excitement.

Much more could be said on the subject of hoops, but further details must be left to the inventive ingenuity of the young reader himself.

KITES.

Not very many years ago the young artist in Kites seldom ventured beyond a very few simple forms, indeed, was mostly confined to one as the only one recognized as *de rigueur;* but now-a-days he has a greatly enlarged choice, and may find in the toy-shops an endless variety of forms more or less eccentric in their design from which to select. Or if he be of an inventive turn of mind, and cannot otherwise please himself, he may construct a kite on a pattern of his own.

The old theory used to be that a very slight deviation from accurate proportions in a kite must certainly prove fatal to its powers of flight; but of late years, amongst other results of opening our communications with China, we have discovered that so long as certain rules of symmetry are observed, that is, so long as one side fairly balances the other, there is almost no conceivable shape that may not be made to mount up as a kite into the sky.

Here in Europe kite-flying is only an amusement for the young, but in China it is the popular recreation of all ages; not below the dignity even of grey hairs. On a suitable evening in some parts of China the whole sky will be populated with kites of strange and wondrous aspect—mandarins, men and women, singly and in pairs, wild beasts, birds, serpents, dragons, fish, in endless variety and profusion. To the Chinaman bent on constructing a kite, nothing animate or inanimate comes amiss; let the shape be as eccentric as you please, he will not only make a kite of it, but will make one that will fly.

At the end of this notice the young kite constructor will find a few designs for kites, which may serve at least as hints for his guidance.

HOW TO MAKE A KITE.—To make a kite of the ordinary pattern, the following requisites must be prepared: a long straight lath, a cane, and a plentiful supply of string, paper, and paste. The lath is for the upright (as *b*, *d*, in Fig. 1.) The cane, which should be about three-fourths the length of the lath, must be securely fastened by its exact middle to the upper end of the lath, as at *e*, and brought down to a bow by the cord at *c*. This cord should be passed with a double turn round the upright at *f* to keep it from slipping, and care must be taken to balance the two sides of the kite most accurately; a very slight preponderance of weight on one side over the other will make the kite lop-sided, and will greatly interfere with its flight.

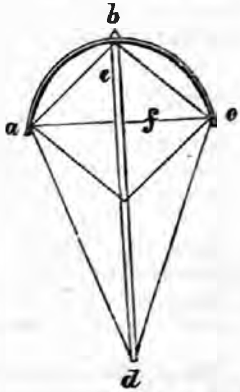


FIG. 1.

Now carry a string, as in the figure, from *e* to *c*, thence to *g*, to *a*, and back to *e*, fastening it securely at each point. Your skeleton is now complete.

Next for the paper: paste sheets of paper together until you have one large enough to cover the whole framework, with a margin of at least two inches to lap over. Lay your skeleton upon this, cut away the superfluous paper all round, and then lap the margin over the edges, and paste it firmly down. Having firmly secured this, cut some slips of paper about three inches wide, and paste them along and over the cross string so as to secure them firmly to the main sheet, and treat the upright in the same manner, though, of course, with a wider strip. The body of your kite is now complete.

For the wings or tassels take two strips of paper, of a length and width proportioned to the size of the tassel required, snip these across like a comb, roll them up, and bind the uncut ends tightly with string. The tassel for the end of the tail may be constructed in a similar manner.

The ordinary method of constructing the tail is by fastening slips of paper at six inches' or so interval along a piece of string. These pieces of paper, though intended for ornament, hardly fulfil their office, but remind one rather of curl-papers than of anything else, and are continually becoming inextricably entangled with each other. A good long piece of string with a tassel at the end answers all the purposes, and is far more graceful. If this be thought insufficient, a little coloured tissue paper rolled up fine, and twined spirally along the string of the tail, will set it off wonderfully. The tail should be from fifteen to twenty times the length of the kite.

In selecting the string for the kite, the two main points to take into consideration are lightness and strength. If the string be too heavy, the kite will not be able to soar very high, on account of the dead weight of the string; if it be too light, the pull of the kite and its own weight together will be too much for it, it will assuredly give way, and the kite will most probably be lost, and will certainly be damaged.

The string, by the way, is not fastened directly to the framework of the kite, but to a piece of string technically termed the belly-band, which is a piece of string fastened to the upright by both ends, and hanging down in a loop about a foot or eighteen inches in depth.

The points of attachment of this belly-band should be one a little below the middle of the upright, and the other about two-thirds up of the remaining length. Or, to be more precise, in a four-foot kite the lower point would be about twenty inches from the bottom, and the other about ten inches from the top. The string is firmly attached to the belly-band: as the exact point of affixture can only be ascertained by experiment, it depends entirely upon the balance of the kite.

Another and very useful sort of kite (see Figs. 2 and 3) may be made with calico set upon a frame, all of whose pieces work upon a single pivot. By this arrangement the whole kite may be folded together and put into a case like an umbrella.

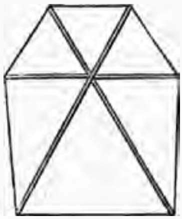


FIG. 2.

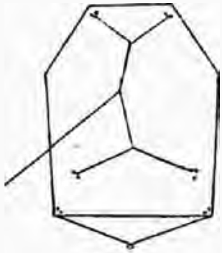


FIG 3.

The calico is only fastened permanently to the two long pieces, and simply tied to the cross-piece; this being released, the three laths may be worked round on the pivot until they are in a straight line, and the calico wrapped round them. The great advantage of this construction is, that not only are they more easy of carriage, but they are much less liable to injury.

Sometimes they are made with only two pieces, an upright and a cross-piece, but the principle is the same.

If expense be no consideration, oiled silk, or that thin gutta percha which is now used as its substitute, may be employed with advantage, and will be found, on account of their superior lightness, infinitely preferable to paper or calico.

For decorations the young artist must follow his own fancy, only he must remember that, as the effect is to be produced from a distance, only the most staring and brilliant colours can be employed, and that fine and finished details will be of no use whatever.

One of the prettiest kites now in use is that which represents a hawk with outspread wings. If this kite be properly made, it sweeps backwards and forwards with a movement exactly like that of the bird whose name it bears. If the tail be made of fine but strong string, and the weight at its end be cut in the shape of a small bird, the kite enacts in a marvellously faithful manner the manœuvres of a falcon attacking its prey.

FLYING THE KITE.—To start the kite in the first instance it is mostly necessary to have some aid; two persons are required, one to hold the kite up and help it off, while the other, holding the string, runs a little way against the wind to increase its pressure upon the kite, and thus help it to get its tail fairly off the ground, after which, if there be sufficient breeze—without which it is of course useless to attempt flying it at all—the kite will do very well by itself.

The kite, once up in the air, may be allowed to soar upwards as far as the string or its own capabilities will permit: if the string be unlimited, the height to which the kite can ascend will only be measured by its power of supporting the requisite length of string.

Sometimes when great altitude is aimed at, when one kite has taken all the string it can well carry, the lower end of the string is attached to another kite, which then takes up a fresh length, and enables its precursor to mount higher.

This method of procedure is only worth practising with really large kites, and in managing these some little care is requisite (a six-foot kite, for instance, pulls like a cart-horse), and serious accidents have been known to happen through the string getting entangled; and the owner of the kite being, as it were, run away with by his unmanageable plaything.

Where the kite is very large, it is advisable to give the string a turn or two round a post or tree; this will enable its owner to control it at will.

A piece of paper with a hole in it, slipped on to the lower end of the string, will soon by the force of the wind be carried right up to the kite itself, however high up it may be. This is called sending letters, or messengers.

NAPOLEON. SAILOR. FISH.

SLING.

The Sling was much used as a weapon in ancient warfare, and was held in such esteem, that it long kept its place even with the bow: as time passed on, though, it fell into gradual disuse, and long before the bow gave way to fire-arms, the sling had come to be regarded as little more than a toy.

It must not be supposed that it was failure in accuracy that brought the sling into disfavour as a military weapon; it is not worth any one's while now-a-days to devote the necessary time and labour to acquire proficiency in its use; though, even at the present time, there would be no difficulty in finding many boys who would be by no means desirable antagonists at fifty yards or so. But in past times, when a man's life and living depended on his skill in slinging, when as a child he had to earn his meals before eating them, then the full capabilities of the sling were brought out, and even the bow hardly overmatched it in absolute accuracy.

Its real defects as a military weapon were the want of penetrative power in the missile, especially against armour, but especially the inconvenient extent of space each slinger required to work in, and the impossibility of discharging the missiles from anywhere but the front rank. It was the bow's superiority in these respects, rather than its greater accuracy, that drove the sling out of the field.

The simplest form of sling is an oval piece of leather, with a slit in the middle and a stout string fastened at either end; one of these strings is looped, the other plain. In using the sling, a smooth stone is put into the leather, the slit in which retains it in its place; the slinger inserts his middle finger in the loop of the one string, grasping it at the same time firmly in his hand, and holding the other string firmly and yet so that he can easily let it slip, whirls the whole swiftly round his head two or three times, and then at the right moment lets fly the loose string; the pocket of the sling immediately flies open, and the stone is discharged with extraordinary velocity.

The explanation of the great velocity is this: The human arm cannot be made to move through the air at more than a certain velocity; its power, therefore, of imparting velocity to stones or other missiles is strictly limited. Beyond a certain ratio of speed, increase of muscular power has not the least effect upon the individual's power of projecting missiles to a distance, it only enables him to cast a greater weight; but though the arm is thus limited as to the rate at which it can be made to move through the air, it is possible to add considerably to its capabilities by mechanical means. Many of our most ordinary tools and implements, for instance, such as long-handled hammers and the like, are mere contrivances to gain extra velocity. Many ways have been invented to effect this with respect to missiles, of which the most striking are perhaps the sling and the throwing-stick of the Australian blacks, by means of which they are enabled to project their spears with extraordinary force and velocity.

The sling in effect lengthens the arm of the person using it, without increasing to any perceptible extent the weight to be moved. The hand in throwing passes through the arc of a circle whose centre is the shoulder of the thrower, and the stone in the sling does the same; but the arc through which the stone passes is larger than that through which the hand passes in exact proportion with the length of the sling. As, therefore, the sling and hand work in perfect unison, it is evident that the stone in the sling passes over a larger space in a given time than when in the hand, which is only another way of saying that it passes over the same space in less time, or, in scientific language, has greater velocity.

If a more solid and reliable sling be required, it should be made entirely of leather, thongs and all, every detail being carefully finished off and adjusted to the missile it is intended to use. The missile, too, should, if anything like accuracy is aimed at, be most carefully constructed. Nothing great can be done with stones, they are too uncertain in weight and shape; clay balls, made as much as possible of equal weight and size, and baked in the ashes, are very serviceable; but the very best things of all are good-sized leaden bullets: they travel farther and faster, and are more reliable, than any other procurable missile; they have only one drawback—their expense. The slinger might keep a stock of both—clay for ordinary occasions, lead for special service; but he should avoid variety of ammunition as much as possible if he means to attain to any great skill.

Armed with a good sling and store of ammunition, a boy may, if his tastes lie that way, do considerably more execution as a sportsman than many a more favoured comrade with his envied pistol, and may, after a successful day's sport, comfort himself that, if the pistol has made more flash and smoke and waked up more echoes, the sling has given him more sport and decidedly more exercise.

Slinging, to be learnt, must, like everything else, be diligently practised; proficiency will come much more rapidly than the novice on first handling the sling would expect.

JAVELIN.

The ordinary game of Javelin is simply a contest of skill in hurling the weapons at a target, and for this purpose the javelins should be rods of ash or fir, about six feet long, by 1½ inches in diameter, and one end must be armed with a good strong iron spike about two inches in length. The target may be knocked up out of any pieces of soft wood that are readily obtainable—the lid of a packing case does admirably. The circles may be chalked or painted, and the rings numbered from the outermost ring inwards.

To throw the javelin: balance it in the hollow of the right hand a little behind the ear, the thumb lying along the fingers, firmly pressing down upon the shaft; the left leg must be advanced, and the body poised upon the right. Now hurl the javelin at the mark with a quick motion of the arm, throwing the body at the same time well forward on to the left leg.

At first the effect produced will appear by no means commensurate with the force expended; but let not that be any discouragement: practice and experience will soon give command over the weapon, and every day's practice will lessen the waste of force

Much greater steadiness of flight will be imparted to the javelin, and therefore much greater accuracy obtained, by bringing the fingers sharply downwards on the shaft at the moment it leaves the hand, and so inducing a rotating motion similar to that imparted to an arrow or a rifle-bullet.

When some progress has been made at the target and fair proficiency attained, blunt javelins, padded at the end, may be procured, and two or three players may practise throwing them at one another, studying, besides the art of throwing them, that of avoiding them, or even catching them in mid-air and returning them "sharp" to the thrower.

When first commencing this practice, the thrower should call to the person aimed at to prepare him for the cast, or the players may chance to give each other some awkward knocks; after a time this forewarning will not be so necessary.

When the players have acquired sufficient skill to throw quickly and with effect, and are able to take reasonable care of themselves in avoiding the missiles aimed at them, they may proceed to make a regular game of it, by attacking and defending a fort; a hedge with one or two gaps, and with a good sloping bank, makes a capital fort.

They will find this capital fun, only they must be careful that the javelins *are* properly padded: with all the padding they can have they will yet give hard knocks enough to satisfy the most enthusiastic; without it they would be positively dangerous.

Hazel rods, or the long straight stems of the dog rose, make capital javelins for this purpose; they should not be over-thick or heavy, and may range from five to six feet in length: each player should have about a dozen, eight or nine in use, and three or four as a reserve in the rear.

The players having divided into two parties, each with its captain, toss for choice of position, and then settle down to work. The game is played just like "Snow Fort," but is decidedly a manlier pastime.

Both parties should, besides their lighter javelins, be armed with shorter and stouter sticks, one for each player, like the "*pilum*" of the Roman soldiers: these are for close quarters. The defenders will find these very useful when some plucky assailant cannot be deterred by the gentle persuasion of a shower of javelins, but still presses onward up the breach: a well administered shove from a "*pilum*," so to call it for want of a better name, will quickly bring him to reason, and send him back whence he came.

Of course the game must be played with good humour and fair consideration for each other. A bad-tempered player should never be admitted, he is sure to spoil all the fun. It is impossible to avoid hitting hard now and then, and therefore, if a player cannot take a hard hit occasionally in good part, he had better not play—for his own sake as well as that of his school-fellows he is better out of the game.

A bundle of javelins, when the art of throwing them with tolerable accuracy has been acquired, makes a very good companion in a country walk; plenty of objects will be found to exercise them upon, and the practice will be very useful for the next attack on the fort.

BOOMERANG.

This is an Australian weapon, and, like the sling, is in its origin a weapon of war and the chase. At first sight it is an unpromising-looking weapon enough, being merely a curved piece of flat wood of no very great size or weight,

and about as insignificant-looking an object as could well be supposed. But in the hands of the blacks this simple piece of flat wood can be made to perform the most marvellous feats: it rushes through the air like "a thing of life;" at will he can make it skim the ground like a swallow, or soar into the air like a hawk; to strike a distant enemy, or to return in a wide graceful curve till it drops harmlessly against his own feet.

Against this strange weapon no trunk of tree or huge mass of rock affords shelter: the boomerang rushing through the air, past and beyond the concealed enemy, comes whirling back again with but little abated force, and smites him from the rear: with spear and boomerang the native Australian must indeed be a dangerous foe, and one not to be despised even by the white man, with his still more deadly rifle and revolver.

The young English boy must not expect to be able to make anything more than a plaything out of this interesting weapon, he can neither afford the time nor get the teaching necessary for a thorough mastery of it. To the native Australian the skilful use of the boomerang forms a great part of the business of his life, and is indeed one of the conditions on which he lives; but to the white man it can only be one out of many aids to relaxation, and he therefore can no more hope to acquire any great command over this extraordinary missile, perhaps the most difficult to wield successfully that the ingenuity of man has ever produced, than he can hope to rival the Japanese jugglers in their wondrous performances with tops and paper butterflies.

Any of our young readers who may hereafter become possessed of a boomerang, and be fired with the ardour of acquiring the art of throwing it, must be very careful at first in experimenting upon it, for he will find it will have a tendency to fly off from its course in the most unforeseen manner, and to make its way into all sorts of unexpected places, generally being exceedingly perverse in going exactly where it is least wanted to go. A large open field to practise in, with not more than one or two companions, will be found the best for safety.

Little or no instruction can be given verbally in the use of the boomerang: the young learner must discover for himself the various tricks of the wrist and hand, simply by dint of a severe course of experiment.

In the act of throwing, the boomerang is grasped firmly by the end, which is slightly smoothed off for the hand, and as it leaves the hand is made to gyrate or revolve on its centre by a quick turn of the wrist; it is thrown, of course, edgeways, with the concave side foremost and the flat side downwards.

PEA-SHOOTER.

The Pea-shooter has long been a favourite with English boys, and is indeed a weapon replete with endless amusement. The boy is not to be envied who, with a pea-shooter and a good pocket-full of peas, cannot find himself recreation for hours.

It is to be feared that the pea-shooter is chiefly prized amongst a large section of the rising generation for the increased opportunities it affords of mischief, and especially of annoying other people; but there is no earthly reason why they should do so, other than the love of mischief implanted in the human breast—a relic, it is to be feared, of the old monkey nature still strong in many of us—and the tempting facility the pea-shooter offers for effecting it undiscovered. There are numberless ways of getting fun out of pea-shooters, which are too well known to need description here; the best of these is "the battle of the pea-shooters," in which the players divide into two parties, and fight with their pea-shooters much in the same way as in the game with "Snowballs" described before.

The most effective way to use the pea-shooter in these battles is to keep up a steady fire of single peas, searching out the weak spots in the enemies' defence with unrelenting perseverance.

Against a fire like this the furious discharge of volleys of peas is of but little avail: it is a case of breech-loading revolver or rifle against the blunderbuss.

In this way the player, having his mouth full of peas, is able to keep up an unintermittent fire of missiles, each one of which, in skilful hands, does its appointed work. He can keep his pea-shooter to his mouth ready for instant action for long spaces of time together, and if he be dexterous, can, by seizing the opportunity as it offers, refill his mouth without abandoning his offensive attitude.

The player, on the other hand, who works on the volley system, has to reload after every discharge, leaving himself for that space of time defenceless before his opponent; and, moreover, he wastes more than three-fourths of his peas, for at the most liberal computation he can hardly hope that more than three or four out of a mouth-full will take effect; he therefore, it will be seen, fights at a decided disadvantage, and can only hope to maintain his ground by adopting the same tactics as his opponents.

Of course there are cases when a sharp volley will be very effective; if, for instance, a player who has worked up near enough to give every pea its full effect, exposes the whole or a large portion of his face, rattle a heavy volley into him on the spot by all means, without hesitation. If that does not drive him back to a more respectful distance, he must be exceptionally tough-skinned or remarkably plucky.

The same exhortation to good humour holds good in this game as in the last.

CATAPULT.

The Catapult, though comparatively a modern invention, has attained wonderful popularity, and few indeed must there be of the young readers who have not possessed, or at least used, one of these simple but effective weapons, which for accuracy, handiness, and general capabilities may be fairly said to rank only next to firearms. Indeed, against small fry such as rats, the smaller birds, and even squirrels—that is to say, for the general requirements of a boy—they may be made, in skilful hands, even more effective; for, while scarcely less deadly, they are inconspicuous and quite noiseless, and so quite make up for any deficiency in certainty of execution by giving the young sportsman more and better chances than he would get if his game were alarmed at the sound or even the sight of a gun.

Another advantage they possess, too, over firearms, which should not be overlooked: they are not dangerous to their possessors, and need not be so to other people. In London, indeed, and most large towns, their use is forbidden in the streets, but so are hoops and many other toys which are perfectly harmless in their place; in the country they are, of their kind, as safe as anything a boy can have.

Catapults are now to be procured cheap at any toy-shop, but they may be made at home quite as efficiently with very little trouble. Get a forked stick, the shape of the letter Y, about six or seven inches in length, the prongs about three inches apart. To the extremity of each of these prongs lash securely a strip of India-rubber band or spring about six inches in length, and attach the loose ends of these springs to an oval piece of soft leather, $1\frac{1}{2}$ inches long by an inch in width, whipping them carefully and strongly for a distance of nearly an inch; this oval forms a kind of pocket in which to place the missile.

The most useful ammunition is No. 1 shot; clay marbles do very well, and even gravel-stones at a pinch may be made to do good service; but the first-named are preferable in every way, for range, accuracy, penetration, and portability; they can be fired in volleys, too, when occasion requires, which the others cannot, on account of their size.

With a tolerably powerful catapult, such a one, for instance, as described above, no game a boy is likely to be entitled to shoot will be safe from his attack; even such large birds as the wood pigeon, the missel thrush, and the like, may be brought down by a well-directed volley of heavy shot.

Not many months before this was penned, within the writer's own knowledge, a little boy, just ten years old, fetched down a sparrow-hawk out of a tree adjoining a farmyard: he had been watching him sailing about for some time, and at last, when he settled in the tree, crept up under the shelter of a wall and gave him a heavy dose of shot, one of which pierced the hawk's brain, and fetched him headlong to the ground, as may be imagined, to the inexpressible delight of the young sportsman, a delight shared no doubt by the affrighted "feathered natives of the farm."

Since such are the powers of the weapon, it will become its possessor to be careful in the usage of it. This is a caution we have had to repeat several times before; but accidents do happen with unpleasant frequency from carelessness, and therefore the necessity for caution can scarcely be too strenuously insisted on.

CLEFT STICK.

Get a stick of tough wood, ash for choice, about thirty inches in length and three-quarters of an inch in thickness, tapering, perhaps, a little towards one end; with a sharp knife split the smaller end down longitudinally to a depth of about four inches, taking care to do so exactly in the middle. Now whip it round strongly with waxed string, beginning about 2½ inches from the end and working downwards.

Now take a smooth flat pebble, force it well into the cleft or slit, take hold of the stick by the butt-end, and throw. The stone will fly out as if from a sling; indeed the cleft stick is nothing more than a sling, only that it is rigid instead of flexible. At first beware how you throw; take care nobody is within hitting distance, for until the right knack is acquired, the stone is wont to fly about in a very independent manner, and it may not improbably find a very unexpected and unwelcome billet. It would be well to avoid the neighbourhood of much glass for a similar reason.

The stone is made to leave the stick at the right moment by a kind of jerk, which will soon come of itself to a boy of any natural aptitude, but which cannot well be described on paper.

In places where clay is tolerably abundant, a very similar effect may be produced by kneading lumps of clay round the top of a pliant stick, and throwing them as above described. These clay lumps, when they strike against anything, a tree or a post, flatten out and adhere to it with great tenacity.

Sometimes boys will get up a battle of clay lumps; but they should always keep at a good distance from each other, forty or fifty yards at the least. Even at that distance a blow from a clay lump in the face will often leave a deep red mark as a memento of its visit, and not even the clothes will afford perfect immunity from their visitations.

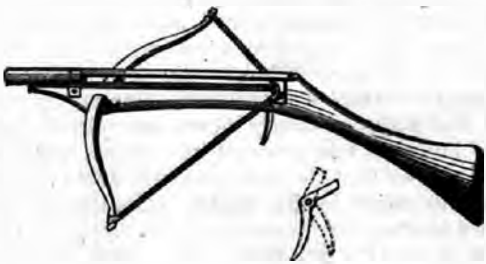
The clay should be affixed to the stick some inches from the end; the exact distance varies with the nature and humidity of the clay, the weight of the lump, and the shape and surface of the stick; a very few trials will give a very fair approximation to the right distance, for which no absolute rule can be given.

CROSS-BOW.

A Cross-bow is in effect nothing more nor less than an ordinary bow set crosswise in a butt in shape like an ordinary gun-stock.

The object of its first invention as a weapon of war was to obtain greater accuracy and in some sort greater propelling power with less muscular exertion. Some of the old cross-bows made of steel were very powerful, but they required a lever or winch to set them, and were, take them in all, so unwieldy that they never superseded the old long-bow, which, in English hands especially, on many a hard-fought field proved its complete superiority to all rivals. The mishaps of the Genoese cross-bowmen at Cressy will at once occur to the young reader's mind.

The Chinese even to this day make a partial use of the cross-bow in warfare. They have even invented a kind of repeater, one that once charged will shoot



off several arrows in succession, the archer having not even to re-set the bow each time, and only needing to work a lever backwards and forwards.

The modern cross-bow, used as a plaything, has been very much driven out of favour by the invention of the catapult, which for rat or bird-shooting, and other aggressive purposes, is infinitely preferable on many accounts, as being more handy, more easily concealed about the person, and infinitely more deadly as a weapon.

A great deal of amusement, however, may be got out of a cross-bow by shooting at a butt or target. In default of more properly constructed missiles, pieces of tobacco-pipe form excellent bolts, and will give a very good account of a piece of paper at a dozen paces or so.

THROWING THE CRICKET BALL.

As this is an accomplishment of extreme value in the cricket-field, as well as in competitive games, the young reader is very strongly recommended to take it up with extra zeal. In throwing the ball the body has almost as much to do as the arm: a backward flexion of the body and sudden recoil simultaneously with the act of delivering the ball will produce a wonderful accelerating effect upon the flight of the ball. The most common fault into which throwers fall is that they do not give the ball enough elevation. In actual cricket a ball should be thrown at as low an elevation as the distance to be traversed will permit; but when, as in the case we are discussing, distance only is the object aimed at, the ball should be delivered at an angle of 45°, which is the angle at which a missile must be delivered to attain its extremest range. To find this angle, stretch your arm straight out from the shoulder, next raise it straight above the head, then let it fall till it is half-way between the two positions: that will be the required angle. It will appear preposterously high at first, but it is the true angle for the purpose, and experience will soon prove the fact satisfactorily.

THROWING THE HAMMER.

This is a feat only to be attempted by well-grown lads. The hammer may be an ordinary sledge hammer, but there is a shape manufactured expressly for the purpose: a shell or hollow shot affixed to the extremity of a long handle.

The weight is entirely optional, and should be carefully apportioned to the powers of the throwers.

The method of delivering the hammer looks at first sight somewhat eccentric: the thrower, instead of standing still, and delivering from the fulcrum of a firm footing, or taking a step or two forward to gain additional impetus, starts from some little distance behind "the scratch," waltzes slowly round and round, swinging the hammer at the same time in a great circle at the full extent of his arms, and with constantly increasing velocity, and finally delivers it at "the scratch" just as it has attained its greatest momentum.

The *rationale* of this is, that the real projectile force is derived rather from the impetus already acquired by the missile in its circular swing at the time of delivery, than by any sudden impulse then imparted to it.

Although at first sight this feat would seem to be a mere matter of brute strength, in effect it is really more dependent upon skill and dexterity than many that are apparently more scientific; *cæteris paribus*, skill will beat brute force out of the field.

The beginner will at first find no inconsiderable difficulty in governing the direction of the hammer's flight; but this, although of vital importance, is the least difficulty to be overcome.

The real secret of successful throwing lies in the happy timing of foot and hand, so that the body is brought round to the scratch exactly at the most favourable moment, and in the most favourable position to give full effect to the already acquired impetus of the missile, and this can only be done with any certainty by first undergoing a long course of patient practice, starting always from precisely the same distance behind the scratch, taking precisely the same number of steps, and revolving precisely the same number of times, until the whole action of delivery becomes purely mechanical.

But even here the beginner must not flatter himself that he has come to the end of his troubles: he has now to learn to let go his hold of the hammer just at the critical moment; and this is by no means so easy a task as he might think; one second, or the hundredth part of a second, too soon or too late, will make a difference in the distance covered by the thrower, a difference perhaps of feet, when the contest is turning upon inches.

In throwing the hammer, the same rule must be borne in mind to which we have called attention in throwing the cricket ball, namely, that for all missiles a trajectory at an angle of 45° is that which gives the highest results when distance only is aimed at.

DUCK AND DRAKE.

This is a very simple method of whiling away the time when nothing better is to the fore. A small sheet of water and plenty of smooth, flat stones, oyster-shells, or bits of crockery are the only requirements.

The stones are thrown so as to skim like a swallow along the surface of the water, touching and flying off again in a series of "ricochets" at constantly shorter intervals, until they finally sink exhausted in the water.

To the three first dips or "ricochets" the thrower cries out, "Dick, duck, drake!" hence the name of the sport; and a proud time it is for the beginner when he first succeeds in reaching the third.

A little practice will soon enable the thrower to make the stone dip seven or eight or even more times.

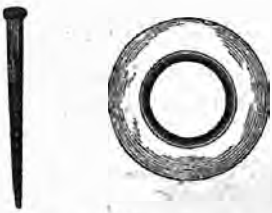
When two or more are together, it is usual for them to match themselves against each other as to who shall score the highest number of dips in a given number of throws.

QUOITS.

Quoits are iron rings, flat on one side and rounded on the other, with a sharp outer edge: their average weight is four or five pounds per pair. The game is played by pitching them from a distance at a short peg, technically termed the "Hob." Two of these pegs or hobs are set in the ground at a distance of from eighteen to twenty yards apart, the distance being entirely at the option of the players. Each player is armed with two quoits, and these they throw from hob to hob, trying, if possible, to pitch them actually over the hob, so as to "ring" it. The game is counted in the same way as in bowls, the usual number to play for being eleven.

The mode of holding the quoit is shown in the accompanying illustration. The flat side is held downwards, the forefinger is placed in a small notch, which is to be found in all quoits, and the thumb and other fingers are shown as seen in the engraving. By means of the forefinger a spinning movement is given to the quoit, so as to enable it to fall with its edge downwards. If properly thrown, the quoit ought to pass through the air without showing the slightest vibration, and when it falls it ought to stick in the ground at an angle of 45°, with its flat side towards the thrower. No correct play can be made until the art of holding and throwing steadily has been mastered.

The best hob is made from gutta percha, as an iron hob cuts the edges of the quoits to pieces if they strike it; and as a good player will be sure to strike the hob several times in a game, this damage must be prevented. There is no pleasure in playing with a ragged-edged quoit, as it tears the hand, and cannot be depended upon for setting fairly in the ground. When the hob is fixed, a hole should be made and the hob pressed into it until it is an inch at least below the surface. A white feather is then stuck into a little hole in the head of the hob, and the players throw at the feather. Of course a store of feathers should be kept.



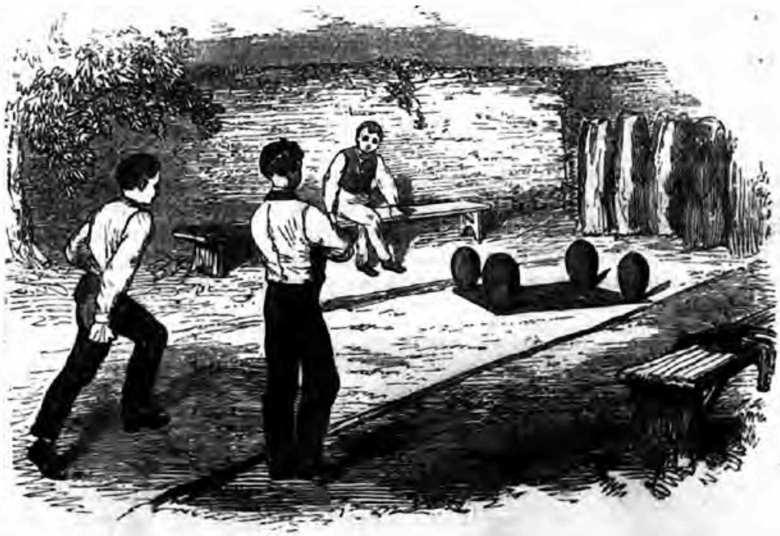
HOB AND QUOIT.

The ground should be carefully cleared of stones, and at each end a round hole, some six feet in diameter, and six inches deep, should be dug, and the space filled with clay. In the middle of the clay is the place for the hob. This clay "End" should be always kept damp, and in dry weather it should be watered and occasionally re-laid.

The quoit is best aimed by holding it so as to look at the hob through it, and it should be thrown, not from the elbow, but with a swing of the arm from the shoulder. The art of throwing it correctly cannot be adequately imparted on paper; it is not, however, difficult to learn from personal instruction. If the quoit be not thrown quite steadily, that is, if it be a "wabbler," it is apt to roll away from the pitch, instead of sticking into the ground, or, worse still, to turn with the flat side up, in which latter case it is considered dead, and cannot be counted for the game.

When only two are playing, the quoits are thrown from either hob alternately, the players following their quoits, and throwing them backwards and forwards; but when four play it is customary for a pair of opponents to stand at each hob, and so make the same set of quoits do for both.

This is a very interesting game for two or four—more cannot conveniently play at it; it has, too, one great recommendation, that the actual result of the game can never be known until the last quoit has been cast: whatever the previous position of the game, a "ringer" may change the whole aspect of affairs. As in bowls, each quoit that is "in" counts one to the game, and a "ringer" counts two, and of course cuts out all other quoits whatsoever.



SKITTLES.

This is a game, unfortunately, not of very good repute, not from any intrinsic defects of its own, but because the cheapness of its fittings, added to its natural attractions, has made a skittle alley the constant adjunct to almost every low public house or common beer-shop; and thus the game itself has become, in the minds of the unthinking many, to be associated with scenes of low gambling and dissipation.

The game itself, however, is by no means responsible for these abuses; it is a capital exercise for the muscles, requires no mean skill, and is altogether a first-rate amusement for a small party of not more than four or six.

The game is played with four egg-shaped pins or skittles, which are set up at the corners of a square platform, and which it is the player's endeavour to knock down with a heavy bowl or cheese-shaped ball in as few throws as possible. The accompanying illustration will show at a glance the nature of the "alley" and the method of play. The ball, it must be remembered, is pitched upon the pins, not bowled at them.

There are several ways of counting the game in vogue in various parts of the country. The simplest is that of counting by "pins" in a given number of throws—three, six, or nine—he who knocks down most being the winner. Sometimes the game is counted by points—three throws each hand are allowed. If all the pins be knocked down first throw, it counts a "treble" or three points; if in two throws, a "double" or two points; if in three, a "single" or one point. If a pin be left standing after the third throw it counts nothing. At the end of three hands the points are compared, the highest being winner.

At the first glance at the pins it would appear impossible to fetch them all down at one throw, even with the most extraordinary good fortune; but it may be done, and that time after time, if the ball be only rightly pitched; and this is the way to do it: pitch the ball high, with a kind of swing round, so as to drop it almost perpendicularly upon the right side of the nearest pin: if this be done rightly it will send the pin flying against the one to its left, of course flooring them both, and will itself spring off to that on the right, strike against that on the inside, floor it, and rebound upon No. 4, thus clearing the lot. This is, of course, the most brilliant play, but as it is rather hazardous—a miss of the first pin being almost invariably a total miss—it should only be tried on emergency.

The safest way, and the most effective, too, in the long run, is to play for the double, and pick off the pins by pairs. In this way you are not obliged to take the pin so "fine," and, in consequence, are less liable to make a complete miss, being pretty sure of one of the pins; and thus, in case of failure with one pair, you will still have a throw to save your "single."

DUTCH PINS.

This game is played somewhat in the same manner as skittles, but is, in our estimation, inferior to that despised though capital game. Nine wooden pins are set upright on a frame, the central pin being called the king and having a crown on its head. A very large and heavy ball is thrown at the pins from a short distance, and the thrower counts one for each pin, and two for the king. The ball is remarkable for having two holes: in one of these the thumb is placed, and in the other the forefinger.

NINEPINS.

This game is very similar to skittles, but it differs in several details. The pins are nine, as the game implies, instead of four, and the ball is *bowled* instead of being *thrown*. The method of counting is much the same—by the number of pins knocked down.

There is not any particular difficulty in knocking down several of the pins at first, the great art lies in *selecting* the pins; that is, in knocking them down in such order, that each shot leaves the remaining pins standing in the way most suitable for the next. Success in the game depends a great deal, too, upon the "bias" imparted to the ball: as in bowls, a judicious use of "bias" will often get the player out of a difficulty which he could overcome in no other way.

Apropos of ninepins there is a good story told of the Americans. The game had become a prolific source of gambling in some of the States, so a restrictive law was passed forbidding the game altogether. The players were in despair, till at last an inventive genius hit upon the brilliant idea of adding another pin, and so playing *ten* pins, which of course did not come within the law. The tenth pin did not materially alter the game, for as they had no use for it, but only wanted its name, it was left to repose snugly on a neighbouring shelf.

AMERICAN BOWLS.

This is a good game, but it requires rather an elaborate court. Each court is a long narrow alley, the centre of it floored with oak planking. As this floor must be very smooth and very level, the planks are only six inches wide, and there are generally twenty-four of them. Pins are set up at one end, and the balls are bowled at them from the other. The scoring is by trebles, doubles, and singles, as at skittles. (See page 59.) Along the right hand of the alley runs a wooden trough, slightly sloping from the top to the bottom. As fast as the balls are bowled, a boy picks them up and puts them in the trough, so that they roll gently back again to the hand of the bowler. The balls are of different weights, but the players will find that the skittles will fall in proportion to the size of the ball, so that he should use the largest ball that he can manage properly

BOWLS.

This is a game that once enjoyed extreme popularity in England amongst the upper and middle classes—it never seems to have taken much hold of the lower. We have constant allusions to it in the works of our standard authors, and most of them, from Shakspeare downwards, draw freely upon its vocabulary of technical terms to illustrate an argument or point a pithy saying. And more than one proverb has drawn its inspiration from the chances and vicissitudes of this game.

Of late years, especially since the introduction of croquet, bowls has somewhat lost ground in public estimation; but even now it can boast no small popularity, and few of our towns, or even of our larger villages, are without their one or more bowling-greens.

The game may be played upon any lawn or smooth piece of turf, but to bring out all its beauties and perfections a properly appointed green is requisite. This need not, however, be absolutely level: a trifling inequality of surface here and there rather enhances than decreases the interest of the game.

The bowls from which the game takes its name are balls of lignum-vitæ or other hard wood, varying in weight and size according to the capacity or fancy of the player. In commencing the game, a smaller ball called the "Jack"—in size and shape like a cricket ball—is thrown forward by one of the party, and the players, divided into two sides, deliver their bowls, one of either side, alternately in succession. The object of each party is to get as many of their own bowls as close to the Jack as possible, and to keep their opponents' away.

The game is wonderfully simple in principle, so much so that the veriest tyro can grasp its whole theory at the first onset; yet in reality it offers an opening for skill and *finesse* to which there is no practical limit, and to this, we may be assured, is mainly owing its long-continued popularity. Space would fail us to give anything like a complete code of instructions to our young readers; a short review of the leading principles of play must suffice.

The player, in delivering his ball, has, as a general principle of invariable application, two things to consider: first, the *direction* in which his ball is to travel; and secondly, the *strength* required to send it the exact distance and no farther. If he be first player this is literally all he has to think of: he has but to place his ball, if he can so contrive it, close up to the Jack, covering it from the attacks of any succeeding balls; this done he has done all that can be done—it is for his successors to get out of the difficulty in which he has left them. He must remember, by the way, that if he wishes his bowl to run straight he must deliver it exactly upright; the least inclination or bias to one side or the other will make it describe a curve more or less rapid according to its greater or less deviation from the upright. In the thorough command of the bowls in this matter of bias centres almost the whole science of the game.

Supposing the first player to have "laid up" his bowl as above described, what is the next player to do? Three courses will be open to him, in the selection of which circumstances only can guide him. He may try to lay his bowl alongside the Jack, gently shouldering the adversary away; he may, by striking the adversary's bowl hard with his own, drive it upon the Jack, and by the communicated force send the latter flying far away from both; or he may, by a skilful use of the bias, steal his own bowl gently *round* his adversary's, and carry the Jack quietly away in company. This latter is the neatest, and,

if successful, by far the most paying method. It is, however, undoubtedly the most difficult and most uncertain, and should only be attempted by a practised player. It makes little difference practically in this latter case whether the bowl or the Jack be struck, in either event bowl No. 1 is cut out, which is the principal object in view, and bowl No. 2 takes its place, which is the next.

The end of the game, or rather the end of the round, is the critical time, when all the bowls but one or two have been delivered. Supposing only one bowl remains to be delivered, and the Jack is in the midst of a crowd of friends and foes, the opponents having the advantage, the question " What to do?" becomes a very serious one. The following hints may serve as a general guide, but they must not be followed too abjectly; there may always be modifying circumstances which it would be impossible to take into account beforehand, but which must certainly be considered at the moment.

If your friends have a number of bowls round the Jack, and the enemy have only *one*, but that one the nearest to it, your play would be, not to lay up closer to the Jack than this opposition bowl, and so cut it out, but to play hard at it and drive it away, and so leave your friends masters of the situation. Of course, if you can't get at the bowl safely, you must be content with simply cutting it out.

If your opponents have a crowd of balls round the Jack, so that you can do nothing with certainty, let drive hard in amongst them and effect as great a "scatteration" as possible. You thus certainly injure your enemies, which is the next best thing to helping your friends, and you may by good fortune achieve that too into the bargain. Only be careful that in the endeavour to bowl very hard indeed you do not lose the control of your ball, and so miss your aim altogether.

If the enemies' bowls be crowded as above, but leave you a fair shot at the Jack, don't be carried away by the ambition of cutting them out, the odds are too heavy in case of failure; but rather play hard at the Jack, and drive it clean away from everybody, on the dog-in-the-manger principle that if you can't get any benefit from it yourself, no one else shall.

If, however, your *friends* have one or two bowls "in," that is, nearer the Jack than any others, and the enemy have a group round only just not "in," you will do well, if you are not a proficient, to be content to leave the matter alone, since you may scarcely better the position of affairs, and are not at all unlikely to do harm. Of course it would be better play to get your own bowl "in" as well; but the old proverb holds good here, if nowhere else, that a "bird in the hand is worth two in the bush."

When the round has been played, that is, when all the bowls—which, by the way, are numbered in pairs for distinction—have been delivered, the players proceed to count for the game. This is done as follows: the side to which the bowl nearest to the Jack belongs count one for that, and the same for every other bowl they have which is nearer than any of the opponents'. If, therefore, the second nearest bowl is an enemy's, the side only counts one; if the third, only two, and so on. It is necessary, however, that a bowl should be within a given distance, previously agreed upon, of the Jack, or it does not count. This distance varies with the size of the ground; on an ordinary green a yard will be found a very fair distance. Sometimes a "tie" takes place; that is, the two nearest bowls are at exactly the same distance from the Jack: in this case neither side counts anything, the round being simply lost.

The numbers agreed upon for "game" varies with the number of players, thirteen, fifteen, and twenty-one being the more common.

LAWN BILLIARDS.

This game is a favourite one in many places, and is useful in one respect, namely, that it can be played in a comparatively limited space. Indeed, a large lawn is unsuitable to the game, and if the ground be of too great dimensions, it will be better to enclose a circular space, as seen in the illustration.

The materials for the game are simple. In the first place there are eight or ten balls of different colours, a stick or cue by which to propel them, and a revolving ring through which they are to be passed. We will describe these articles in rotation.

The balls are generally a foot in circumference, and ought to be made of some hard and heavy wood. An ordinary set of croquet balls will answer the purpose perfectly well.

The ring is usually made of iron, though brass is perhaps better, and, as may be seen in the diagram, has a shank or neck. When it is to be used, a large wooden peg is driven into the ground, with the top a little below the surface, and into it a hole is bored, large enough to receive the shank of the ring, and to let it revolve freely.

The cue is made of two parts, namely, a wooden handle and a metal tip of rather a peculiar shape. The reader will see, by reference to the illustration, that this tip is also ring-shaped, and that it is fixed at an angle with the

handle. This formation enables the ball to be played better than if the cue and tip were in a line. Sometimes each player has a cue, but as a general rule one cue only is required, and is handed round to the players in succession.

The objects of the game are very simple, and the rules scarcely less so. Each player endeavours to pass his ball through the ring, and every time he can do so he scores one point. If his ball runs through the ring after striking another ball, he adds two to his score. The ball must not be pushed through the ring with the cue touching it, neither may it be thrown through. After making a successful stroke, the player does not go on with the game, as in croquet, but makes way for the next player.

In this game there is more play than at first appears to be the case. If, for example, a player finds the hoop turned edgewise to him, he can either place his own ball so as to obstruct the next stroke of the enemy, or, by dexterous play at the ring, can turn it edgewise to the enemy next in succession. Sometimes he will strike a ball belonging to his own party so as to put it into position, or will strike away the ball of an enemy who seems likely to make a successful stroke.

A really good player will often contrive to pass the ring even though it be almost edgewise to him. If the ring be turned in the least to one side or the other, he will play at it with a peculiar push of his cue, and strike it a little on one side. If this be properly done, and with moderate force, the ring spins round, and catches the ball in its progress. The effect of this sudden shock is, that the ball vibrates backwards and forwards for a moment, and finally settles on the opposite side of the hoop.

Half the amusement of this game consists in having a ring only just large enough to let the balls pass through, and so neatly poised as to revolve with a touch. The best plan for securing this latter point is to have a metal socket let into the wooden peg. If so, care must be taken that the socket be brass if the ring be iron, and *vice versâ*. Both shank and socket should be kept well oiled.

GOLF.

Golf (pronounced *goff*) is chiefly a Scotch game, but it is played in many parts of England where there is a suitable piece of common land in the neighbourhood. Blackheath Common is especially frequented by golfers, and there the game may be seen by the curious almost any day, but especially on Saturday afternoons.

It is played with a ball about 1½ inches in diameter, now-a-days made of gutta percha, but formerly of leather stuffed with feathers, and painted white. This ball is driven along the ground or through the air by clubs of various shapes and constructions, to be severally employed according to the nature of the ground. Each player has his own ball and his own set of clubs, which latter are carried by an attendant, technically termed a "caddie."

The game is played as follows: A series of small holes, four inches in diameter, are cut in the turf at a distance of from one to four hundred yards apart, according to the capabilities of the ground, on the circumference of a great circle, and the rival players, starting from beside the first hole, work round the circle, each endeavouring to "make his holes" in a less number of strokes than his antagonist, and they count for game thus:

Supposing A and B to be playing, A makes his first hole in five strokes, B in six; A counts one to his game. The next hole B wins; they are now one and one. The next two perhaps they achieve in the same number of strokes. These count to neither, or what comes to the same thing, they are "halved." If A then manages thus to make more holes than B, he is declared winner by so many holes.

Space would fail to enter fully into the minutiæ of the game; a few hints as to the correct way of standing and hitting, with some general remarks, are all that can be compassed here.

First, to hold and use the club. Grasp the handle with both hands firmly but not too tight, lift it slowly over the right shoulder (see left hand figure in cut), and bring it down smartly but steadily on the ball, letting the lower surface of the butt-end just skim the ground. The action should be more of a steady sweep than a blow, and the club must be allowed to follow on in its swing after the ball, and not be brought up abruptly after the stroke.

Accuracy and clean hitting are far more effective than hard hitting, and

should be specially studied: if the ball be only taken properly, a comparatively slight muscular exertion will send it an amazing distance.

But it is not only a true and correct style of hitting that will serve the purpose of the striker; it is indispensable that he should also *stand* correctly. A very slight error in this important item will entirely vitiate all the results of even the most scientific manipulation of the club.

The feet should be set firmly on the ground, about eighteen inches apart, the toe of the left foot opposite the ball, and at a distance exactly proportioned to the length of the handle of the club employed. If the striker be too near, the ball is liable to be taken by the heel of the club—technically "heeled"—and will have a tendency to the right of the direct line. If too far from it, the club is apt to take the ball with its "toe," or extremity, thus "drawing" or "hooking" it to the left of the true line.

But this correct driving of the ball is, after all, only the very A B C of the game; the real triumph of skill is in accurate and judicious "putting" (pronounced as in *cutting*). When the ball has been driven up to within a few yards of a hole, the novice would suppose that the most important part of his work was over, whereas, on the contrary, the real struggle for the hole is only just going to begin.

So many circumstances have to be taken into consideration in making a "put" (pronounced as in *cut*),—the nature and "lie" of the ground; the strength required to traverse the exact distance and no farther; the position of one's own ball, and very often the position of the adversary's, which may chance to be between it and the hole; and last, though very often not least, the general condition of the game, by which must be decided whether to play boldly or cautiously. With all these against him, it will not be surprising that as a general thing "putting" is the last thing in which a player acquires real proficiency. The right hand figure in the cut is making a "put."

For much of our information in this interesting game we are indebted to the kindness of Messrs. Chambers, to whose excellent little handbook on Golf and Curling we would refer those who desire further information than our limited space enables us to afford.

BASE BALL.

This game, which has attained an immense popularity in the United States of America, is nothing more nor less than a kind of glorified "Rounders." It is rounders, in fact, improved and reduced to a system; the two games bearing much the same relation to each other that the cricket of to-day does to the cricket of a hundred years back.

The following rules for the game are taken from those adopted and published by the National Association of Base Ball Players of New York, dated the 9th December, 1863.

1. The ball must weigh not less than $5\frac{1}{2}$ ounces, and not more than $5\frac{3}{4}$; and must measure not less than $9\frac{1}{2}$, and not more than $9\frac{3}{4}$ inches in circumference. It must be composed of India-rubber and yarn covered with leather.
2. The bat must be round, and must not exceed $2\frac{1}{2}$ inches in diameter at the thickest part; the length is left to the discretion of the striker.
3. The bases, four in number, must be securely fastened at the corners of a square whose side is thirty yards. They must be so constructed as to be plainly visible to the umpire, and must cover respectively a space equal to one square foot. The first, second, and third bases shall be canvas bags, painted white and stuffed with sand or sawdust; the home base to be marked by a circular iron plate coloured white. A similar mark shall also be used for the pitcher's post.
4. The base from which the ball is struck shall be called the home base; the first base is that on the right hand of the striker; the second, that opposite to him; and the third, that on his left. Chalk lines must be drawn from the home base to the first and third bases respectively, so as to be plainly visible to the umpire.
5. The pitcher's position shall be marked by two lines, four yards in length, drawn at right angles to a line from home to second base, having their centres upon that line at two fixed iron plates, placed at points fifteen and sixteen yards respectively from the home base. The pitcher must stand within these lines, and must deliver the ball as nearly as possible over the centre of the home base, and suitably for the striker.
6. Should the pitcher fail repeatedly to deliver fair balls to the striker, for the apparent purpose of delaying the game, or from any other cause, the umpire, after warning him, shall call "One ball;" and if the pitcher persists in such action, "Two" and "Three balls;" when three balls shall have thus been called, the striker shall be entitled to the first base, and each occupant of a base at the time shall be entitled to the next, without the liability to being put out.
7. The ball must be pitched, not jerked or thrown, to the bat, and a "balk" must be called if he make pretence or offer to throw the ball without doing so; or he be not inside his ground, or either foot be off the ground at the moment of delivery.

8. A balk entitles every holder of a base to make the next, with the same impunity as before.
9. If a ball from a stroke of the bat *take the ground, touch the person of a player or any other object*, between home and the first or third base, the umpire must call "Foul."
10. A player making the home base shall be entitled to score one run.
11. If three balls are struck at and missed, and the last one is not caught either flying or at the first bound, it shall be considered fair, and the striker must attempt to make his run.
12. *The striker is out* if a foul ball be caught either flying or at the first bound; or if three balls be struck at and missed and the ball be caught as before; or if the ball be similarly caught from a fair stroke of the bat; or if a fair ball, after being struck, be held by a player on first base before the striker touches that base.
13. Any player running the bases is out if at any time he be touched by the ball while in play in the hands of an adversary, unless some part of his person be on the base.
14. No ace or base can be made on a foul ball: such ball shall be considered "dead" and out of play until it shall be settled in the hands of the pitcher. In such case players running bases must return to those they started from, and in so returning may be put out in the same manner as the striker in making his first base.
15. No ace or base can be made when a fair ball has been caught *before* touching the ground. In such cases players running bases must return as above, subject to a similar risk of being put out. But *after* the ball has been so caught, players may start to run their bases at their discretion, subject to the ordinary risks of being put out.
16. The strikers must stand on a line drawn through the centre of the home base, their feet on either side of it, and parallel with the line occupied by the pitcher. Players must strike in regular rotation; the order agreed upon at the beginning being continued throughout the match, from innings to innings. The next man to the last man out in one innings being the first striker in the succeeding.
17. Players must make their bases in the order of striking, and when a fair ball is struck and not caught, as in Rule 15, players holding bases to which another player must of necessity run must vacate them and make for the next, subject to being put out as in Rule 13.
18. Players running bases must touch them, and so far as possible keep upon the direct line between them. Should any player run more than three feet out of this line to avoid the ball in the hands of an adversary, he shall be declared out.
19. Any player who shall intentionally obstruct an adversary in catching or fielding a ball shall be declared out.
20. If a player in making his base be obstructed by an adversary, he shall be entitled to that base, and cannot be put out.
21. If a fieldsman stops the ball with his bat or cap, or takes it from the hand of any one not engaged in the game, no player can be put out until the ball shall first have been settled in the hands of the pitcher.
22. If two hands are already out, no player running home at the time a ball is struck can make an ace if the striker is put out.
23. The game shall consist of nine innings to each side.

24. In playing matches, nine players on a side shall constitute a full field.
25. Should a striker stand at the bat without striking at good balls repeatedly pitched to him, the umpire, after warning him, shall call "One strike," and, if he persists in such action, "Two" and "Three strikes." When three strikes are called, he shall be subject to the same rule as if he had struck at three fair balls.

THE GROUND.—For the purposes of this game it is necessary, if really fine play be contemplated, to have a sheet of turf smooth as a cricket-field. There is, of course, no necessity for the ultra-smoothness of the "between wickets," but the out-fielding ought to be at least as good in one as in the other. For men the field should be about two hundred yards long by a hundred and fifty yards broad; but for boys a field of considerably less dimensions will serve all reasonable requirements.

In laying out the ground, which had better be done permanently, it is well to start with the home base, which should be marked out about twenty yards from one end of the field; measure from this along the field one hundred and twenty-seven feet four inches for your second base. Now, for the first and third attach a cord sixty yards long, with a knot in the middle, to the rings of the home and second base, stretch this as far as it will go to the right for the first base, which will be marked by the knot, and to the left for the third. Mark also a point fifteen yards from the home in the direction of the second base for the pitcher's post.

The bases should be marked by letting a short stout post into the ground, just leaving the top flush with the surface, and a stout iron ring must be screwed into each as a point of attachment for the canvas cushions described in Rule 3.

The striker is left to follow his own fancy as to the length of his bat, and, so long as it is of wood, is not tied down by any regulation. Ash is, perhaps, the most generally serviceable, but willow will be, perhaps, preferred by those who like a light bat.

There is no rule as to the manner of handling of the bat, this also being left to the individual fancy of the player.

THE GAME.—The rules for striking and running are precisely the same as in "Rounders." Each player counts one to the score every time he completes the circuit of the bases, and *two* if he makes an *ace* or rounder, that is, gets all round and home off one strike.

THE FIELD.—The nine fieldsmen are placed as follows, their names indicating their positions: the *Catcher* or *Back-stop*, a few yards behind the striker, to catch or stop the ball; the *Pitcher*, at the pitching-post, to serve the ball; the *Short-stop*, about ten yards behind the pitcher, as a near field and general utility man inside the bases; three *Base-tenders*, one for each base, whose duty it is, when a runner is making for a base, to stand with one foot on the cushion in readiness to catch the ball. The other three, called respectively *Right-field*, *Centre-field*, and *Left-field*, stand well out in the positions their names indicate.

The same qualities are required in a fieldsman for this game as in "Cricket:" great activity and alertness, a safe pair of hands for a catch, extreme dexterity in meeting and stopping a ball, and above all, without which the rest will be of little avail, perfect accuracy in returning it to the pitcher or base-tender as occasion may require.

Further, an umpire and scorer are required, the former of whom must be thoroughly up in the rules of the game, and should see that they are rigidly enforced.

This will be found a very good game where suitable ground is procurable, and might with great advantage be cultivated at the slack time between cricket and football: especially is it suitable for those occasional hot days in spring, which so sorely tempt the cricketer to disregard all prudential considerations as to the yet tender turf, and break the spell of winter too early. For such days, this game seems exactly suited: let us hope that, it may have at least a fair trial.

CURLING.

This game is in all its leading features nothing more than a game of bowls on the ice, only that, to suit the altered circumstances, instead of balls rolled over the turf of a "green," large flat stones are employed, which are caused to slide along the surface of a sheet of ice.

The Rink.

As a first preliminary, a figure is marked out on the ice, as in the accompanying diagram. This is called the "Rink," and may vary in length according to circumstances from thirty-two to forty-two yards. The circles at either end are called "Broughs," and the central mark in each the "Tee."

The object of the game is to get as many stones of one side as possible nearer to the tee than those of the other, only those inside the brough to count: exactly as in bowls, the endeavour is to lie up to the "Jack."

The stones employed are cheese-shaped, with flat top and bottom, with a handle on the upper side for the player to grasp them by. They must not weigh less than thirty pounds nor more than fifty pounds, and their greatest circumference must not be more than thirty-six inches.

Each player is armed with a broom or besom, with which he is allowed to sweep away any accumulation of snow that might retard his friend's stone, but he must not sweep snow *in* its way—that is, he may remove obstructions, but must not cause them. The opposite party are allowed to sweep before an adversary's stone *after* it has passed the tee, to help it as far away as possible from it.

If a stone does not pass the "Hog score" (see diagram) it is considered dead for that round, and is taken off.

This game is so like bowls in all its main features, and in fact in its whole theory and practice—the lying up to the tee, the knocking out of the adversary and substitution of one's own stone, all the manœuvring for a place, and the like—that the instructions given above for the one may well serve without iteration for the other; and for further particulars we must refer the inquirer, as before in golf, to Messrs. Chambers's handbook.

DOG-STICK AND SPLENT.

In the North of England a game is played which is a sort of combination of trap-ball, knurr and spell, and rounders.

A tongue-shaped piece of wood is made, as seen in the illustration, having one end tapering, and the other rounded and slightly hollowed so as to hold the ball. Instead of a bat, a rounded piece of wood, called a dog-stick, is employed. The origin of the name is rather dubious, as the stick certainly could not be used for beating dogs, a blow of it being sufficient to kill any ordinary dog. Players are very fastidious about the weight and balance of the dog-stick, and each has his own stick. The ball is made of boxwood, loaded with shot to make it heavier, and covered with a coating of stout leather.

There are so many rules for this game that we can do little more than mention that the principle lies in two points, namely, striking the ball beyond a certain distance, and calculating the number of stick-lengths from the splent when thrown up.

The out-players divide themselves into two bodies, one set spreading themselves over the field, and the rest forming in close line in front of the striker, and just behind the boundary-line beyond which a ball must be struck. They may stop the ball in any way, and usually do so with their hats or caps, in the crown of which a handkerchief is placed, so as to deaden the force of the ball. The player is out if he twice successively misses the ball, or fails to strike it beyond the boundary-line; if it be caught by the enemy; if he cuts it behind the trap; or if, when the ball is thrown up, he indicates more than the proper number of stick-lengths from the trap.

When he has succeeded in striking a ball beyond the boundary, one of the out players throws it towards the splent. The striker may, if he can, strike the ball with his dog-stick before it touches the ground, and either stop it or knock it away from the splent. When it stops, he measures with his eye the number of stick-lengths between the ball and the trap, and calls out the number. The distance is measured by the umpire, and if the guess be within the mark, the number called is added to the score; if it be over the mark, the striker is out. Thus, if the ball be three and a half lengths from the splent, and the striker call four, he is out; if he call three, he adds three to his score. In any case he may not add more than five to the score, so that when the ball is palpably beyond five lengths from the splent the umpire calls "Five," and that number is added to the striker's score without measurement.

Owing to the hardness, weight, and velocity of the ball, this is rather a dangerous game for beginners, who ought to play as out-fielders for a long time before they venture to rank among the home players.

LES GRACES.

This game derives its title from the graceful attitudes into which it throws the body if properly played. Unfortunately, when badly played, it is about as ungraceful a proceeding as can be imagined.

The materials of the game are very simple, namely, a couple of slender sticks for each player, and two or more hoops of different sizes The players stand at some distance from each other, and the object of the game is to throw the hoops backwards and forwards, catching and throwing them by means of the sticks.

The proper mode of throwing the hoop is as follows: Hang it on the sticks, and then cross them, so as to prevent it from falling off. Hold the sticks, with their points downwards, on the left side of the body, the left hand grasping one stick firmly, while the right hand holds the other loosely between the finger and thumb. Now raise the arms, point the left-hand stick in the direction which the hoop is meant to take, and with the right-hand stick throw the hoop, gliding, at the same time, the right-hand stick over the other.

These movements should be performed as one, without any pause between them; and if they are properly done, the hoop revolves rapidly, so as to keep it steady as it flies through the air. Unless this be done, it wabbles, or even turns over and over, in either of which cases the player to whom it is thrown can scarcely have a chance of catching it.

The hoop should be thrown tolerably high, and ought to be sent with such accuracy, that if it were not stopped, it would fall on the head of the second player.

Catching the hoop ought to be done with both sticks slightly crossed, unless it be flung much to the right or left, when, of course, a single stick must be employed. Sometimes an unskilful player flings the hoop so that it presents its edge to the catcher. Even in this case an expert player will catch it by giving the lower edge a little tap with one stick, the effect of which will be to make the hoop fall over the stick.

Let me here warn the beginner against one mode of throwing the hoop, than which nothing can be more awkward. We have often seen players cross the sticks horizontally in front of their noses, stick out their elbows level with their ears, and throw the hoop by flinging both arms apart. Now, in this mode of throwing there is neither ease, grace, nor certainty. A properly thrown hoop ought to look quite steady as it passes through the air, and to be thrown so accurately that there is no difficulty in catching it.

With every good set of Les Graces implements there ought to be two hoops of a foot in diameter, and two of seven inches. The test of good play is to exchange the hoops, throwing them so that the small hoop passes through the large one. This feat looks rather formidable, but all good players can perform it, and the writer has done it repeatedly whenever he could find a steady partner whom he could trust. When the hoops are thus crossed, the larger hoop should be thrown first, so that aim may be taken with the smaller one.

LA CROSSE.

(The National Game of Canada.)

No apology is needed for introducing La Crosse to the sport-loving British public. The devotion of our kinsfolk, the Canadians, to this charming game is introduction enough for it; while no one can doubt that we have room for another good game.

It is to be observed that the rules of the game, as settled by the La Crosse Association, are now published *for the first time*. While still incomplete they appeared in some of the sporting newspapers, but in a form differing greatly from that finally adopted. One or more sets of Canadian rules have been sold in this country, but they have been unanimously abandoned by the clubs in favour of the Association rules here given. It cannot be doubted that these rules are greatly superior to the Canadian (at least for use in this country), and that they are the best which English experience has yet been able to devise.

It seems strange that England should sit at the feet of the foreigner for instruction in manly sports. The ancient home of cricket, football, and a host of minor games—the natural abode of all sport—she is accustomed to teach rather than to learn. Has not *le sport* become a French phrase, in the utter absence of a native word for such a purely English notion? And can any good thing come out of foreign parts? In matters of sport is not the world divided into two parties?—the one Greeks, the other barbarians; we being the Greeks, and all other nations whatsoever the barbarians.

Yet, doubters notwithstanding, there seems a good prospect of a beautiful foreign game becoming thoroughly at home among us. Like other importations, *La Crosse*, the illustrious stranger, has more grace and elegance about it than similar articles of home manufacture. There is nothing very graceful in football, thoroughly English game though it be. A "maul," with half a

dozen Britons kicking each other's shins, is perhaps amusing as a spectacle, and is certainly evidence of national pluck and good temper, but a foreigner may be excused for holding it in some contempt. Then again, too many of our games are dangerous. Certainly we have no maudlin horror of a spice of danger, for we remember that those who led the six hundred over Russian guns at Balaclava had learnt the trick from five-barred gates at home. We even think that square-leg to a hard hitter is no bad training for coolness at the "cannon's mouth." But while many bold spirits will always love the rough games for their roughness, many will welcome a safe game, second to none in excitement, as a boon of no small value. Plenty of men—especially under certain conditions of shins and knee-caps—curse the "Rugby rules" they are obliged to play.

La Crosse, beside being safe and yet exciting to the players, is beautiful and interesting to lookers-on, as we think all will admit who saw it played by the Indians at the Crystal Palace. This alone is high recommendation; but its chief merit lies not so much in the quantity as in the quality of the *exercise* involved. It gives as much running as cricket or football, if not a great deal more, and requires a quicker eye than any other field game besides cricket; but its *spécialité* is that the running must be of *the best*. To succeed, a man *must* run steadily and in good form, since the ball is only allowed to be carried while resting on the crosse, a state of things it has a natural antipathy to. Just as the Austrian officers prove their graceful dancing by waltzing round the room holding a glass of wine, so may a man prove his graceful running by carrying on the slippery foundation of a crosse an India-rubber ball, and evading on uneven ground the attack of numerous and active foes.

We claim for La Crosse, then, that it is a pastime containing more *hidden* *drill* than almost any other. A cricketer may satisfy the requirements of his village club in respect to batting, bowling, catching, fielding, throwing, without much improvement in his bearing. At football shambling legs may give a vigorous kick, and arms may grip tight from shoulders almost as round as the ball itself. We lack a game which shall *enforce good bearing* on us *incidentally.* La Crosse does this. We defy a lad to play it well (and no one will find it difficult) without acquiring true grace in running, and, more or less, in every other action of his body. No better plan can be devised for making a man run well than giving him something to carry which he is liable to *spill.*

Let our reader try for himself, making only due allowance for the imperfections we always find at first in tools we don't quite understand.

ORIGIN AND NATURE OF THE GAME.—Though free from most national prejudices, we can quite forgive an Englishman who turns up his nose at the name, to begin with. What, one may ask, can a field game be good for with a *French* name? The objection is a natural one, but is easily disposed of: the game is *Canadian*, and originated apparently in pre-historic times amongst the noble aborigines of that country. The name was given by the French, its first European possessors, on account of the curved stick resembling a *crosse* or bishop's crozier. The name is not a very happy one, as it suggests *cross* in English. The French for that is *croix*, quite another thing. When more at home in England, it is too likely to be called the "cross." This is a matter of small moment, perhaps, but it is always well to keep up the proper derivation of words. To call a wooden hook a "cross" (as we already pronounce it) is absurd; to drop one *s*, and call it a "crose" would be far better, as suggesting the original meaning at once. The reform may be carried out some day, but at present we shall keep to the established spelling. (The French use the verb *crosser*, as "to bat, to strike aside with a bat," probably in the same way as we might speak of hindering or "crossing" a thing, or crossing its path with a bat.)

As to the nationality of our new game, even British conceit may be satisfied. Surely we can condescend to learn athletics from the North American Indians, who may well teach us "a thing or two in running." When the redskins first began to play La Crosse we have no information, but it is stated to have been first seen by Europeans when Charlevoix, one of the French pioneers in Canada, ascended the St. Lawrence. That was in the tribe of the Algonquins, who inhabited the country about Quebec and Montreal. Rather more than a century ago, a chief named Pontiac, hoping to surprise the English garrison in the fort at Detroit, collected parties of Delawares, Ottawas, and Shawanees in the neighbourhood. Knowing the skill of the supposed friendly Indians in playing La Crosse, the officers were in the habit of inviting them to play close to the fort. Pontiac directed that on one occasion a larger number than usual were to join in play, and that the ball, as though accidentally, was to be struck into the fort. A few Indians were to follow and search for the ball; this was to be repeated again and again, sometimes a number entering, sometimes only a few. When suspicion was lulled the ball was to be struck over again; the Indians were to follow in large numbers, and to attack the garrison with concealed weapons. The stratagem was put into execution and nearly succeeded, but the garrison discovering the nature of the visit before the Indians had penetrated to the strongest part of the fortifications, turned upon them and drove them back with great slaughter.

It was not until the last few years that the colonists generally began to take up La Crosse. The first clubs were formed at Montreal, taking the game from an Iroquois tribe; since then it has spread rapidly through the "New Dominion," and now claims the title of the national game of Canada. To those who know the Canadians this will sound high praise. It must be a rare game indeed to satisfy that hardy race.

La Crosse was introduced into England in August, 1867, by Captain Johnson, a Canadian, who brought over a troupe of eighteen Indians, chiefly Iroquois, but including representatives, it was stated, of the Onondagas, Cayugas, Senecas, Oneidas, Mohawks, and Algonquins. Of course they were not all of pure Indian blood. They first made a tour in the United States, and then came over here. The "Field" of August 3rd contains the following:

"Captain Johnson brought over eighteen Iroquois Indians in the *Peruvian* last week, for the purpose of introducing the national game of Canada into England. The Iroquois tribe inhabit Lower Canada, near Montreal, and several of Captain Johnson's company were the same that performed the game before the Prince of Wales when in Canada in 1860. On Tuesday last a private performance took place at Beaufort House, Walham Green, under the patronage of Lord Ranelagh, at which members of the Press and a few friends only were present. The Indians looked very smart, dressed in their blue and red drawers, the chiefs of each side being distinguished by feathers in their caps and other ornaments." After this public performances were held at the same place, and then for some time at the Crystal Palace. Canadian authorities all agree in praising the game as one affording great pleasure to the lookers-on; of course this is hardly felt yet in England, as not many players have attained to really good play. One Canadian book speaks of "the strange wildness and beauty of the game, and these terms we do not think misapplied.

The various attempts made to define the game in few words have not been happy. "A combination of football and hockey," is perhaps better than "a sort of hockey;" but it has this drawback, that no greater offence against the rules can be committed than to introduce either hockey or football into the game. Striking the ball hockey fashion is strictly forbidden; so is kicking, throwing, or even catching it. Football played with racket bats would be nearer the mark.

Be this as it may, La Crosse is a ball game, played by preference with an India-rubber ball. Two goals are erected, as in football, and the object is to drive the ball through them by means of the crosse alone. Stations are assigned to the players in different parts of the field, but there is this remarkable difference, that no "off side" rule exists; indeed one player is always kept close in to the enemy's goal. Owing to this plan the game is very sociable, as the men usually find themselves placed in pairs (foemen, of course) about the field, and can chat away in comfort. As far as practicable the hands and feet are forbidden from touching the ball. "Running in" (called "dodging" by the Canadians) is the principal feature of the game, the ball being carried on the crosse. The crosse is a hooked stick partly filled in (tight) with a netting, something in the manner of a racket bat. Running with the ball, as has been said before, is soon learnt, but evading hostile attacks gives scope for life-long study: if hard pressed the runner throws the ball (with the crosse) to a friend, probably in advance of him, and there is no off side rule to prevent the friend from at once continuing the running. The ball should be stopped by the crosse. Experienced players learn to catch with it, and are equal to a catch of thirty or forty yards or more. Throwing the ball requires great judgment and great skill; quickness of thought to decide the right direction, and skill to send it straight. Turning round and throwing back over the head is the usual way. The rules about going out of bounds, &c., &c., are of the plainest kind, and contrast favourably with even the simplest code of football rules.

In July, 1867, the National La Crosse Association of Canada was formed, "to improve, foster, and perpetuate the game of La Crosse as the national game of our dominion." Its rules (with a copy of which we have been favoured through the courtesy of its secretary, Mr. W. George Beers, of Montreal) are very full, and admirably drawn up. The rules of the game differ slightly from those adopted in England. The difference will be explained further on when we come to discuss the English rules. The Canadian rules are much more minute than ours, and seek to provide laws for all sorts of matters which we in England prefer to leave to honourable understanding amongst the players. The close directions given for the guidance of umpires, and the care taken to insure fair play, show that La Crosse is really a national game, exciting great and general interest. The colonists have not been schooled in the continual playing of games where written laws are unknown, so they pile up safeguards as if the combatants were going to law instead of playing a match; but though too minute for us, their laws are well framed. It may some day be necessary to follow their example, but while the game is young the good feeling of the players can be depended on.

The Canadians, according to letters received, are looking forward to international matches with the old country. We dare not try such an experiment this year, but in 1869 surely some of our clubs will be proficient enough to give a worthy reception to the travellers from the New Dominion.

When first played in England, the rules of the Montreal La Crosse Club (adopted prior to those mentioned above) were followed by the various clubs; but not finding them quite satisfactory or quite adapted to English ways, the leading clubs agreed to form a La Crosse Association, the laws of which should be binding upon all clubs. The same thing has been done in football with very fair success, considering that various local ways of playing that game have existed for ages. In La Crosse there are no local rules to excite opposition, and all the clubs are desirous of starting with similar rules. The task of the Association is thus made easy, and the wisdom of forming it proved.

Some of the earlier supporters of La Crosse believed that they had found a game for "all the year round." We scarcely go so far as this; it is a very fatiguing game for hot weather, while all our admiration for it would not induce us to set up a rival to cricket; winter and spring are its seasons. It is not as a rival but as an auxiliary to cricket that we would recommend it, and if we are not mistaken it is amongst cricketers that it will find its chief supporters. Above all winter games it is a game of SKILL, and that is what cricketers have hitherto sighed for in the winter

The rules of the La Crosse Association are here described:

THE RULES OF THE GAME.—The rules of the game, as settled by the Association for the acceptance of all the associate clubs (they were confirmed on the 12th February, 1868), are as follows.

1. THE CROSSE.—The crosse may be of any length, but the woven network must not be bagged, nor of a greater width than one foot.
2. THE BALL.—The ball shall be of solid India-rubber, not more than nine or less than eight inches in circumference.
3. THE GOALS.—The goals shall be upright posts seven feet apart, with

a tape or bar across them six feet from the ground; when practicable they shall be placed at not more than two hundred and fifty nor less than one hundred and fifty yards apart, and the ground shall not be more than one hundred nor less than sixty yards wide.

4. COMMENCING THE GAME.—The game shall be started by the ball being placed on the ground opposite the centre flag, between two players on opposite sides, who shall "tussle" for the ball with their crosses. This is called "facing."

5. BALL OUT OF BOUNDS.—When the ball goes out of bounds it shall be thrown in by the player who first touches it with his crosse. When it goes behind goal without passing through goal, it shall be thrown out by one of the players behind whose goal it has passed.

6 & 7. TOUCHING THE BALL WITH THE HAND.—The ball must not be caught, thrown, or picked up with the hand, except in the case provided for by Rule 7; but a ball coming in the air may be blocked or patted away with the hand to protect the face or body; otherwise it must not be touched.

7. Should the ball lodge in any place inaccessible to the crosse, it may be taken out by the hand and immediately placed on the crosse.

8. STRIKING AND KICKING THE BALL.—The ball shall not be hit while on the ground, or kicked.

9. SPIKED SOLES.—No player shall wear spiked soles.

10. OBTAINING A GOAL.—A goal is obtained when the ball is caused to pass between the goal-posts and under the bar or tape, in any manner whatever by one of the defending side, or in any manner not forbidden by these rules by one of the attacking side.

11. HOLDING AND PUSHING.—Players shall not hold each other, nor grasp an opponent's crosse; neither shall they deliberately trip, strike, or push each other.

12. THROWING THE CROSSE.—No player shall throw his crosse.

13. CHANGING GOALS.—After each game the players shall change goals, unless otherwise agreed.

14. DECIDING A MATCH.—A match shall be decided by a majority of goals won during the time specified for play.

15. NUMBER CONSTITUTING A FULL SIDE.—Twelve players shall constitute a full side.

16. CHANGE OF PLAYERS.—No change of players shall be made after a match has commenced without the consent of both parties.

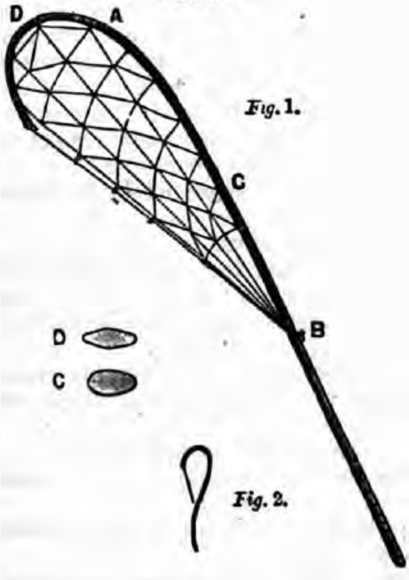
17. ALTERATION OF RULES.—No change shall be made in the foregoing rules except at a general meeting of the La Crosse Association. Should any alteration be deemed necessary, notice of it must be sent to the secretary in writing three weeks prior to the general meeting; and the terms of the proposed alterations shall be advertised in such sporting papers as the committee may direct two weeks prior to the general meeting.

THE CROSSE.—"The crosse may be of any length, but the woven network must not be bagged, nor of a greater width than one foot." The usual length is from four to five feet, but most players like it short rather than long, and reduce the length to about four feet by cutting off part of the handle. The Indians use larger crosses than have been adopted in England, though they probably did not exceed the breadth of network here given. The best specimen which has come under our notice had been reduced by the owner to less than four feet in length, the network was nine inches in width, and the weight of the whole scarcely exceeded three-quarters of a pound. Though probably too short, this crosse seemed to us otherwise perfect.

There is little or no advantage in a large crosse. It is more cumbrous to handle, and more likely to get broken. For catching the ball the small and handy crosse is just as good, success depending most upon a careful eye. If the eye is not careful it is well it should be trained. With a small span the netting is not so likely to bag.

Plate I. represents the crosse above alluded to. It was obtained from Mr. Roberts, a Canadian, who was appointed by Captain Johnson his agent in England, and who has been at great trouble to introduce the game amongst us. Roberts has correctly appreciated the English taste for refinement and finish in all the appurtenances of sport, and comprehending that we wish to make the game skilful rather than easy, has improved considerably on the original instrument. He has lately appointed J. Lillywhite, of 10 Seymour Street, Euston Square, his sub-agent, in order, we presume, to reach the larger circle of his world-wide cricketing connection. The price hitherto asked—eight shillings and sixpence—is unreasonable, and must be reduced, or the trade will fall into local hands. In Canada a crosse of the best make costs under a dollar, so that from four to five or six shillings ought to be the limit in England.

PLATE I.



The stick may be either ash or hickory, but hickory is the lightest, strongest, and best. There are some variations in the shape to which it is bent, but we prefer that shown in Plate I. Sometimes the handle is curved back, as at Fig. 2 in Plate I. This gives a more symmetrical appearance, perhaps, but is really no advantage in carrying the ball, which rests against the stick at A, and not in the centre of the net. The handle part is round or oval; beyond the pin B, it takes the shape shown in section at C, one side being tapered to allow of holes being made near the edge for fastening netting. The stick then gets gradually thinner, until at the top of the crosse, where the curve is sharpest, it takes the section shown at D. At the tip it thickens again; about an inch from the tip a hole is made through (in the plane of the crosse, not through from top to bottom). A string is put through this, and both ends are made fast round the pin, B: this gives two strings near together to form the edge of the net, and serves to hold the stick in shape. Three other strings (four in Canada) are then stretched from the pin to the top of the crosse, and diagonal network is fastened to these and to holes down the stick at the side. A badly woven net will be dear at any price, as it will certainly "bag," and render the crosse unfit for play.

The Canadian rule places no limit to the width of the crosse, though it forbids a baggy net by the simple test of its remaining "flat when the ball is not on it." It then says: "A leading or outside string above the level of the others may be used. It may rest on the top of the stick, but must not have anything under to increase its height."

Now, as this *leading string* is allowed in Canada, and is not forbidden by the English rules, we presume it must be considered admissible. It is, however, in our opinion, most objectionable, and we understand that the best authorities (though La Crosse is young yet to talk about "authorities") are of the same opinion. It gives a clumsy player an advantage, by preventing the ball from rolling off his crosse when he inclines it the wrong way. But the ball has no business on that side of the crosse; its proper place is against the stick, which gives ample protection already. A "balustrade" on the other side is quite out of place, and we condemn it at once. Fortunately, it will be of little or no use to good players, and will prove only a snare to the bad ones who adopt it, leading them into careless ways of carrying the ball.

The stick should not be more than an inch thick at the handle, and rather less than an inch wide in the curved part; the handle may be covered with string, or otherwise roughened, to give better hold.

The crosse is always carried so that the wood forms the right hand edge of the net, as in Plate I. The best are made with a slight *sheer*, as a shipbuilder would say, so that they do not lie quite flat on the ground, the ends being rather higher than the middle; this helps to keep the ball on, and shows at once when the crosse is upside down.

The best material for the net is strong *gut*, in pieces of good length, so as to have as few knots as possible. Moose-skin is also liked in Canada, and various kinds of string have been tried. But there can be no doubt that the best gut is the proper stuff, and is alone likely to be used in England. At B is a wooden peg round which the strings are fastened; this is better than drawing them through a large hole, as is sometimes done. From B to the top of the crosse is about two feet five inches.

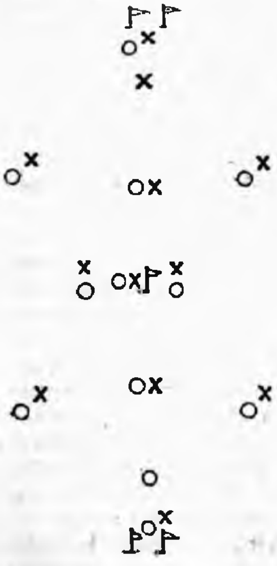
THE BALL AND THE GOALS complete the simple apparatus of the game. The dimensions of the ball were fixed without reference to the Canadian rule, after trial of different sizes. It may therefore be assumed that a circumference of between eight and nine inches (which is also adopted in Canada) is the best. By a "solid India-rubber" ball is meant one which will not collapse; India-rubber with a wood core, and plain India-rubber with a small hollow in the centres, have both their supporters. For our own part we advocate the wood-cored ball, too much springiness being undesirable. The ordinary hockey ball sold by Lillywhite and other makers at eighteenpence, or say twelve or fourteen shillings a dozen, is just the thing. The ball will last a long time, and may practically be left out of the calculation of expenses.

We prefer a light crosse, and not too light a ball. With a very light ball the temptation to *hockey* is increased; with a relatively heavy one it becomes difficult, and not worth the certainty of detection, a light blow at a heavy ball being useless.

The goals are marked by simple poles, flags, and tapes or bars, just as in football and other games. A fifth pole is planted at the centre of the ground; the Canadians draw a line six feet in front of each goal, "within which no opponent shall stand unless the ball is actually near or nearing the flags." Our Association, wisely we think, leaves this point to the good feeling of the players, who are of course expected to leave the goal-keeper full room to act, unless actually engaged in attacking the goal. It is hardly a case for a rule, the necessary exceptions being so large and vague as to make its observance little more than a matter of taste.

THE GROUND AND THE PLAYERS.—It would seem that in Canada the game was once played over very long distances and rough ground; but the "pale faces" bringing less wind and more science to bear upon it, the distance was gradually contracted. One Canadian book recommends that half a mile be not exceeded, but we have heard of two miles between the goals. We think that game must have "blown" even the Indians. Boundless prairies being scarce in England (especially in suburban districts), a limit has been fixed at two hundred and fifty yards, which we think quite sufficient; one hundred and fifty is made the minimum. The breadth of the ground must not be less than sixty or more than one hundred yards. Of course a club may use a smaller ground, but matches *must* be played according to the rule given *when practicable.* The Indians thought nothing of a few trees or a small forest on the ground, with gullies and holes *ad lib.* Englishmen will try for the best and smoothest ground they can get; but the game *can* be played anywhere, which is one among its many advantages. The boundaries of the ground must be marked in the usual manner.

PLATE II.



The distribution of the players is a matter on which doctors disagree. All rules appoint a *Goal-keeper.* A few yards in front they place *Point*, and farther on *Cover-point.* Close to the middle flag is the centre or *Facing-man* belonging to each side. The man stationed next to the enemy's goal is called *Home;* he should not stand directly before the hostile goal-keeper, but to one side. The other players, disposed pretty well at the discretion of the captain, are called *Fielders.* One forward player is usually put in advance of the centre flag, close to the enemy's cover-point. Each side has a man standing behind each facing-man, or behind its own facing-man only, to take the ball from him if he succeeds in getting it away from his opponent. Plate II. shows a plan much liked by the Richmond La Crosse Club.*

Although some of the names have been borrowed from cricket (before the game was brought to England), yet the arrangement of the players has nothing in common with that game. Cricketers object to the piracy strongly, and would substitute "first out" and "second out" for "point" and "cover-point." As, however, the names have a firm hold in Canada, and are certainly convenient as well as pithy, we shall retain them in speaking of the different stations.

In placing his men the captain will derive valuable hints from any experience he may possess of the same duty at football.

The players are supposed to keep pretty well to their stations, especially

* The marks O and X representing players of the respective sides.

goal-keeper and point. Nothing spoils the game more than every one joining in a free fight over the ball. Of course a man who has got the ball may run with it as far as he can, but it is quite sufficient to have two or three "checking" or opposing him; if more come they merely prevent each other from using the crosse effectively, and most likely leave open the way to their own goal. Beginners hunt the ball in a pack, and will never learn better if not kept in strict order by their captains. We call particular attention to this practice: it renders the game ridiculous as a spectacle, stops all play properly so called, gives rise to disputes and unfair practices, and turns the game into a poor kind of hockey; it is, in short, one of the greatest drawbacks the game has to encounter.

PLATE III.

The *facing-men* commence the game by standing as in Plate III. At an agreed signal they "tussle" for the ball, trying either to press away the opposing crosse and drive the ball straight on, or to disengage it and roll it back between their legs to the men of their own side standing behind them. The fear of breaking the crosses prevents too much roughness. It is prettier and more creditable to get the ball by finesse than to drive it on by brute force. (See Rule 4.)

Twelve players, by Rule 15, constitute a full side, but of course fewer can play. The English rule as to changing players—only with the consent of both parties—is simpler than the Canadian, which includes matters we prefer leaving to "public opinion." In Canada no one can play in a match who has not belonged to his club for thirty days, which shows that the spirit of the Voltigeurs, Oscillators, and other famous rowing "clubs," is not unknown in Canada. At present we may consider ourselves safe from combinations of *famous La Crosse players* into *quasi* clubs, for the purpose of carrying off prizes (!)

Goal-keeper's duties are obvious: he must not quit the goal. *Point* must on no account leave his post, which ought not to be more than twenty yards in front of goal-keeper. He should be the best *checker* on his side ("checker" is the Canadian name for any one essaying to stop a player "running in" with the ball). Point's particular function is to let no one get past him with the ball, but to oblige it to be thrown from a safe distance at the goal. If the runner were allowed to get close to the goal, and then threw the ball, goal-keeper would have little chance of stopping it. Point is the outwork who obliges the foe to uncover his batteries at a certain minimum distance from the citadel. When the foe "throws in," it is for his "home" to get the ball and complete the work, and for goal-keeper to show cause to the contrary. Cover-point may be dispensed with, but not point. Goals are changed after each game (Rule 13) unless otherwise agreed. Rule 10 defines a game as won "when the ball is caused to pass between the goal-posts and under the bar or tapé, in any manner whatever by one of the defending side, or in any manner not forbidden by these rules by one of the attacking side." In other words, the goal counts if got accidentally by the defenders, but only if obtained fairly by the attacking party. The question of umpires, on which the Canadian rules enlarge so freely, is best left to be settled by agreement. Umpires are scarcely required in such a game, unless the match is considered a very important one. If the ball bounds through the goal off the person of a player it counts all the same, provided it was not unfairly propelled in the first instance.

The arrangement which appoints goal-keeper, point, and the hostile "home" as the three men always close to goal, is a good one, and should be adhered to. If a captain chose to put two "home men," his opponents would be obliged to have two goal-keepers, and the anticipated gain would be lost. As irregular posting, therefore, cannot pay, it should never be tried, for any system of massing the men together is certain to spoil the game. No two of a side should be close together except goal-keeper and point.

The Canadian rules direct that spectators must not stand within twenty feet of the goals. The rule is a good one, and ought to be enforced in England, when possible, as part of the "unwritten law." It is, however, best left so, being scarcely a fit subject for formal enactment.

The Canadians decide their matches by three games out of five; we, by Rule 14, decide it "by a majority of goals won during the time specified for play." This is simpler and better in every way. A five-game match might be interminable.

When the ball goes out of bounds at the sides it is to be thrown in (by the crosse of course) by the first player who touches it with his crosse. Having touched it, he may get it on his crosse at leisure, and is not to be "checked" or baulked while throwing it. He should throw it straight in from the spot where it passes the boundary. When the ball goes behind either goal-line it must be thrown in, *straight*, by any player of the side behind whose goal it has passed, who is also to be allowed a fair throw. The best man to throw out is usually the goal-keeper. The ball, for obvious reasons, should be thrown out to one side of goal. (Rule 5.)

STOPPING THE BALL.—UNFAIR PLAY.—The main distinction between La Crosse and all other ball games is that in the former the ball is manipulated by an instrument, and not directly by the hand. The same is the case in tennis and rackets, and to some degree in cricket. But in these games the instrument is used only for *striking*, while in La Crosse striking, carrying, and catching are equally performed by it, the direct use of the hand being essentially foreign, and even hostile, to the game. In drawing up rules it is not easy to meet all the cases which may arise, but this is the *spirit* of the game as played in England. The Canadian rules allow the *goal-keeper* "to stop the ball in any way." This rule has been rejected by our Association, and we think very properly. In the first place, there is no rule to forbid the ball being stopped by the feet or body, and it is even permitted to stop it by the hand *to protect the body or face.* It seems to us that stopping by the hand is really a matter of little importance, for in nine cases out of ten, if the hand can be stretched out, the *crosse* can be stretched out to much greater advantage. Nevertheless, if *stopping* by hand were allowed, it would soon lead to *catching* and *throwing* by hand, both of which are strictly and rightly forbidden. For this reason, then, the ball must not be touched by the hand while in the air, except to protect the person, and this exception must be jealously watched (Rule 7). We see no advantage in arming the goal-keeper with an exceptional power, which after all is of little value, and which can only lead to dispute. The feeling of the La Crosse conference was unanimous on this point, as indeed it was on nearly all the alterations made in the rules.

The ball may be stopped with the foot when coming along the ground. To make a rule to the contrary would be to invite endless dispute, though foot-play is almost as obnoxious to the game as hand-play. However, in almost every case the crosse, in the hands of a practised player, will be a better stop than either the hand or foot. Thus the evil will defeat itself, and no great harm be done. *Kicking* the ball is quite a different matter. Rule 8, forbidding it, must be strictly enforced, or the game loses its character entirely. If men are allowed to get careless about kicking, they will be rushing into "scrimmages" for the sake of a sly kick. If prevented from kicking they will find that scrimmages do not pay. A mob of men packed too tight to use their crosses, and not allowed to kick, will find themselves wasting a good deal of energy, and will soon see the wisdom of scattering. A goal obtained by kicking does not count, though at other times a purely accidental kick—which cannot always be avoided—must be excused. Rule 8 also provides that the ball shall not be *hit while on the ground.* This by no means forbids its being struck at by the crosse while in the air or on the bound. It would be useless to authorize the ball being *stopped* by the crosse, and then to forbid its being *struck* under the same circumstances, as the difference consists merely in the amount of forward movement given to the crosse—a matter which no rule can touch. An unsuccessful stop or catch may be a stroke without being intended for it. Striking the ball in the air does not come under the head of hockey, as it will probably take effect by the network, which is not capable of giving a very hard stroke. But striking the ball on the ground is simply hockey, and is forbidden. While on the ground it cannot be struck by the net, so that any offer to strike is an attempt to use the stick part of the crosse as in hockey. Pushing or spooning the ball *in the attempt to lift it* is lawful, but not striking. *Swiping* is the word used in Canada: it means a deliberate swing of the crosse round upon the ball. It is considered dangerous to the other players, and destructive to the crosse, and at any rate is wholly unlawful. Swiping at a ball in the air is probably included in the condemnation. It should not be done, though our rules do not exactly forbid it, and could not without leading to disputes.

The one case in which the ball may be touched while on the ground is met by Rule 7.—"Should the ball lodge in any place inaccessible to the crosse, it may be taken out by the hand and immediately placed on the crosse." This is a very important rule, and deserves attentive consideration; though it may be observed that most grounds likely to be chosen for matches are too level for it to happen often.

The rule should always be rigidly construed: make it a point of honour to avoid using the hand whenever possible, and keep a very sharp look out on breakers of the rule. No one is likely to use the hand on even ground, because, even if hard pressed, he can pick up the ball quicker with the crosse than with the hand. It is only on *rather* difficult ground where men will try to save time by unfairly revoking this rule.

The ball when picked up must be placed on the crosse *immediately;* it must not be kept an instant in the hand. The Canadian rule is that the ball, whenever taken up by the hand, must "be faced for with the nearest opponent." Our Association rejected this in the interests of simplicity, and not because there was no good in it. Who, for instance, is to decide who is the *nearest opponent?* In favour of the English view it may be said that if a man gets the ball on his crosse and runs off with it before his pursuers come up, he is fairly entitled to the advantage; while, if they come up, they have a good chance of knocking the ball off his crosse, or even of getting it first. When once he has the ball in his hand, he must be allowed to place it on the crosse without hindrance; and his hand may not be held. Though the Canadian rule seems fair, it may be remarked that under it a man loses all the advantage of being first after the ball, if only it happen to go into a hole, and that men might be tempted to throw the ball purposely into such places, for the sake of the breathing-time which a solemn "facing" will afterwards allow them. The English rule may want revision some day, but at present we think the Association has decided for the best.

Of course, if the ball goes out of bounds "in an inaccessible spot," it becomes the prize of the first man who touches it with the hand, and who is at liberty to place it on his crosse by hand. But if accessible, it must be touched (and afterwards taken up) by the crosse.

The rule about spiked soles is sufficiently plain and desirable. Mocassins, which can be obtained of the Mr. Roberts before mentioned, are better than shoes or boots, provided you are sure of your ground, and are not afraid of stepping on a sharp stone.

Rule 11 must be strictly enforced, as embodying one of the essentials of the game, which, though it requires both nerve and endurance, boasts of being a *gentle* game. "Players shall not hold each other, nor grasp an opponent's crosse; neither shall they deliberately trip, strike, or push each other." Tripping and striking we need not enlarge upon, but pushing and roughness generally cannot be looked after too sharply. Holding an opponent is bad enough, but holding his crosse is worse. You are at liberty to strike it or knock it up or aside with your own crosse, but never with the hand or foot.

At the same time never *throw* the crosse: this rule (12) may seem laughable to some, but it was found soon after the game was introduced into England, that men took to throwing their crosses at the ball on an opponent's crosse when not near enough to touch it fairly. The manœuvre was only too successful. Though obviously unfair, there was no rule against it, so the Association has made one.

Picking up and Catching the Ball.—The ball should be picked up by the crosse as you pick up a racket ball. Go at it hotly, and you are sure to fail. Violence saves no time, be you ever so hard pressed. If running fast, and on rather *uneven* grass, you may get the ball up by simply pushing the top of the crosse (D, in Plate I.) under it, with a sharp, lifting motion, tipping up the crosse to prevent the ball falling off again. If the ground is very smooth, there is, however, a chance that the ball will merely be struck forward, and not picked up at all. It certainly will be so if a tuft of grass or any other obstacle in front prevent the edge of the crosse from getting fairly *under* the ball. It need scarcely be said that a good *edge* to the top of the crosse is indispensable. You never, unless under very unusual circumstances, roll the ball on to the crosse by any other part than the top. For the few inches forming the top or head, therefore, the stick is brought to the lozenge section shown in Plate I., and this is the only right form.

The more usual and safe way of picking up the ball is a little troublesome to learn, and obliges a partial stoppage if it has to be picked up on the run. Stretch out the crosse on approaching the ball, and catch the latter by the inside of the top part of the stick—*hooking* the ball, in fact. Draw it sharply *towards* you, and while the ball is still in motion bring back the crosse and push it underneath. As the crosse is presented to the ball while it is still rolling towards you, it would probably roll on of itself, but you should help it by pushing the crosse as directed. There will be little danger of striking it away from you, even if the edge of the crosse is presented not quite on the ground. In offering the crosse, the body should lean forward, so as to get the handle near the ground. This diminishes the incline the ball has to ascend, and assists in getting it over the stick. Directly the ball is on, tip up the crosse, and cant it slightly over to the right, so that the ball may rest against the stick near, but not too close to, the top.

When the ball is flung towards you, and runs along the ground, you can usually pick it up by holding the crosse to it at an angle, with the top on the ground: the ball will run up the incline. When coming hard, it may run up and jump into the face or over the head, if the crosse is not inclined sufficiently. If coming very fast, it can only be stopped and picked up afterwards. If coming on the bound gently, it should be received on the crosse (inclined, of course); if hard, block it with the crosse inclined forwards, so as to throw the ball straight down on the ground: catch on the rebound.

As to catching the ball when coming in the air, there is not very much to be said, except that it requires much the same qualities as catching a ball in the hand. Receive the ball on the net, and of course drop or draw back the crosse slightly at the moment of contact. A practised hand will catch the ball with more facility than can well be imagined, even when it comes straight breast-high, or even overhead. When coming straight at you above the waist, hold the crosse perpendicular to stop it. As the ball commences falling, follow it with the crosse. A rapid twist of the wrist will revolve the crosse from above to beneath the ball, which will thus be caught.

Catching is entirely a matter of practice, joined with natural aptitude.

RUNNING WITH THE BALL.—Called "dodging" by the Canadians. To throw the ball well, to catch it on the crosse, and even to pick it up, require more dexterity than most exercises. But the chief interest of the game lies in running with the ball; to do this properly needs high qualities, among which *coolness* stands pre-eminent. It seems so easy to drop the ball from the crosse, and so difficult to avoid the blows of the same far-reaching weapon, that one doubts at first how a good "run in" can ever be accomplished. Yet it is done continually by good players, and it may even be said that, man for man, the attack is stronger than the defence.

Plate IV. shows the position in running with the ball. The crosse is inclined more and more in proportion to the speed, the ball being kept in its place by the pressure of the air in front. The crosse is canted to the right, that the ball may rest against the stick, which, as already stated, forms the *right* edge of the crosse. That, at least, is the way most players prefer to carry it, though in Canada it seems to be turned either way. The matter is immaterial, of course. With the light crosses used here one hand is sufficient. (Perhaps there will be a one-handed *versus* two-handed controversy some day, as there is now in croquet.) Steadiness and watchfulness are required to keep the ball on the crosse, and slipshod running will soon bring it to grief. However, it is easier than it first appears.

When intercepted by an opponent, and unable to get past without fencing (distretion is much the best part of valour when running in), prevent your crosse being struck, if possible. It may sometimes be saved by transferring it to the left hand, or even behind you, but you risk dropping the ball in this. If pressed hard, throw up the ball over the enemy's head, and darting quickly on before he has time to turn, catch it in its descent. This is a pretty piece of play, and is often done with success. It needs strength of wrist. A slight jerk of the crosse *from the wrist* throws the ball over the head of the "checker."

PLATE IV.

Another way is to throw it in the same manner to your right, darting off immediately to catch it. The chances are you get the start, the enemy not being previously prepared, as you are, for the movement. Still a good "checker" will not be soon got rid of, and it may become necessary to *throw* the ball either at the goal, if near enough, or to another of one's own side. A "checker" may be kept at bay by turning the back to him, which makes it difficult for him to reach your crosse, and at the same time puts you in the best position for throwing if necessary. In reaching past your side to strike your crosse, he gives you an opportunity to turn to the other side and run on.

A vigorous, charging sort of run does not pay at all, at least with good players. Quickness and suppleness are the chief things to attend to. Mind while engaged in front you are not also attacked from behind. When there are two to one it generally becomes expedient to get rid of the ball at once. When near enough to the goal, throw to your "home man" without trying to get too close.

It is well to wear gloves, to save the knuckles from blows of hostile crosses.

The art of "checking" is of course analogous to "dodging." Given an active man, with a crosse in his hand, and a ball to be knocked off another man's crosse, and we think he may be pretty well left to self-instruction.

It is assumed that a runner will seldom get beyond "point" without having to throw. Goal-keeper's chief duty is therefore stopping balls thrown, though sometimes he must engage in "checking." If it comes to this, the goal is in no small danger.

It need scarcely be said that in field play both "dodging" and "checking" is the soul of the game. Both branches must be studied before a player can become perfect in either.

A good plan is to strike the "dodger's" crosse down with the edge of your own; but so as not to hit the ball, which will forthwith jump into the air and give you a good chance of catching it.

THROWING THE BALL.—Throwing the ball over the head of an opponent by a jerk of the wrist has already been mentioned in the chapter on running. The same movement may be employed in throwing the ball short distances, but it can hardly be reckoned amongst the "methods" of throwing. We do not intend to divide the chapter into thirteen sections, devoted to as many styles, as the Canadian book before mentioned does, for we confess we cannot find so many; but there are two or three which require separate description.

The Indians trusted more to throwing and striking the ball to long distances than to running with it. The "white" practice lays more stress upon running, and enjoins that the ball shall only be thrown when its possessor for the time can run no farther, owing to the opposition he encounters.

When "checked" hopelessly by an enemy, the runner should throw the ball to a friend farther advanced or more free to advance than himself. The commonest plan is to turn the back to the checker, or rather to the person you desire to throw to, and then throw straight overhead. The finish of the movement is shown in Plate V. It is surprising how straight a throw can be made in this manner, and how well distance can be calculated by a rapid glance over the shoulder before throwing. The ball can be sent to a long distance if required. Turn quickly round, slanting the crosse sideways as you do so to prevent the ball flying off; put the left hand to the handle above the right, which slide down to the end; then raise the crosse over your head with a quick motion, partly from the shoulder, but chiefly from the elbow; stop it suddenly before the hands touch the face, and the ball will fly off with great velocity. It is easy, with a little practice, to give either a low and swift throw or a high and slow one; the latter being the easiest for a friend to catch, and the former the hardest for an enemy to stop. A man checking you is baulked by having your back turned on him, which makes it hard for him to reach your crosse. While he is trying at it, you throw in this way right over him. This *overhead throw* may be regarded as the standard throw, and as the most generally useful.

PLATE V.

A very good method for a short, vicious throw at goal, is to bring the crosse to the shoulder and throw out straight in front. It requires practice, as the ball may be easily dropped. Keeping the crosse level, you bring it round towards your right side, but pointing straight out from the body. At the same time raise the arm and the crosse; swing the latter round, using the hand as a pivot, until the net is over the shoulder, and level enough for the ball to remain on. In coming round the fingers instinctively change their hold on the handle, and the wrist gets bent back. With a sudden spring from the elbow and wrist you swing the crosse upwards and forwards, and drive the ball both hard and sure. The difficulty lies in bringing the crosse round to the shoulder without dropping the ball. Besides this *throw from the shoulder*, there is what we may call

The *underhand throw* (to borrow another name from cricket). In this you face the mark you throw at, and jerk the ball up off the crosse straight before you. It requires no change of position, and therefore can be done quickly; but it is the weakest throw of all. It is, however, accurate, for you have the advantage of a good view. You cannot throw this way *with a low trajectory* (to use a term well understood by volunteers), and therefore the ball is easy to stop. You must hold the crosse short with one hand, and try to get the ball on the middle of the net. It is not a bad throw to end a run in close to goal. By turning the left side a little to the mark you gain power. Except in throwing from the shoulder, the more you face away from the mark the stronger you will throw.

There are various ways of *throwing past the side* (the left). You turn your back to the mark, but with the left side more or less to it. Raise the right side of the crosse to prevent the ball coming off, and then swing round. In most of these ways you keep the crosse as close in as possible, and jerk the ball off just clear of the left side or shoulder. (It is jerked back over the right shoulder sometimes.) But there is one way in which the crosse is kept out at right angles to the body the whole time of throwing. This is a good throw, but a difficult one. It is performed with a short swing and a half jerk. Of course the left is the natural side to throw past in all these cases, but it is good to practise with the right as a means of baulking an opponent by an unexpected throw. A good swinging side throw *along the ground* is often effective.

There are several fantastic methods of throwing recommended, such as—face the goal and throw overhead from behind your back; or throw past your left side from behind. The latter throw is confusing to an adversary, but only an experienced hand can risk dropping the ball in the attempt to bring it round behind. Throwing between your legs is one elegant method, especially recommended if your enemy also happens to be standing in the same position.

Tipping the ball is often done when the player is too hard pressed to be able to take it up. It consists in just getting the ball on to the stick, and tipping it forward before it has time to roll off again. It may be described as a gentle evasion of the rules against hockey. Goal-keeper often "tips" the ball to one side as it comes towards him.

There is a way of throwing exactly analogous to throwing by hand. The crosse is raised and drawn back to the right. At the moment of throwing it is turned almost edgeways, but the rapid motion prevents the ball from falling. The arm is moved as in throwing by hand, but the left shoulder must be brought round. This is a quick, useful throw for short distances.

It must not be supposed that it is as difficult to play La Crosse as it is to describe it clearly. Throwing, for instance, is a simple art enough, difficult as our description of it may seem. La Crosse is, in fact, a very easy game; any one can join in it without previous training, and there are no troublesome rules to be remembered. On the other hand, *expertness* with the crosse is the result of practice only. Yet while the player may go on improving for years by long practice, he will find that he may become a moderately good player by very little indeed. That is just what a field game ought to be, simple enough for boys, clever enough for men.

It should be remarked that catching, stopping, and sometimes throwing, may very well be practised in private gardens, before venturing out to exhibit in public.

CROQUET.

This is a game of very modern invention, and yet, in a very few years, it forced its way into such astounding popularity, that there is scarcely a parish in the kingdom where the game may not be found—scarcely a suitable lawn in England where the hoops may not be seen.

At its first introduction, its French name and numerous, cumbrous, and now happily obsolete Frenchified technicalities, led people to suppose it was a French game. This is a mistake; it is English—purely English—both in its origin and present cultivation. The game may, indeed, we believe, be seen in France, just as cricket may; but it has not achieved there one tithe the popularity it has here.

Many boys, perhaps some even of our own readers, despise, or affect to despise, the game as not *manly* enough, and uninteresting.

For the former of these charges the same arguments that may be advanced against Croquet will hold equally good as against billiards, and no one ever dreams of calling that an unmanly game.

For the latter, we can only assure them that the fault only lies with themselves or those they have played with. Let them only take this article, and follow out faithfully its counsels and directions, and we can promise them they will have no more cause for complaining that croquet *bores* them.

Since the game first made its way into general popularity, many important modifications have been introduced into its rules and system of play.

Greater simplicity, both of method and of nomenclature, has been lately introduced, much to the improvement of the game as a science. The code of rules given further on, though they may not—indeed, are almost certain not to—escape some further modification, are yet about the most advanced and most practically perfect that have been framed up to the date of our present writing, the summer of 1868; and we, therefore, offer them to our readers with some confidence.

We have observed upon many of the rules and the modifications lately made in them further on, and therefore need not stay now to debate them.

IMPLEMENTS.—A boy with a genius for turning, with access to a good lathe, might perhaps make all the necessary implements—balls, mallets, and all—for himself; but, unless he can do so with perfect accuracy, can be certain of the truth of the mallets, and the absolutely perfect sphericity of the balls, he had better abandon the attempt, which will certainly only lead to disappointment; for nothing is so discouraging as playing with untrue balls and mallets.

The other gear, hoops, sticks, &c., add so little to the expense, that it is hardly worth while expending time and material upon them; especially as the home-made articles are sure to cost in the end quite as much, if not more than, the others, and will certainly be very inferior in appearance and general get up.

If purchase of materials be contemplated, it will be found better in all respects, and certainly far cheaper in the end, to invest in a thoroughly good set at first. The inferior sets are never very good to begin with, and the least wear soon reduces them to a most deplorable condition; the mallets get chipped as to their heads, and altogether smashed as to their handles; and the balls, after a few hard knocks, even if they escape having large pieces chipped out of them, rapidly assume an irregularity of outline—deep indentations here, huge protuberances there—that makes all real *play* with them simply impossible.

MALLETS.—Great uncertainty seems to exist amongst even the leading makers as to the best form, material, and proportions of these important adjuncts to the game.

In a general way the handles are made unnecessarily and inconveniently long. For the more scientific and increasingly popular one-handed play, a handle of two feet six inches is ample measure, even for a tall player; and for one of middle height this allowance may be reduced by an inch, or even two, with advantage. A great deal of the crispness of a stroke is lost by the disturbance in the balance produced by the superfluous length of handle in the ordinary mallets.

There is another point, too, in the construction of the handle, to which we would direct attention, and in which we are sure the ordinary mallets are defective. This is its *roundness*. We are persuaded that the true shape is a very flat oval, with the longer diameter in line with the greater axis of the head—like the handles, in fact, of those upholsterers' hammers in which accuracy and flexibility are so beautifully combined.

If the handle be *round*, as the fashion is now, there must always be more or less of a tendency in the mallet to turn in the hand just at the critical moment, of course to the utter ruination of the stroke; and nothing but the utmost care and watchfulness will suffice, even with the best players, to guard against the constant recurrence of this untoward accident. But, with a decidedly *ovate* handle, this revolution in the hand can never take place; its very shape renders the thing impossible, and the player, relieved from the necessity of guarding against any slip in this direction, is enabled to give his mind more thoroughly to the refinements of the game.

We think, too, that provision should be made for binding the handle, for some six inches or so, just at the grasp; this will afford a far better hold than the present method of grooving, and will so far, therefore, increase the efficiency of the mallet.

It it be thought proper, this binding, by using coloured string, may be made to subserve also the further purpose of ornamentation.

The mallet-handles are best made of ash or lancewood; no other material so thoroughly fulfils all the requisite condition of toughness, flexibility, endurance, &c. Compound handles have been tried, as, for instance, of cane and ash mixed, and the like, as in cricket-bats; but, we believe, the ash or lancewood handle, pure and simple, after all bears off the palm of real general efficiency.

There are several forms of croquet mallets furnished by the trade, some rather fanciful than otherwise; but perhaps the most practical and generally useful is the simple cylinder, with one face nearly flat and the other rounded; we say *nearly* flat, because it is practically found desirable to have the face slightly convex.

Most makers err in proportioning the weight of the mallet to the balls, and always on the side of lightness. The mallet-head should at least be *heavier* than the ball it is to drive. This is so much an axiom that it is hardly worth while to argue it out. The familiar illustration of the proportion observed between the balls and the cue at billiards will be quite sufficient to prove our point. Try to play billiards with a cue one-half the ordinary weight, or with a common walking-stick, and the importance of the question of relative weight will need no further impressing on your mind.

We think, too, that, as a general rule, at least another inch is desirable in the length of the head. The ordinary proportions are $4\frac{1}{2}$ in. by $2\frac{1}{4}$ in.; but we should prefer $5\frac{1}{2}$ or even 6 inches (with large balls), keeping the diameter unaltered.

This increase of length, besides effecting a very desirable increase of weight, would also materially improve the driving power of the mallet (it is quite a mistake to suppose that a tolerably heavy mallet is more difficult to wield than a very light one); while the slightly augmented tendency to turning in the hand would be more than counteracted by the ovate handle.

Of all ordinary materials for the heads of mallets, the best in all respects is sound Turkey box. But, if expense be no object, ivory is decidedly superior even to box, and indeed, from its greater weight, closeness of grain, and endurance, is not, in the long run, so much more expensive after all. An ivory-headed mallet costs a few shillings over the pound, more or less, according to the weight, and with ordinarily fair usage and care ought to last nearly a lifetime.

Thus much for the ordinary type of mallet. We have a theory, however, of our own, which we should much like to see carried out. That is, to accept the experience gained from billiards in the construction of our balls and mallets; and make the balls of ivory much smaller in diameter than the "club" set balls, and the mallet-heads of wood, tipped, at one end at least, with leather. This, of course, would only be worth doing on a first-class lawn, and where reasonable care could be taken of such valuable implements. But we are sure that, were it tried, it would prove a wonderful advance upon the present practice, and would, by offering increased facilities for refinements in play, open up a new world of croquet to the enterprising innovator.

One more word about mallets. Every mallet has its own peculiarities and specialities, no two by any chance being exactly alike in every particular; and a player, to make the most of his opportunities, must know his mallet thoroughly, as well as the lawn and the play of the balls. A player, therefore, who aspires to eminence in the game, ought always to have his own private mallet, as a cricketer has his bat, and always play with that and none other.

It has been objected to this that he thereby gains an advantage over other players who have not thus provided themselves; but we think croquet has now arrived at such a stage of development, that such futile and childish restrictions should be definitively abandoned.

Does any one ever dream that a cricketer has an undue advantage who uses his own bat, or a billiard-player who has a private cue, or a tennis-player who has his own racket, or a sportsman who uses his own gun or rifle? We might multiply instances *ad infinitum*, but the mere statement of the position is sufficient. What, then, is universally conceded in all other games can surely not be reasonably objected to in croquet.

THE BALLS.—Of ordinary materials for balls, as for mallet-heads, the best is Turkey box. We have above proposed the introduction of ivory for special sets, at least as an experiment, and need not therefore discuss the matter again here.

As in making the mallets the great manufacturers err generally on the one side, not allowing sufficient size and weight, so do they err in making the balls, on the other. The balls, as furnished with the best or club sets, are invariably *too large* and *too heavy*.

The two faults, of course, mostly go together, the one being commonly, though not always, a consequence of the other.

The fact is, there is a very prevalent idea that the *larger* and *heavier* the ball, the more truly will it travel. This is one of those half-truths, half-errors, that so much mislead us all. THE HEAVIER THE BALL COMPARED WITH ITS DIAMETER, THE GREATER ITS ACCURACY; AND, CONVERSELY, THE GREATER THE DIAMETER COMPARED WITH ITS WEIGHT, THE LESS ITS ACCURACY.

The point, therefore, to be decided is, with each class of material, where is the exact point at which the relative quantities of weight and measurement so balance each other as to produce the best results?

Now with box-wood as a material we are sure, and indeed have proved by actual experiment, that in club sets this limit is far overstepped.

The most perfect set of croquet balls we ever played with—and our experience has not been slight—were hardly larger than cricket balls, being just about $9\frac{1}{2}$ inches in circumference, while the club sets range from 11 to 12 inches. We have tried these balls in many ways, experimented with them in all the several requirements of the game, pitting them, too, against others of the most orthodox pattern, and have invariably, and without one single exception, found them come out of the trial more than triumphant.

They are of Turkey box; and, though they have now stood the wear and tear of more than one season, are still in good condition, and infinitely more reliable even now than many a bran-new set of the most orthodox pattern and proportions.

It should be remembered that not only does size as *versus* weight detract by natural law from the truthfulness of the ball, but that every increase of diameter beyond certain very narrow limits increases almost in geometric proportion the difficulty of obtaining perfect homogeneity of structure in the ball—of securing an equal balance of parts throughout. However well and carefully made a croquet ball may be, one part will inevitably from this very cause be slightly heavier than the other,—a fact easily verified by swimming one or half-a-dozen balls in water.

This must, of course, interfere more or less with the truth of their running. Increase their diameter, and you increase this tendency to aberration; reduce their diameter, and you reduce it.

The thing therefore to find out is, as was said above, the point where the two disadvantages of insufficient weight and superfluous diameter are reduced each to a minimum, and this, as was also said above, we have found by actual experiment to be—as far as Turkey box-wood is concerned—somewhere between a diameter of 9 and 10 inches. Anything in excess of that is, we are sure, a mistake.

Another disadvantage of overweighting the balls is that, unless for very short distances, the mere weight of the mallet is quite insufficient to drive them, and more or less muscular effort is required.

Now every unnecessary exertion of the muscles is so much detracted from the chance of making an accurate stroke, and therefore is so much to be deprecated. The balls we have commended above, for this very reason, take the stroke with the most delightful ease and certainty, and make the most charming practice at almost fabulous distances.

The mode of distinguishing the balls from each other varies widely. The earlier croquet balls used to be made each of a uniform colour, and the sequence was determined by the sequence of the coloured rings on the starting-peg; then in the better sets they were only coloured in narrow bands or rings; but the best kind now are only painted in two colours, and the sequence is decided by the number of rings or bands upon them, numbered from 1 up to 4.

This latter is a great improvement, and, from its great simplicity, makes a mistake as to one's turn almost impossible. The veriest novice, even the most obtuse, can hardly be required to be told twice that the ball with one ring plays before that with two, and that before three, and so on; whereas, with the old method, a constant reference to the starting-peg for guidance was the only safeguard against mistakes.

THE STICKS AND HOOPS.—These require little comment, if they be made in the ordinary way; but there is a new hoop, the invention of Mr. McEvoy, combining hoop and marking apparatus in one, which is altogether such an admirable invention, so simple and yet so perfect, that we must spare a few lines for its description.

This hoop is shown in Fig. 1, and is thus constructed: Affixed to the upper part of the hoop, and hinging on it, are a series of eight labels or strips of metal, coloured and numbered in agreement with the balls, and their backs resting against a broad strip of metal which passes from side to side of the hoop.

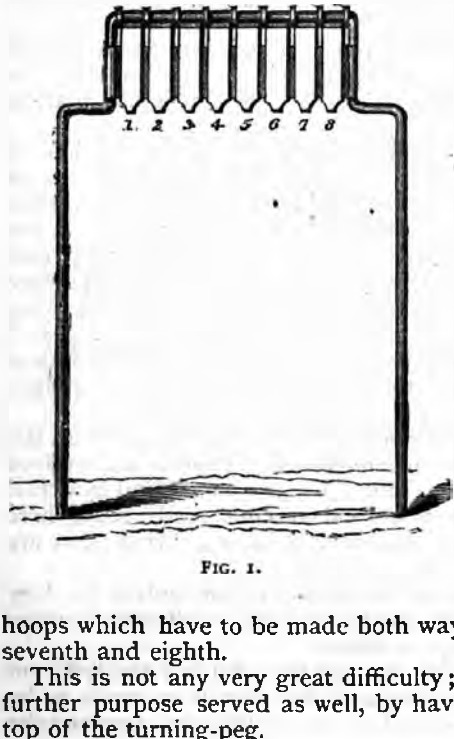


FIG. 1.

At the commencement of the game, the hoops are all set with the front of the labels facing in the direction in which the balls will come up to them, and each player as he makes his hoop, by a mere touch as it were of his finger, turns over his own label to the other side of the hoop, thus showing by the blank it leaves that the ball belonging to that label has passed through.

There is a beautiful simplicity and facility about this method of marking which cannot but commend it to all true croquet-players.

There is only one difficulty apparent in its working, and that is the management of the labels in the case of those hoops which have to be made both ways—viz., the first and second, and the seventh and eighth.

This is not any very great difficulty; but it might well be obviated, and a further purpose served as well, by having some similar arrangement on the top of the turning-peg.

This would not only solve the difficulty above noted, but would also serve to mark the balls that had made the turning-peg.

A T-shaped contrivance, like that on the hoops, on the top of the peg could be of no manner of inconvenience, and would certainly, combined with the new hoops, be of immense advantage to the players, who, by a mere look round, could thus tell at a glance what was the exact position in the game of each and every ball.

In further commendation it may be noticed that these hoops are at the same time simply and strongly constructed, do not easily get out of order, and yet are very readily repaired, and, lastly, from the increased mark they offer to the eye, prove better marks to aim at, especially in a failing light, than do the ordinary plain wire ones.

THE CLIPS.—After recommending the new kind of hoop, there is perhaps not much to say for the ordinary clips. They are mostly such a nuisance that, save in a game where three or four play on a side—a style of play greatly eschewed by real players—they are almost universally ignored, and, even when used, prove, as often as not, a cause of the very confusion they are supposed to obviate.

The fact is, however they may be made, the ordinary clips, being mere make-weights in a set, are very clumsy and inefficient. As long as they have to be lifted from one hoop to another, carried in the hand, and so on, they will never be of any real service.

The very people who without them would be likely to forget and make mistakes about their hoops are the very people who are equally certain to forget them just at the critical time, and get involved in all sorts of confusion; while those who would use them properly and methodically are the very people who need no aids to their memories.

Still, as there are so many careless players, some mode of marking the hoops is required, and the clips become necessary. Moreover, as it is often a player's ill fate to be obliged to take part in games of three or even four on a side, he will find that he cannot execute those combinations which form the real charm of the game, unless he can by a glance round the hoops tell at which hoop each ball is due. Unless, therefore, the registering hoops are used, clips will be required.

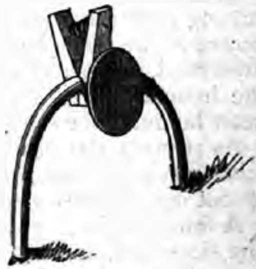


FIG. 2.

Fig. 2 is a representation of a clip invented by the Rev. J. G. Wood, easily manufactured at home, and far preferable to those furnished with the ordinary sets, as it is self-fixing, and yet can be removed by the mere pressure of the thumb and finger. It is made by affixing a coloured disc of tin to an American paper-clip.

THE GROUND.—This is undoubtedly the most important requisite of the game. On a good lawn very fair practice may be made even with a very inferior set of implements; but on a thoroughly bad one, however good the other accessories, the game as a game of skill is simply impossible.

We do not mean to say that a lawn should be immaculate, absolutely perfect in every requirement. Much skill may be shown in taking advantage of the various inequalities and peculiarities of the ground: but we do say, "the better the lawn, the more scientific can be the play." Moreover, on an uneven lawn those who are accustomed to the ground have an unfair advantage over those who play on it for the first time.

There are numberless little refinements of play, which require the accurate placing of one or both balls almost to an inch, which are simply impossible on any but a true sheet of turf. Where there are any considerable inequalities in the turf, a slow stroke is hardly to be attempted; just at the critical moment the ball may come upon one of these, and wander off indefinitely. And as in croquet the gentle and not the slashing strokes test the skill of a true player, it is exceedingly annoying to any one who really cares about the game to find himself forced to play hard in order to drive a ball over the inequality.

A gradual slope does not so much matter; that can be calculated on and provided for: it is the small, abrupt irregularities that prove the ruin of fine play, and, fortunately, it is these that are most easily remedied.

Almost any sheet of turf may be turned into a croquet lawn, and entirely by home labour too, if only a little industry and perseverance be displayed. Of course, where money is no object, the thing may be better and more thoroughly done by hired labour; but this will not give half the pleasure, and may not, after all, if any talent be displayed by the amateurs, be so very far superior as to make it worth the additional expense.

The work, to be carried to a thoroughly successful issue, should properly be commenced not later than the middle of October; but, if the season prove favourable, it will not be of much consequence if the work be begun later, so that it be well out of hand by the end of January.

If there be already a satisfactory covering of turf, with a good subsoil, there will be little to do but to remove inequalities, for which the general recipe will be continuous work with a heavy roller as soon as the ground is fairly sodden by the winter rains; while for special bumps and depressions, which continue to resist any other treatment, the following is a simple and certain remedy:

Make two incisions in the turf with a spade, about four inches in depth, cutting each other at right angles, so that the point of section is just about the centre of the obnoxious irregularity; now raise the turf at the four angles thus presented, and subtract or add, as the case may be, sufficient soil to reduce the inequality to the surrounding level. In each case some little allowance must be made for the further crushing powers of the roller.

As regards the turf itself, no pains must be spared to eradicate all weeds, moss, plantain-roots, coarse grass, &c.; and, if necessary, faulty pieces must be cut out and replaced by sound turfs.

A few pounds of good grass-seed will prove of great service in providing a fine close turf, and a good heavy top-dressing of road-scrapings will also well repay the trouble taken to lay it on.

If the turf be not good to commence with, and the subsoil poor and gravelly, the best thing to do, and, indeed, the only satisfactory course, is to take up the whole sheet of turf, carefully level the subsoil, with spade and pickaxe if necessary, lay down a superstratum of good sound mould, and then relay the turf over that, rejecting, of course, such sods as are not well up to the mark, and replacing them by new ones.

If sufficiency of new turfs be not available, lay down as much of the centre of the ground as you can, and trust to a good supply of seed for the borders. Then roll, and otherwise treat it as above described.

Arrangement of the Ground.—This is not a matter of such vital importance to the game as might at first sight be supposed, almost all the ordinary systems affording a very good opening for an interesting contest.

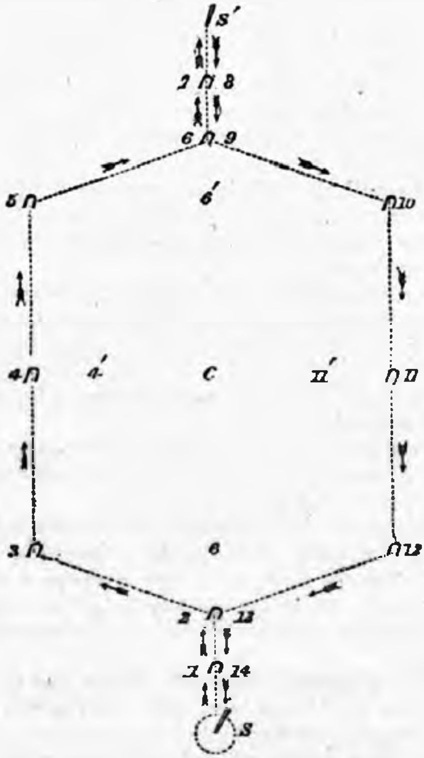
Nevertheless, the arrangement of the hoops undoubtedly does make a material difference to the lasting interest of the game; and many a closely contested war of words has raged over this question.

The question is not likely soon to be settled authoritatively, nor is it exactly desirable perhaps that it should.

On first-class lawns, of course, any possible arrangement is just as practicable as another, and were these the only places to be legislated for, uniformity of practice would be much to be desired; but it is one of the great recommendations of croquet that it can be played almost anywhere. Granted a piece of tolerably smooth turf, if it be only a few yards square, and croquet is at once a possibility.

One of the most agreeable lawns we ever played on was of quite insignificant proportions, and had, besides, a large pear-tree in the middle; and once we played on a nearly circular lawn, with a flower-bed in the middle. Of course the ordinary arrangement of the hoops was quite impracticable in both cases; but the game was not spoilt, scarcely even marred, for all that.

The pear-tree whose presence we so greatly lamented on the first mentioned ground, at the commencement of our practice on it, proved afterwards, when we became more proficient in aim and general skill, almost a compensation for a more extended field of operation; for, without it, it would have been impossible to place a ball almost anywhere on the ground in even tolerable safety from any other, while, as it was, many a ball lying under its friendly shelter was as safe, nay safer, from the assaults of a foe not two yards off as if it had been two hundred.



PLAN OF CROQUET GROUND.
s, starting-peg; s′, turning-peg; 1 to 14, hoops; c, centre.

A rigid uniformity of practice being, therefore, in this particular, thus at once undesirable and impracticable, we shall not attempt to offer our system of arranging the hoops as one to be invariably and undeviatingly followed. We only propose it as that which, under ordinary conditions, seems to us to offer the best and most satisfactory game.

In the above diagram we suppose the lawn to be 60 yards long by 36 yards, or thereabouts.

To mark it out, proceed as follows: Place your starting-peg about 6 yards from one end of the lawn, and as nearly in the middle as possible. Then with a piece of stout string, 48 yards long, and knotted at every 4 yards, measure off the distance, the full length of the string, for the turning-peg.

Now plant the hoops thus:—1 at the first knot, 2 at the second from the starting-peg, and 7 and 6 in like manner from the turning-peg. Further, make marks, *b*, *b*, at the third knot from each peg respectively.

From these marks, *b*, *b*, measure off on either side, at right angles, 12 yards, for hoops 3 and 5, 10 and 12; and exactly half-way between each pair, that is, 12 yards from each, and in a line with the centre, plant the hoops 4 and 11. Your ground will be now complete, and the respective measurements will stand thus:

Distance between pegs, 48 yards; width at centre between side hoops, 24 yards; distance from starting-peg to hoop 1, 4 yards; from that to number 2, 4 yards; thence to *b*, 4 yards, the same proportions being observed at the other end; distance from *b* to number 3, thence to 4, and so on all round the square, uniformly 12 yards. The circle round the starting-peg has a radius of 1 yard.

Where the lawn is small, the side hoops may be made a little more difficult by placing the two centre ones at 4′ and 11′ respectively, instead of at 4 and 11; or even, as is more common still, by using one hoop only in the centre at C, which has to be passed each way.

In the early game it was usual to place at C an arrangement called a cage, composed of two hoops set across each other at right angles, and with a bell dependent from the centre, which bell had to be rung by every ball in making the cage.

This peculiarity, though even now sometimes to be met with, has almost entirely died out upon good lawns.

There is a very considerable controversy still raging, and apparently still for some time likely to rage, as to the best way of placing hoops 3 and 12, 5 and 10, relatively to numbers 2 and 6 respectively.

A large and formidable body of players strenuously uphold the desirability of placing them in a line, so as to make the passage of the third hoop from the second, the sixth from the fifth, and so on, a physical impossibility, without the help of another ball; while an equally large and imposing phalanx as vehemently insist upon the superior merits of the arrangement given in the plate.

When doctors differ, who shall decide? When fine players are arrayed in hostile camps, in almost equal numbers, who shall venture to decide to which side the balance of greater practical advantage actually inclines?

After all, perhaps, it is a matter of not very important detail, and scarcely worth the powder and shot expended upon it.

Our preference for the plan given in our plate is based upon the discouragement the other system offers to the first player, who, it is quite evident, can by no possibility make the third hoop the first turn, having no ball to help him, and who even runs the risk—no inconsiderable one with good players—of furnishing with his ball, to the next player, his opponent, the very aid he himself so grievously lacks.

Thus it becomes a most serious disadvantage to be first player, by making it impossible for him to make any material progress, however fine his play, and at the same time having the possibility of his ball proving a stepping-stone for his opponents; this, surely, is something to be avoided.

Besides, we believe it to be a mistake in any game of skill to put a barrier in the way of good play. Make a stroke as difficult as you please, and the greater is the glory of effecting it; but do not cramp a player by making it impossible.

It would be wonderful play to take *one* ball all round and home the first turn; but there are numbers who can get round with two.

THEORY OF THE GAME.—The game is played by opposite parties, of two or more on a side, each player armed with a mallet, having his own ball, which it is his business to drive with his mallet through the several hoops in order, striking the turning-peg on the way, and go home to the starting-peg, contact with which puts his ball out.

The side that gets all their balls out first wins.

This is the mere outline of the game, the framework, as it were, on which the game is constructed: in point of fact, making the hoops comes to be a matter of very inferior interest in a close game. It is only when both sides have made all their hoops, and are fighting for the starting-peg, to get out, that all the capacities of the game are revealed.

In a case like this, with good and well-matched players, the interest becomes absorbing; the game sways backwards and forwards, now one party has it all its own way, now the other; and it is only when the last ball of a side has actually struck the peg, that victory can be confidently reckoned upon by one party, or despaired of by the other. There is, perhaps, no other game played in which the maxim, that it is never lost till it is won, is more constantly exemplified as it is in croquet, or in which a player may with more advantage take for his motto, *Nil desperandum.*

Now for the meaning of the words Tight and Loose Croquet.

When a player strikes another ball with his own, or, as it is termed in the croquet terminology, *roquets* it, he is allowed to bring his ball up to the one struck, and placing them in contact, put his foot on his own ball, and, by striking it with his mallet, drive the other away, after which he takes another turn. This is called "tight croquet."

Or he may simply place the two balls in contact, and drive them both together by striking his ball as before, but without putting his foot on it. This is called "loose croquet." In a judicious calculation of strength, and the angles at which the balls will severally fly off, is all the salt of the game.

In some of the early codes of rules, a player was not allowed to use "loose croquet" until he had passed through all his hoops, or, in the then technical phrase, had become a "rover." But gradually, as the capabilities of loose croquet were more and more understood and developed, the system crept in of allowing more and more latitude as to its use, until now the most perfect liberty is accorded.

The tight croquet party made a stout fight for it, and even now numbers many adherents; but they fight, and will fight, in vain. A player who has once tasted the pleasures of the unrestricted game will never be induced to go back to the old bondage; to him henceforth it will be like fighting with the right arm tied behind his back, walking with peas in his shoes, or any similar abomination.

For further and more particular information on the game, we must refer our readers to the following code of rules, and the succeeding comments and practical hints.

RULES.

1. The players shall play one ball of either side alternately in regular rotation, according to the sequence of colours on the starting-peg.
2. Each player, at starting, may place his ball anywhere within a mallet's length of the starting-peg, and must play for the first hoop; until he has made this he cannot croquet or roquet another ball.
3. After the first stroke the player must play his ball from the spot where it lies when his turn of play comes round.
4. If a ball be struck beyond the edge of the ground, it must be replaced on the ground half a mallet's length from the edge, measured along a line drawn from its starting-point to the place where it left the ground. Some players prefer to place it at right angles to the edge.
5. A player having made his first hoop, and also in every turn, continues to play so long as he can duly succeed in "making" other hoops, in striking the turning-peg, or in roquéing and croquéing other balls.
6. *Making the Hoops.*—A hoop is "made" when the ball is in any way passed through it in the right direction, and remains settled at the other side. In doubtful cases, the fact of its having duly passed through may be decided by laying the handle of the mallet across the hoop, from wire to wire, on the side from which the ball passed; if this do not come into contact with the ball, the hoop is made. In this and in all other cases the hoop must be rigidly perpendicular.
7. If a ball, played from behind a hoop to gain a position duly in front, fail to pass completely through, it cannot make the hoop when next played, but must be passed completely through to the front. Its real position may be decided as in the previous rule.
8. *Holding the Mallet.*—The player may stand and hold his mallet in any way he pleases, so that his hands be not within 15 in. of the mallet-head.
9. The ball may be struck with the *face only* of the mallet; if it be struck otherwise, it is a foul stroke, and the player shall lose his turn, and any balls disturbed shall be replaced or suffered to remain, at the option of the opposite party.
10. If a player in striking at his own ball hit another, it is a foul stroke, and subject to the same penalty as the above.
11. The ball must be *struck*, not *pushed.* The stroke is considered fairly delivered only when the *sound* of the blow is distinctly audible. The *push* is made when the mallet-head is made to rest against the ball *before* delivering the stroke.
12. *The Croquet.*—A player, having roquéd a ball, may croquet it at his discretion; that is, he may put his foot on his own ball, and retain it in its place during and after the stroke, or he may slip his foot as he delivers the stroke, or he may make the stroke without putting his foot on the ball, at his option. N.B.—The croquéing ball must be brought to the croquéd.
13. In making the "croquet," the two balls must be in actual contact; but it is not necessary that the croquéd ball should be moved.
14. Each player, as his turn comes round, may "roquet," and therefore, of

course, "croquet," any number of balls in succession; but he cannot so treat the same ball twice until he have first duly made his next hoop or struck the turning-peg.

15. If two or more balls be roquéd, the croquet can only be taken from that first struck.
16. If a ball, in making a roquet, glance through its own proper hoop, or touch the starting or turning peg, the roquet only, as being first effected, shall be counted—a ball being "dead" after it has roquéd another.
17. If a ball, after passing through its hoop, come into contact with another ball, the player may elect to count this a roquet, or not, at his discretion.
18. When a ball, which has made all its hoops and touched the turning-peg, comes into contact in any way—except it be struck by a dead ball (see Rule 19)—with the starting-peg, it is at once, *ipso facto*, dead, and must be at once removed from the ground.
19. Any ball struck and displaced by a "dead ball" must be replaced in its original position.
20. If a ball be played out of its turn, and the error be discovered before the next player has commenced, the ball so played, and all others displaced by it, may all or severally be replaced in *statu quo* at the discretion of the adversary; and any advantage accruing to the player thus erring, or to his side, is forfeited.
21. A ball accidentally displaced may be replaced or left, at the option of the side opposed to the displacer.
22. If a player stop or divert a ball in its course, the opposite side may, at their discretion, leave it, or carry it as far as they choose in the direction in which it was originally travelling, provided that they do not take it out of bounds.

OBSERVATIONS ON RULES. *Rule* 2.—In many codes the rule is to place the ball in a line with the hoop; but we think the above arrangement better, because it allows a good player, by starting a mallet's length on one side of the stick, to "place" his ball at hoop No. 2 in such a manner as to make the passage of No. 3 practicable, a thing that can only otherwise be effected by mere chance or through some defect in the ground. This arrangement, too, has the further advantage of making the lead off with the first ball less hazardous.

Rule 3.—On most lawns the "boobies," or balls that have missed their first hoop, are for all the purposes of the game dead; but we can see no grounds for this concession When a player has once launched into the game, he surely ought to be subject to all its chances and conditions, and, unless some good reason can be produced why missing the first hoop should be visited with less pains and penalties than missing any other, it seems more reasonable that the player's entrance into the game should date from the first stroke, and not from the first hoop. Laxity of rule is never conducive to good play, and in this case, especially, where the "booby" is allowed to start afresh after each miss, a positive premium is offered to the first player to miss the first hoop, and thus become last player instead of first—often a position of no mean advantage.

Rule 4.—There are many local modifications of this rule, and there is no particular reason why, in such an unimportant detail, each ground should not retain its own long-established usage, so long, of course, as it is generally understood.

Nevertheless, there is a certain advantage in having a rule of universal application, and the rule given here is about as fair a one as can be contrived.

Rule 6.—The ball is required to *rest* on the other side of the hoop, to obviate any possible chance of dispute.

The cases are very rare in which the ball actually does pass through, and afterwards roll back, and, in nine-tenths of those that do occur, the hoop has only been made by sheer accident; the hardship, therefore, if any there be, is very slight, and not to compare with the undoubted advantage to all parties secured by this regulation.

Rule 8.—There is still much diversity of opinion on this head. A large and influential party loudly calls for a rigid restriction to side play, and side play only, and utterly repudiates any concession to the forward or pendulum players, while a no less, or perhaps more, influential party upholds the right of private judgment in this matter,,and, within certain not very restrictive limitations, would allow each player to hold his mallet as he likes. In good sooth, if we come to reason on the matter, these latter seem to have much of the logical argument on their side.

It only stands to reason that in any game of skill the great object to be attained is to produce the highest possible results with the least possible exertion on the part of the player. For this purpose inventive minds are ever bringing out improvements in all the numberless appliances of our thousand-and-one indoor and outdoor sports; and would it not be highly absurd, after all this care to provide perfect machinery for a game, to require the players to make use of it in such a fashion as not to bring out all its merits?

As well require a cricketer to bat with only one hand, or a racket player to hold his bat between his first and second fingers, or any similarly absurd restriction, as require a croquet player to hold his mallet in any other way than that by which he can obtain the best results.

The restrictive party prove too much. They say that the right way (by which, of course, they can only mean the most effective way) of holding the mallet is *their* way, or sideways; and, therefore, they would force all players to adopt that, and that only. But to this the opposite party reply, "If you are satisfied that the side stroke is the most effective, why, having the superiority, cannot you be content with it, and leave us to find out by practical experience the inferiority of our own method? If yours is the only right way, all others will soon die out by natural decay, without any laws and regulations."

The present writer is a strong advocate himself for the side stroke, and always holds his mallet with one hand only. But he does not on that account see why everybody else is to be bound to do the same. He adopted his present style purely upon his own personal conviction of its practical superiority over any other; but he has met so many really fine players who maintain the very opposite, both in theory and practice, that he is perforce bound to consider it still a moot point as to which side the actual balance of advantage really inclines.

Rule 9.—This rule holds good even when the ball is so "wired" that it is simply impossible to strike it in the desired direction. In this case the player must accept the situation, and be content to expend one turn in placing his ball more favourably.

Rule 11.—Many people hold it a foul stroke if the mallet follow the ball at all, but this in actual practice is simply untenable. When the ball has to be driven to any distance, and especially when two balls have to be rolled up together, the mallet *must* be made to follow up the ball, or the croquéd ball will fly off, while the croquéing ball will hardly stir. There is, besides, no reason why it should not be permissible. "Spooning," however, is a very different affair.

Rule 13.—The old rules required that the croquéd ball should be moved at least six inches: this is such a mere splitting of hairs—such an objectless finicking restriction upon the game, that few good players will be found now prepared to uphold it.

It can make but little difference to the course of the game whether a ball is now and then moved a trifle more or a trifle less than six inches; and therefore a rule on this matter is not only making a mountain out of a molehill, but leaves an opening for very unprofitable disputes. Croquet players must not be expected to carry a six-inch rule with them; and even if they did so, there would be great fighting about six inches or five and a half inches, and so on. Some players see the absurdity of a "six-inch" standard, and say that the croquéd ball must be "perceptibly moved." Now, this plan is quite as objectionable as the other. What is "perceptibly moving"? Some of the players may say that the ball was moved perceptibly to their eye, while others deny that it was moved at all. The simplest and most rational method is to ascertain that the two balls are actually in contact with each other, and to leave it to the discretion of the player whether he moves the croquéd ball, or prefers to allow it to remain in its position.

THE ROVER.—This is the term used to designate a ball that has passed through all its hoops. In the old Tight Croquet game, only the rover had the privilege of the loose croquet, as a reward for the skill displayed in passing the hoops. In the present game, to be a rover is a disadvantage, as the ball is deprived of the power of passing a hoop and getting another stroke. Moreover, it is always liable to be put out of the game by being driven against the peg. For these reasons, we never let our ball pass the last hoop unless we see our way to victory.

SCIENCE OF THE GAME.—The science of the game may most conveniently be considered under two heads, Mechanical and Intellectual. Under the former will naturally fall all that pertains to mere manual dexterity; while the latter will include those higher qualities which are, as it were, the very salt of the game, and which are to the mere physical science what a general is to his army, or the brain to the body.

The former, as the very basis upon which the latter has to work, the material it has to manipulate, naturally comes under discussion first.

MECHANICAL.—*How to hold the mallet.*—This will depend very much upon the style adopted by the player—whether he plays forwards or sideways, and, if the latter, whether he employs one hand or two.

As to the former, we are so fully persuaded that it is a mistake and a delusion that, not to encourage it in any way, we shall confine our instructions solely to the side play, leaving any who are bent on adopting the futile forward play to seek the requisite information elsewhere. We have before given our reason for not advocating its abolition by law, but beyond this position of simple toleration we are not disposed to stir.

To get a proper grasp on the mallet, place the head on the ground beside your right foot, and lean the handle against the outside of your leg. Now stoop slightly, running your right hand down the handle, knuckles inwards, thumb to the front, say for about two or three inches, and grasp firmly as you would a singlestick or sword, that is to say, with the thumb not crossing the fingers, but pointed downwards and retaining a firm grasp.

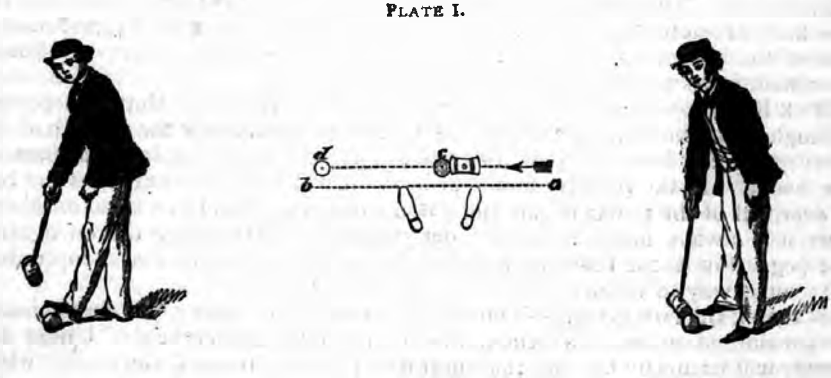
This motion need not, of course, be repeated every time you have to handle your mallet: it is only a guide, once for all, to indicate generally the whereabouts of the hold, and the manner of grasping. The exact place for the grasp cannot be pointed out, as it differs more or less in every mallet, according to the balance of the head and handle, and the length of limb possessed by the player.

How to stand.—This might seem a point of. very inferior importance. Since the arms, or it might be even almost said the hands and wrists, do all the work, what can it matter how the player stands?

The best answer to this is to take an extreme case: try to play standing on one leg, or in any other way where the body will be more or less off its balance. A very few trials will convince the most sceptical of this, after all, very intelligible fact.

It is very evident that before the arms can come fairly into play, so as to put their work to the greatest advantage, the fulcrum from which they work,

PLATE I.



namely, the shoulders, must be suitably placed; and equally so, that upon the steadiness of this fulcrum their own steadiness will entirely depend. Nor must we forget that the head, too, must be kept steady, or the eyes cannot possibly maintain their accuracy. We see the same rule exemplified in billiards, cricket, and, indeed, in any game where steadiness and accuracy of eye and hand are brought into requisition.

There are many ways of standing adopted by good players, but undoubtedly the most effective and the most scientifically correct is that now to be described. Although there is, of course, much to be said for other methods, otherwise they would not be successfully employed by fine players, yet they will all be found upon critical examination, when tested theoretically and practically, to fail in some or other important particular.

The requisites of a correct position are these:—a firm footing, the body brought into an easy position for striking, and finally a good sight of the line of projection.

All these requirements may be satisfied thus: take Plate I., the central figure; *c* is the striking, *d* the object ball. Place the feet firmly on the ground (as in the figure), about 15 in. apart, so that the line *a b*, joining the toes, is about an inch from your own ball, and parallel with *c d*. Now stoop slightly over the ball, taking care to keep the knees straight, and the feet firmly planted, until your mallet-head is almost touching the ball, and just clear of the ground. The attitude is shown in the right-hand figure.

In this way, not only is an easy and natural position secured, but the eye is brought just over and thoroughly commands the line of projection. The left-hand figure shows the attitude for tight croquet.

How to strike.—Having satisfactorily posed yourself, the next thing is to deliver the stroke; but first you must determine *where* to strike your ball, and this you may ascertain thus: Take the central figure as before; it is very evident that, to drive the ball in the direction *c d*, the mallet must strike it in the line indicated by the arrow—a line passing through the centre of the mallet-head and of both balls.

Having got this rightly, swing back your mallet with an easy action of the wrist, moving the arm as little as is compatible with freedom—all stiffness must be avoided—and let it fall on the ball exactly on the spot indicated.

The mallet should be allowed to fall by its own weight, rather than by any muscularly imparted impetus; this will be quite sufficient to drive the ball: any muscular effort has always a tendency to impair the steadiness of the stroke.

Great care must be taken, too, that the mallet-head's longer axis is exactly in the line of projection; a very slight deviation from this line will suffice materially to divert the ball from its true course. If the mallet be not allowed to swing perpendicularly, or very nearly so, there will always be a tendency to *pull* the ball: this is a very common cause of failure with many people.

Another very common cause of error is the twisting of the mallet-head to one side just as the stroke is delivered, and this is specially observable with nervous people; the remedy—an infallible one, by the way—is to hold the mallet *tight*. Let the wrist play as loose as you like; but the hand must keep a firm grip of the mallet: a loose grasp is not only a fertile source of erratic play, but it is fatal to crisp, clean hitting.

So much for ordinary aiming, the mere A B C of the game. We now come to what may fairly be called the high art of this branch of the game, viz., the "CROQUET."

The tight croquet is very simple: the player has only to acquire the not very difficult art of hitting the ball, and the ball only, with perfect immunity to himself and the turf, and he has mastered all that can be learnt.

In the amount of force he puts into the blow, he must, of course, be guided by the immediate exigencies of the situation; he should, however, remember one thing, that in the tight croquet, as in the ordinary stroke, the mallet should be allowed to do as much of the work as possible, being suffered to fall almost entirely by its own weight. If, however, any extra impetus is wanted, the wrist, and the wrist alone, should be employed to impart it.

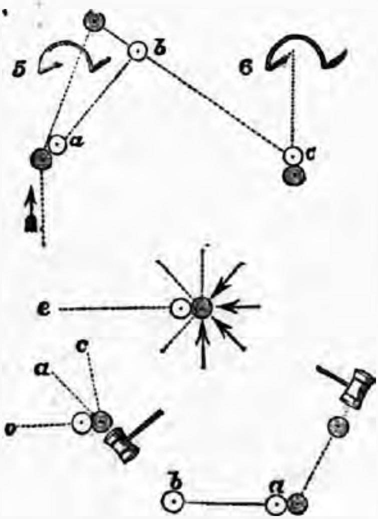
It is, however, in the loose croquet that are to be developed all the latent scientific possibilities of the game. To drive your own ball where you will in a straight line is a matter of comparative facility, and some skill in "judging strength" is not difficult of attainment, nor by any means uncommon; but to be able to place *two* balls, at will, exactly where most wanted, each going off at a different angle, and having to traverse a different distance, this indeed is a triumph of skill and dexterity, and entitles a player to a place amongst the first, so far, at least, as mere practical skill is concerned.

Now this command of the loose croquet cannot, of course, be acquired without a thorough knowledge, theoretical or practical, or both, of the natural laws which govern the motions of the balls when brought into contact with one another.

We need not go into any abstruse scientific details; they are not necessary for the due attainment of our object, which is to take a practical rather than a theoretical view of the subject: a reference to one simple rule of mechanics will answer every purpose.

If one ball be driven by another ball coming into contact with it, the former will fly off from the latter in the direction of the straight line joining their centres. This rule holds good also when the two balls are in contact at rest, and one is struck as in "the croquet."

PLATE II.



Attention to this rule will make the *direction* of the croquéd ball a matter of mathematical certainty. Get this line correctly, and it matters not how you strike your own ball: the croquéd ball *must* take the right direction. The central figure in Plate II. illustrates this rule: in whatever direction the mallet --represented by the arrows—falls on the dark or croquéing ball, the light or croquéd ball *must* inevitably fly off in the direction of *e*.

There is not much difficulty in placing either the croquéd or the croquéing ball singly; but when both have to be placed, or still more when both have to be taken through a series of hoops together, then the player will indeed be required to put forth his utmost skill, to do all he knows.

The movements of the croquéing ball depend entirely upon the handling of the mallet. For instance, in the left-hand bottom figure of Plate II., if it be required to place the croquéing ball at *a*, a very different stroke is required to that which would place it at *c*. The object-ball, of course, will in either case fly off to *b*. A simple formula will, perhaps, prove more serviceable here than pages of instruction. Bear this, therefore, in mind: "SHORT SHARP STROKES

PRODUCE GREAT ANGLES; LONG SWEEPING STROKES, FINE ANGLES." The former drive the croquéd ball, and hardly stir the other; the latter drive the croquéing ball, and, unless the angle be fine, scarcely move the croquéd.

The short sharp strokes must be delivered with a loose wrist, the mallet not being held too tight, but rather allowed to play in the hand. Care must be taken, too, to arrest the mallet's motion at the very instant of delivery; if it be allowed to follow the ball in the least, it will not only modify the angle, but will impart to the ball more or less of its own forward impetus. To avoid this, the mallet should be brought up sharp with a kind of jerk—a knack not very difficult of acquirement. A thorough command of this method of making the croquet is exceedingly valuable, and, indeed, to a first-rate player, is simply indispensable: in every game he is sure to find abundant opportunity of making it serviceable.

In making the sweeping or driving stroke, the mallet must be grasped with rigid hand and wrist as firmly as possible, and quite low down, and must be made to follow well after the ball. Great firmness and decision are required to make this very useful stroke effectively.

SCIENCE INTELLECTUAL.—It would be impossible, in the short space of a few pages, to enter into a very elaborate disquisition on the practical working of the game, or go into and describe all the moves upon the balls. A few general hints and illustrations will be all we can attempt.

Hints to young Players.—At the beginning of the game, and before making each stroke, look well around you and see what is the exact position of affairs; then, having made up your mind what to do, make your stroke deliberately and carefully.

Above all things avoid hurry, especially when in the midst of a good break. Nothing is so likely to bring your break to an untimely end.

Watch the game carefully throughout, studying especially each player's style, both friend and foe. You will thus not only measure the capability of the other players—a knowledge sometimes of the utmost importance at critical moments in the game—but you will be very likely to pick up a hint or two which may hereafter prove very serviceable.

Do not play a selfish game; that is, do not be in too great a hurry to make your own hoops. You may often do more service to your side by going back, or lying by to help a friend, than by running your own ball through half-a-dozen hoops. Remember, you cannot win the game off your own ball.

Do not hesitate either, where you can do real injury to your opponents, to abandon your own game, in order to go down and break up theirs.

Look with an especially jealous eye upon any assembly of two or more of their balls in friendly contiguity: rush down, at all hazards, and break it up. Such a gathering always portends mischief.

Never try a difficult stroke, however brilliant, when circumstances do not imperatively demand it. It is the safe game that wins. For instance, in trying for a hoop from a difficult point, unless you are pretty certain of making it; it is better to place your ball and wait for your next turn, than run the risk of overrunning your hoop, and so having to come back. Better the certainty of making the hoop in two turns, than the chance of having to take three. Of course this is on the supposition that none of the enemy's balls are lurking about near.

Lastly, take every opportunity of practising the various strokes, especially the more simple ones. If the brilliant strokes make the beauty of the game, it is the ordinary strokes that do the work, and in most cases win it. The opportunity for a fine *tour de force* only occurs now and then; but the ordinary routine strokes are in requisition at every turn.

Especially study and perfect yourself in *long shots;* make everything within twenty yards a dead certainty on level ground: this, alarming as it sounds, is perfectly feasible on a true lawn, and with proper mallets and balls. You will then, not only find all the shorter strokes come perfectly easy, but your own game will be made much more free, from the increased certainty of the strokes. You will be a tower of strength to your friends, and a standing menace to your foes.

Finally, and in conclusion, remember to keep your temper—one's temper is sometimes tried pretty severely—and "play up" to the very last. Croquet, as we have said before, of all other games, is not lost till it is won.

PLAYING THE GAME.—Now for a few practical hints on the actual practice of the game. As we are rapidly approaching the limits of space allowed us for this subject, we cannot enlarge as we would upon these practical details, and a very short notice must suffice.

For convenience sake, we will suppose a player taking his ball all round and home, as in actual play.

Referring, then, to the plate of the ground (p. 99), let us suppose that of four players, two on a side—A and C, and B and D—that A has played, and lies near hoop 10, having been left there by B, who has failed to make his 5th hoop, and lies "placed" about a yard in front of it; that C, having failed to make his 2nd hoop, has gone down to help A, and now lies within a couple of yards of him, and between him and B.

D has now three courses open: first, and most obvious, to play from the extreme left of the starting-ring, pass through hoop 1 diagonally, and so lay himself at 2 as to be able to take another diagonal shot through that, and thus enable himself to make No. 3. If he could only calculate with certainty on doing this, he would thus be able easily to make 4, pick up B at 5, and, taking him along in company, have the game entirely in his own hands from that moment.

But no player living would back himself in such an emergency to make the third hoop, and failure at any point would be ruinous; for A and C being close together and favourably placed, and A playing next, it must be A's fault entirely if he does not, in this very turn, ruin his adversary's game, and make his own and his friend's. This first plan, therefore, will obviously not hold water.

Secondly, he may run straight through the first hoop, or a little, perhaps, to the right, and then playing hard through the second, go to B at No. 5, by a loose croquet put him through his hoop, and at the same time run off to A and C, separate them, and help himself off one of them to his own hoop 3.

This would do very well; but it is not so certain, and by no comparison so effective, as the third alternative, which is this:

C, it must be remembered, lies between B and A, at a distance of two yards from the latter. Run slightly to the left, through 1, play hard through 2 down to A at hoop 10, running, if anything, to the right of it, so that, when you roquet it, you may knock it nearer to C. Roquet A, and by tight croquet send it well into the far top right-hand corner away from its hoop, out of harm's way; for it plays next, and might do mischief. Next, roquet C hard in the direction of B; place it, by a tight or loose croquet, as is most convenient (this will depend upon your nearness to C), about a yard on the far side of No. 5. Roquet C gently, and by a loose croquet, hardly moving C, run off to your own hoop 3. If you can succeed in making that, the game is now all perfectly plain sailing, and, bar accidents, C ought not to have another turn; for A, which plays next, it should be remembered, is for the present almost *hors de combat*, and C is in the hands of its enemy.

If you cannot make 3, you yet have far the best of the game, and may confidently "place" yourself quite secure from molestation.

Supposing this latter to have been the case, and A, as is almost inevitable, to have made an ineffectual stroke from its far distant corner, B now runs through 5 in such a manner as to leave his own ball at C's in the relative position indicated in the upper figure of Plate II. A hard roquet now will drive the object or white ball from B to C, that is, in front of hoop 6, whence B, taking his croquet, ought infallibly to make the turning-peg and the hoops 6 and 7 both ways.

If now, through any mischance, he becomes "wired," or is uncertain of making hoop 10, his better plan will be, instead of placing himself, to croquet C—who plays next, and might spoil sport—into the part of the ground most distant from A, and then run down between hoops 3 and 4 to help D.

By this play A and C are still kept separate and innocuous, while B and D are together and making progress with their game.

This leads us to the enunciation of the following maxim:—"That side which most successfully keeps its own balls together, and those of its enemies apart, must win (*cæteris paribus*) in the long run."

There is one more point of play which we are loth to pass over, and for which, therefore, we must endeavour to find room. Sometimes it is desirable in roquéing a ball to drive it not in a straight line, but at some slight angle to one side or the other of it; this may be effected in the manner indicated in the right-hand bottom figure of Plate II.

This is a very neat stroke, very effective at times, and sure to "bring down the house." It is, however, rather hazardous, as the chances of missing are greatly enhanced, and only to be attempted from a comparatively short distance, and not then unless at very close quarters on a thoroughly good lawn.

Failing space bids us now take leave of this interesting game, which we will again venture to press upon the notice of our young readers as well worthy their attention. If they will only bring to it—as every English boy should to all he undertakes—determination and perseverance, with lots of energy and good temper, they will find no reason to repent of following our recommendation, but will rather thank us for introducing them to a new and lasting pleasure; and so we wish them all good speed.

FOOTBALL.

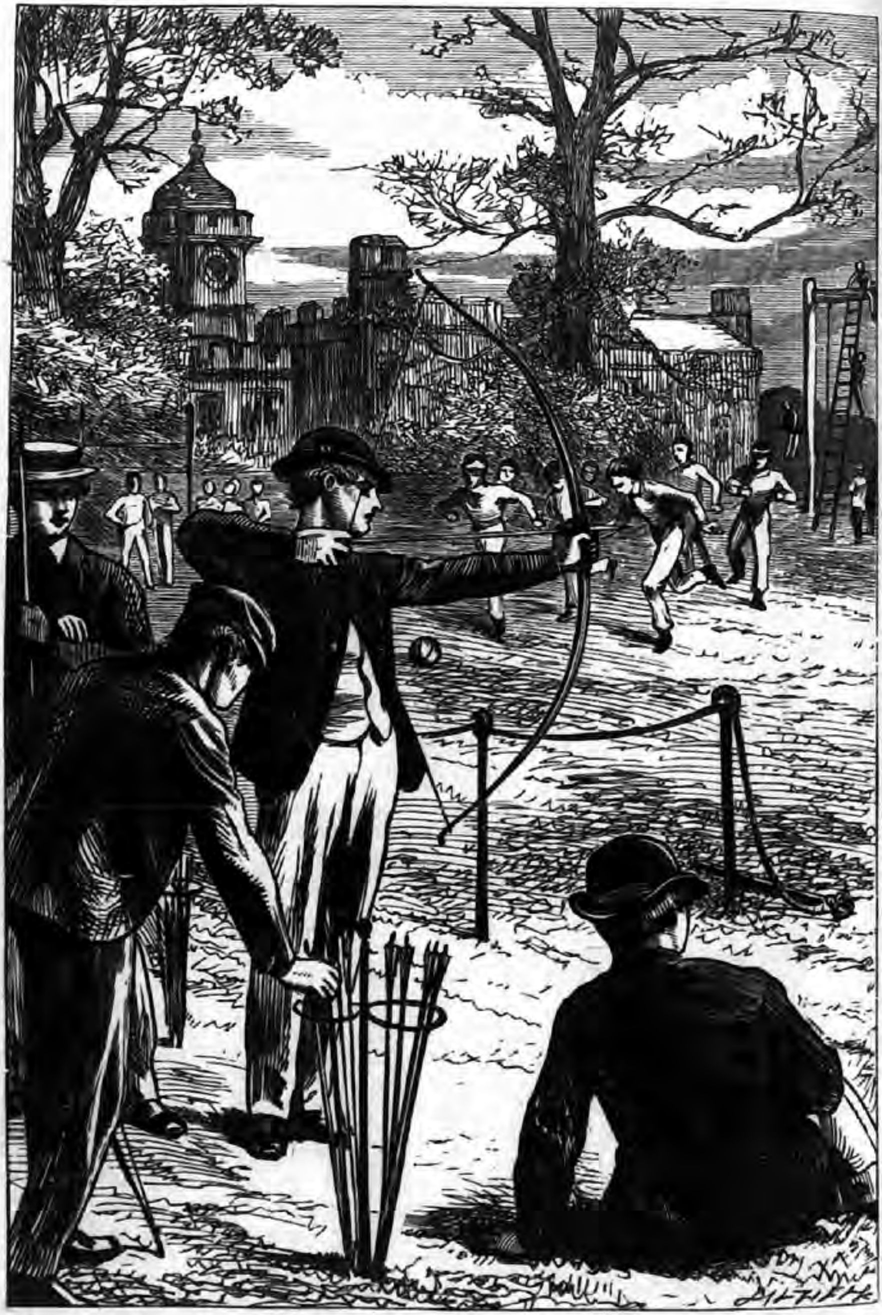
Though ranking second to cricket only among our outdoor games, football yet labours under one immense disadvantage in being unprovided with a code of rules of universal acceptance.

Some steps have been taken with a view to supplying this want, but at present with only partial success. Both the Cambridge and the London Amalgamation codes are steps in the right direction, and have achieved some success; but a still further revision in the direction of unity of principle and simplicity of action is in each case still urgently required, before either can hope for more than mere local acceptation.

The code of rules given below, which it will be seen on comparison takes pretty much the same line as the two above mentioned, is the result of many years' paring and revision under the crucial test of constant hard play; a privilege being added here, or curtailed there, as occasion required.

In its present form it has stood unaltered through five or six seasons, and on occasion of matches has been accepted without reservation by more than one club, as at once simple in theory and thoroughly practical in action.

A very few hours' play will be amply sufficient to give an insight into the practical working of these rules, and, once mastered, their extreme simplicity renders their due observance so perfectly easy and natural as to require



OUTDOOR GAMES.

scarcely an effort of recollection even from the most inexperienced and unintelligent.

Whereas in most other codes a thorough working familiarity with all the *minutiæ* of the laws and bye-laws is only to be obtained by prolonged and sustained hard practice, yet a thorough mastery of the rules in this code will enable a player to pick up with the utmost facility any other form of the game.

A further claim, too, may be set up on its behalf, namely, that all unnecessarily dangerous and rough play has been carefully and rigidly excluded: this may, perhaps, be more of a recommendation in the eyes of parents and grown men generally than of boys; but it is, perhaps, none the less valid for all that.

THEORY OF THE GAME.—Football, like cricket, requires two opposing sides. It is played with a hollow ball, some eight or ten inches in diameter, of India rubber (in former times a bladder) blown full of air, and protected by a leather case.

The goals are placed at opposite ends of the field, each side defending its own, and trying to drive the ball through its opponents'.

It is a game only suitable for cold weather, as cricket is for hot, for the exertion is not only very severe while it lasts, but the intervals of rest in a well-contested game are few and far between.

RULES.

1. The length of the ground shall be not more than 150 yards, and the breadth 55 yards. The ground shall be marked out by posts, two at each end, parallel with the goal-posts, and 55 yards apart; and by one at each side of the ground, half-way between the side-posts.
2. The goal shall consist of two uprights 15 feet apart, with a cross-bar 8 feet from the ground.
3. The choice of goal and kick-off shall be determined by tossing.
4. In a match, when half the time agreed upon has elapsed, the sides shall change goals the next time the ball is out of play. In ordinary games the change shall be made after every goal.
5. The heads of sides shall have the sole management of the game.
6. The ball shall be put in play as follows:
   (*a*) At the commencement of the game, and after every goal, by a place-kick 25 yards in advance of the goal, by either side alternately, each party being arrayed on its own ground.
   (*b*) If the ball have been played behind the goal-line (1) by the opposite party, the side owning the goal shall have a place-kick from behind the goal-line at their discretion; (2) by the side owning the goal, whether by kicking or guiding, the opposite party shall have a place-kick from a spot 25 yards in front of the goal, at their discretion.
   (*c*) If the ball have been played across the side-lines, the player first touching it with the *hand* shall have a place-kick from the point at which the ball crossed the line.
7. In all the above cases the side starting the ball shall be *out of play* until one of the opposite side has played it.
8. When a player has played the ball, any one of the same side who is nearer the opponents' goal-line on their ground is *out of play*, and may not touch the ball himself, or obstruct any other player, until the ball

be first played by one of the opposite side, or he have crossed into his own ground.

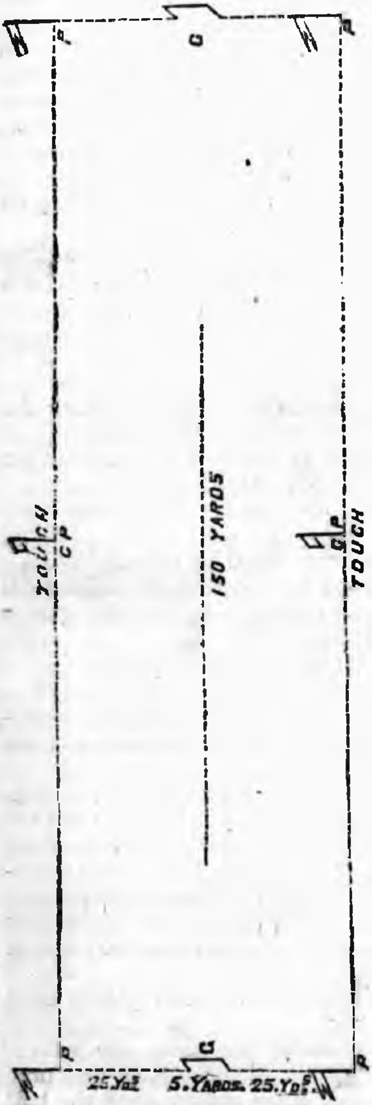
9. No player shall carry the ball, hold it, throw it, pass it to another with his hands, or lift it from the ground with his hands, on any pretence whatever.

10. All charging is fair; but holding, pushing with the elbows or hands, tripping up, and hacking are forbidden.

11. No player may wear iron plates, projecting nails, or gutta percha on his boots or shoes.

12. A goal is gained when the ball is *kicked* from the front between the uprights and beneath the cross-bar, or in any way passed through from the front, by the side owning the goal.

13. In case of any distinct and wilful violation of these rules of play by one of either side, the opposite side may claim a fresh kick-off.



DEFINITION OF TERMS.

A place-kick is a kick at the ball while at rest on the ground. The kicker may claim a free space of 3 yards in front of the ball.

Ground.—Each side claims as its own that portion of the ground which lies between its goal and the centre.

Charging is bringing the body into collision with that of an opponent. The arms, and especially the elbows, must be kept well to the sides, not to violate Rule 10.

Hacking is kicking an adversary intentionally.

Tripping is throwing an adversary by placing the foot, leg, or any part of the body in the way of an adversary's legs, and thus causing him to fall or stumble.

OBSERVATIONS ON RULES.

Rule 1.—The accompanying diagram will explain, better than any words, the arrangement of the ground required by this rule.

More flags at the side may be used with advantage: the rule only states the number absolutely indispensable.

G G, the goals; P P P P, side-posts; C P, side-posts marking centre of field. All outside the side-posts on either side, and within the lines of the goals (supposing the goal-lines to be prolonged indefinitely), is called "touch."

The *length* of the ground may be varied to suit the number of players; but the *breadth* will be better maintained as above: it is sufficiently wide not to cramp and overcrowd the players, and yet not so wide as to offer too great an opening for that utterly futile side-play which is the great temptation of inferior players who will not see, and inexperienced players who have not yet learned, that to run round is not the quickest way to the opponents' goal. A chance may occur, it is true, once or twice in a match; but it is only a good player and a quick runner who can at once see and take advantage of the opening. Meanwhile side-play in general, since it has no effect upon the result of the game, is mere waste of time and strength; the narrower, therefore, the limits within which it can be restrained, the better.

Five yards or so will not make much difference where some modification is required; but in general the 55 yards prescribed in the rule had better be maintained.

Rule 4.—The first part of this rule is framed to avoid the possibility of one side in a match gaining an unfair advantage over the other by some accident of the ground or wind, a very slight slope or breeze in favour of one party being quite sufficient, if the sides are otherwise at all evenly balanced, to give it an overwhelming preponderance over its opponents.

By the expedient of changing goals at half-time, each side has an equal share of such advantages or disadvantages as the peculiarities of the ground may afford.

The same or a similar rule is not enforced for ordinary games, because, being uncertain in their duration, it is impossible to fix a definite time for the change to take place.

Rule 5.—The heads of sides will of course be careful to gather the opinions of their followers, and to act in accordance with them. The rule only provides a legal channel through which all communications and arrangements may be made between the contending parties. All agreements entered into by the respective heads of sides, within the limits of the rules, are binding upon each.

Rule 6 (*a*).—This way of starting the ball has been adopted out of several, after long practice, as offering the least advantage to either side. If the length of the ground be materially curtailed or extended, the distance from the goal at which the ball is kicked off must be altered in proportion—*i.e.*, one-sixth of the distance between goals. The ball may be kicked off each time by any player the head of the side may select.

(*b*) These regulations are framed to render it the interest of all sides to keep the ball in play.

(*c*) is framed to check, on the part of the defending party, a somewhat dastardly but constantly-employed practice—(if commenced by one side, necessarily followed in self-defence by the other)—of kicking the ball, in cases of emergency, wilfully behind their own goal, to put it out of play.

This rule does not apply to cases where the ball flies off the person of a player endeavouring to stop it, and need not be enforced with too great strictness, being a rule that, once admitted, no honest player would dream of breaking.

Rule 7 is framed to meet the case of two or more players of a side having a little sharp practice all to themselves, by zigzagging the ball from hand to hand, or rather from foot to foot, backwards and forwards across the side-lines; an idea that may appear more ingenious than ingenuous, and very unlikely to occur in actual practice. It did nevertheless occur in a regular match, and being of necessity taken up on all hands, proved so destructive to all play that it was then and there inhibited by general consent; and Rule 7 was forthwith made to render its introduction impossible for the future.

Rule 8 is framed to prevent a player from playing cunning—"sneaking" is the technical phrase—and so, by loitering on any or no pretence about the opponents' goal, without trouble or exertion on his own part, seize a chance opportunity of the ball coming near to kick it into goal.

The mere meanness of such a proceeding is quite sufficient argument against it, even were it not evident that its general adoption by both sides alike would entirely rob it of its chance of success, if it did not put an effectual stop to all play whatsoever.

Rule 9.—This does not prohibit a player catching the ball, or taking it on its rebound from the ground: he must only not retain it in his hands, but must put it in play again on the ground. A slight delivery of the ball forward, as much as is necessary to give it an impulse in the direction the player means to take it, does not come under the definition of "throwing."

The main object of the rule is to reduce the opportunities for rough play.

It is obvious that the more privileges are conceded to the offence, the more extensive must be the powers of obstruction granted to the defence.

If a player be allowed to carry the ball, he for the time being identifies himself with the ball; and as all means are and must be lawful to stop *it*, so all means are and must be lawful to stop *him*, for stopping him is stopping the ball. Hence "hacking," "tripping," "mauling," &c., the prolific sources of broken bones, twisted joints, and other attractive features of the "carrying game."

Rule 10.—Charging is retained, partly because, with the restrictions as to elbows, &c., here enforced, it is really not the source of any particular danger, partly because its retention is simply a matter of necessity. It could not be required of the defending party to get out of the way of the attacking party, nor of the attacking party to turn aside whensoever the defending party chose to put itself in the way; and if the one party may fairly obstruct and the other fairly force its way, who is to judge or to define the precise amount of force to be lawfully employed? The only resource, therefore, is to allow it under due restriction.

How to Kick.—This may appear a very superfluous piece of information: "Anybody can kick!" Anybody *can* kick, in the sense that they can give a blow with the foot; but it is no more true in football that anybody can kick than it would be true to say that in boxing anybody can hit with the fist. It takes long training and practice to strike out as a prize-fighter does, and in the same way it takes long practice to kick like a good football-player.

There are two points to be acquired in learning to kick: one is to make the ball go *far*, and the other to make it go *straight*. These are not, however, two distinct acquirements; accuracy is the first and primary ingredient of hard kicking, and practice for one will be equally practice for the other.

The young player must first learn the correct attitude and action for kicking. This he may do, and with advantage, even without a ball. Let him make a line on the ground, marking on it the place for the ball; then toeing

FIG. 1.

FIG. 2.

the line with his left foot some eight inches to the left of this mark, pose himself as follows:

The whole body held erect, and inclined forward over the left foot, the chest projected, the arms hanging quietly but easily from the shoulder, the left leg straightened out and supporting the whole weight of the body, the right leg also straight, but drawn up so as to hang just free of the ground. (Fig. 1.)

In delivering the kick, the right leg is swung well back (the knee being bent as little as may be), and then brought forward with full force, the toe being raised as high as possible, and the whole foot and ankle held rigid. The leg must be made to swing freely from the hip. (Fig. 2.)

Now to *kick* the ball. Of course, wherever the ball is struck, it will fly from the foot in some direction or other; but, to ensure distance and accuracy, it is necessary for the toe to meet it in one spot, and in one spot only. The accompanying diagram will best point out this spot, and Fig. 3 may be found a useful help to understanding the description of attitude given above. Care must be taken to kick the ball accurately in the centre, or it will inevitably fly off to one side or the other.

One final direction. The eyes must always be fixed on the ball, under whatever circumstances it is played at. Accurate and effective kicking can only be by sight; therefore at the moment of delivering the kick the eyes *must* be on the ball.

The diagram only represents the most effective spot in which to kick the ball for distance: if it be desired to make it run along the ground, it must be little sharp practice all to themselves, by zigzagging the ball from hand to hand, or rather from foot to foot, backwards and forwards across the side-lines; an idea that may appear more ingenious than ingenuous, and very unlikely to occur in actual practice. It did nevertheless occur in a regular match, and being of necessity taken up on all hands, proved so destructive to all play that it was then and there inhibited by general consent; and Rule 7 was forthwith made to render its introduction impossible for the future.

Rule 8 is framed to prevent a player from playing cunning—"sneaking" is the technical phrase—and so, by loitering on any or no pretence about the opponents' goal, without trouble or exertion on his own part, seize a chance opportunity of the ball coming near to kick it into goal.

The mere meanness of such a proceeding is quite sufficient argument against it, even were it not evident that its general adoption by both sides alike would entirely rob it of its chance of success, if it did not put an effectual stop to all play whatsoever.

Rule 9.—This does not prohibit a player catching the ball, or taking it on its rebound from the ground: he must only not retain it in his hands, but must put it in play again on the ground. A slight delivery of the ball forward, as much as is necessary to give it an impulse in the direction the player means to take it, does not come under the definition of "throwing."

The main object of the rule is to reduce the opportunities for rough play.

It is obvious that the more privileges are conceded to the offence, the more extensive must be the powers of obstruction granted to the defence.

If a player be allowed to carry the ball, he for the time being identifies himself with the ball; and as all means are and must be lawful to stop *it*, so all means are and must be lawful to stop *him*, for stopping him is stopping the ball. Hence "hacking," "tripping," "mauling," &c., the prolific sources of broken bones, twisted joints, and other attractive features of the "carrying game."

Rule 10.—Charging is retained, partly because, with the restrictions as to elbows, &c., here enforced, it is really not the source of any particular danger, partly because its retention is simply a matter of necessity. It could not be required of the defending party to get out of the way of the attacking party, nor of the attacking party to turn aside whensoever the defending party chose to put itself in the way; and if the one party may fairly obstruct and the other fairly force its way, who is to judge or to define the precise amount of force to be lawfully employed? The only resource, therefore, is to allow it under due restriction.

HOW TO KICK.—This may appear a very superfluous piece of information: "Anybody can kick!" Anybody *can* kick, in the sense that they can give a blow with the foot; but it is no more true in football that anybody can kick than it would be true to say that in boxing anybody can hit with the fist. It takes long training and practice to strike out as a prize-fighter does, and in the same way it takes long practice to kick like a good football-player.

There are two points to be acquired in learning to kick: one is to make the ball go *far*, and the other to make it go *straight*. These are not, however, two distinct acquirements; accuracy is the first and primary ingredient of hard kicking, and practice for one will be equally practice for the other.

The young player must first learn the correct attitude and action for kicking. This he may do, and with advantage, even without a ball. Let him make a line on the ground, marking on it the place for the ball; then toeing

FIG. 1.

FIG. 2.

the line with his left foot some eight inches to the left of this mark, pose himself as follows:

The whole body held erect, and inclined forward over the left foot, the chest projected, the arms hanging quietly but easily from the shoulder, the left leg straightened out and supporting the whole weight of the body, the right leg also straight, but drawn up so as to hang just free of the ground. (Fig. 1.)

In delivering the kick, the right leg is swung well back (the knee being bent as little as may be), and then brought forward with full force, the toe being raised as high as possible, and the whole foot and ankle held rigid. The leg must be made to swing freely from the hip. (Fig. 2.)

Now to *kick* the ball. Of course, wherever the ball is struck, it will fly from the foot in some direction or other; but, to ensure distance and accuracy, it is necessary for the toe to meet it in one spot, and in one spot only. The accompanying diagram will best point out this spot, and Fig. 3 may be found a useful help to understanding the description of attitude given above. Care must be taken to kick the ball accurately in the centre, or it will inevitably fly off to one side or the other.

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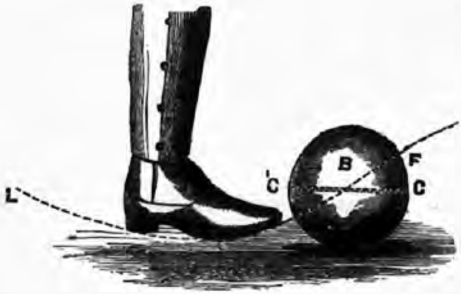


FIG. 3.

kicked higher; if to fly more perpendicularly in the air, the foot must take it lower.

To give the ball due impetus, the player generally takes a short run: it need not be long—10 yards at the utmost; but in every case where he kicks the ball from the ground, whether it be at rest, or he meet, follow, or cross it, he must use the same form in delivering the kick.

He should specially endeavour to kick equally freely with either leg. The best way to do this is to practise mainly with the weaker leg; the other will take care of itself.

Besides the Place-kick, and the various kicks that take the ball from the ground, there are others that take the ball in the air. These are the Half-volley, Drop-kick, and Punt.

In the two former the ball is met by the toe just at its rebound from the ground; in the one case from an ordinary kick, and in the other as it is dropped from the hands of the player. The punt is made by meeting the ball let fall from the hands with the instep: it is occasionally a serviceable variation; but the drop-kick, when practicable, is more effective, and certainly more brilliant.

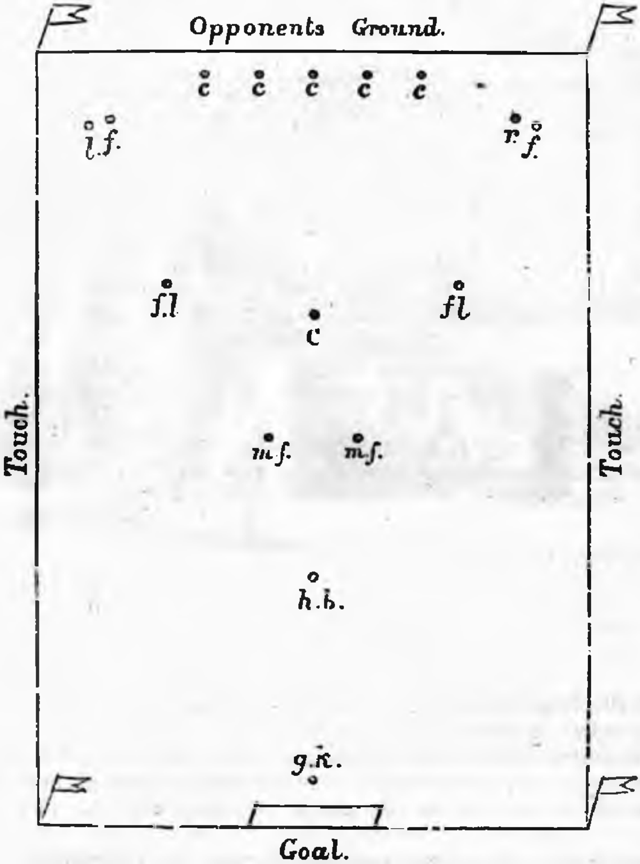
The ball is occasionally met with the foot *before* the pitch; but, except when the ball is coming with but little force, and time is precious, this method is not to be recommended.

The knack of kicking the ball with the side of the foot, at an angle to the line in which the player is running, is not difficult of acquirement, and is invaluable in actual play, as also is that of "rushing the ball," *i.e.*, of patting it along with the feet while at speed, so as to keep it constantly within reach. To do this well, with unabated speed, and yet without offering a chance to the adversary, is the *ne plus ultra* of fine play.

PLACES OF PLAYERS.—In Diagram C are shown the names and positions of the field, as set for a match sixteen on a side. As both sides will be placed alike, only one-half the field is given.

HAND-PLAY.—A few words upon hand-play. The use of the hands, though as far as possible to be avoided, is yet allowable, and even to be recommended where no other method of stopping the ball is available. For instance, the ball may be struck with the hand in mid-air, or even caught, so that it be immediately put again into play. The ball may not be *lifted* from the ground; it is not, however, unlawful to receive it into the hands at the rebound. Finally, the ball may be stopped with the hand while on the ground, and may at any time be struck with it; but this privilege should only be sparingly exercised, not only for the sake of the game in general, but because where the foot can be employed with effect, it will be found far more efficient, and is, moreover, more player-like.

DIAGRAM C.



FIELD SET FOR MATCH SIXTEEN ON A SIDE.

C, Captain; *c*, Charger; *r.f.*, *l.f.*, right and left forward; *m.f.*, Mid-field; *fl.*, Flanker; *h.b.*, Half-back; *g.k*, Goal-keeper.

CRICKET.

Cricket is the king of all outdoor sports—the game which beyond all others it behoves English boys to learn and master.

At once the most scientific and the most permanently interesting of all open-air pastimes; while providing healthy, but not too exhausting, exercise for the body, it stimulates and excites the mind to action not less wholesome and agreeable.

Nor do its claims to the proud position asserted for it amongst our English sports and pastimes rest here. It requires from its followers, and, indeed, cultivates and confirms in them, habits of patient, unflagging attention to the work immediately before them; for of what worth is a would-be cricketer who cannot concentrate his whole thought and energy on the game; who should venture to think, "I was not looking," sufficient excuse for a catch missed or a run lost? Habits of ready obedience and self-negation; for who shall call himself "cricketer" who respects not the laws of the game, and regards not the august decisions of their exponents, who cares not to submit to the wholesome discipline of his captain, or who, steeped in self-conceit and burning with the lust of personal distinction, cares rather to play for his own hand, to see his own name blazoned forth prominently in the score-sheet, than to consult the advantage of his side, or to further its ultimate success? Habits of presence of mind and unhesitating readiness of action in emergency; for is not the whole game but one long series of sudden emergencies, demanding instant and unhesitating treatment?—and a score of other virtues and moral qualities on which it were tedious to enlarge.

The game of cricket is of some antiquity amongst us. Like most of our public institutions, it has risen from small beginnings, little by little, a rule added here, a licence curtailed there, to its present compact and approximately perfect form.

Of the early history of the game we have very little record. A game called "creag," played with a bat and ball, and common amongst the Saxons, even before the Norman conquest, is supposed by the best authorities to be the germ from which, in the course of many generations, our present game of cricket has been developed.

It is certain that the game was played, and that commonly, more than two centuries ago; but in its present form, which differs materially from its earlier constitution, it has not yet existed a hundred years.

Before the year 1781, the wickets, which now form, as it were, the very central point of the game, had no practical existence; the bat was in shape like a hockey-stick or golf-club; and there were many other points of divergence from present practice, such that in effect they must have rendered the cricket of 1769 an almost totally different game from that of the present day.

As, however, our present purpose is rather with the game of our time than with that of 1769—rather with actual practice than with past history—we will forbear any further reference to those dark ages, when wickets as wickets were not, and when bats were bludgeons, and address ourselves to the task immediately before us.

It is scarcely possible, and, indeed, it is almost an insult, to suppose that any English boy, who is old enough to read this, can be ignorant of the general character and theory of cricket. Nevertheless, for the benefit of such benighted beings, if any such there be, a few lines may be not unreasonably devoted to a due and concise exposition of the leading features and objects of the game.

There are two methods of playing cricket, viz., single and double wicket, differing from each other in many important points, yet in elementary constitution and in most leading points of practice essentially the same. A short glance, therefore, at first principles may well serve for both.

To play cricket, two opposing parties strive in turn to score as many "runs" as possible from the bowling of their opponents, who, of course, strain all their energies to reduce this score to the smallest practicable dimensions.

The "outing side," through its bowler, strives to knock down the wickets with the ball, delivered from a given point and under certain restrictions; while the other or "inning side," through its batsman, defends them with the bat, and, if possible, strikes the ball away to such a distance that, before it can be returned, he may be able to run from wicket to wicket one or more times, and each time this distance is accomplished, one is added to the score of his party.

If he fail to protect his wicket, or if the ball be caught by the opposite party after he has hit it and before it touches the ground, or if in any other way specified in the rules he be "put out," he has to retire, and another of his party takes his place, until they are all in turn thus disposed of. The outing side then takes their place at the wickets and becomes the inning side, while they become the outing side.

When this change has been effected twice in due rotation, each side being allowed two turns or "innings" at the wickets, the runs that each has made are added up, and that side which has scored the most wins the day.

Amongst its other recommendations, cricket possesses an advantage over football and most other outdoor games in the universal identity of its rules. There is one central club, the Marylebone, better known to cricketers as the M.C.C., to which, by common consent, the whole body of cricketers looks for the rules and regulations of the game.

As it is imperatively necessary to know the rules of a game, at least in outline, before beginning to play it, the rules of the M.C.C., as authorized and published in 1866, are here given; and the young reader who burns with the hope of one day attaining a cricketer's fame is strongly advised to study closely and carefully not only the rules themselves, but also the explanatory notes appended to them.

THE LAWS OF CRICKET,

With the latest alterations, revised by the Marylebone Cricket Club, 1866.

1. THE BALL must weigh not less than $5\frac{1}{2}$ oz., nor more than $5\frac{3}{4}$ oz. It must measure not less than $9\frac{1}{4}$ inches in circumference. At the beginning of each innings either party may call for a new ball.
2. THE BAT must not exceed $4\frac{1}{4}$ inches in the widest part; it must not be more than 38 inches in length.
3. THE STUMPS must be three in number, 27 inches out of the ground; the bails 8 inches in length; the stumps of equal and sufficient thickness to prevent the ball from passing through.
4. THE BOWLING-CREASE must be in a line with the stumps, 6 feet 8 inches in length, the stumps in the centre, with a return-crease at each end towards the bowler at right angles.
5. THE POPPING-CREASE must be 4 feet from the wicket, and parallel to it; unlimited in length, but not shorter than the bowling-crease.
6. THE WICKETS must be pitched opposite to each other by the umpires, at the distance of 22 yards.
7. It shall not be lawful for either party, during a match, without the consent of the other, to alter the ground by rolling, watering, covering, mowing, or beating, except at the commencement of each innings, when the ground may be swept and rolled at the request of either party, such request to be made to one of the umpires within one minute after the conclusion of the former innings. This rule is not meant to prevent the striker from beating the ground with his bat near to the spot where he stands during the innings; nor to prevent the bowler filling up holes with sawdust, &c., when the ground is wet.
8. After rain the wickets may be changed with the consent of both parties.
9. THE BOWLER shall deliver the ball with one foot on the ground behind the bowling-crease (see p. 126) and within the return-crease, and shall bowl four balls before he change wickets, which he shall be permitted to do only once in the same innings.
10. The ball must be bowled. If thrown or jerked, the umpire shall call "No ball."

11. He may require the striker at the wicket from which he is bowling to stand on that side of it which he may direct.
12. If the bowler shall toss the ball over the striker's head, or bowl it so wide that in the opinion of the umpire it shall not be fairly within the reach of the batsman, he shall adjudge one run to the party receiving the innings, either with or without an appeal, which shall be put down to the score of "wide balls." Such ball shall not be reckoned as one of the four balls; but if the batsman shall by any means bring himself within reach of the ball, the run shall not be adjudged.
13. If the bowler deliver a "no ball" or a "wide ball," the striker shall be allowed as many runs as he can get, and he shall not be put out, except by running out. In the event of no run being obtained by any other means, then one run shall be added to the score of no balls or wide balls, as the case may be. All runs obtained for wide balls to be scored to wide balls. The names of the bowlers who bowl wide balls and no balls in future to be placed on the score, to show the parties by whom either score is made. If the ball shall first touch any part of the striker's dress or person, except his hands, the umpire shall call, "leg-bye."
14. At the beginning of each innings the umpire shall call, "Play!" From that time to the end of each innings no trial ball shall be allowed to any bowler.
15. THE STRIKER IS OUT if either of the bails be bowled off, or if a stump be bowled out of the ground;
16. Or if the ball, from the stroke of the bat or hand, but not the wrist, be held before it touch the ground, although it be hugged to the body of the catcher;
17. Or if, in striking, or any other time while the ball shall be in play, both his feet shall be over the popping-crease and his wicket put down, except his bat be grounded within it;
18. Or if, in striking at the ball, he hit down his wicket;
19. Or if, under pretence of running or otherwise, either of the strikers prevent a ball from being caught, the striker of the ball is out.
20. Or if the ball be struck, and he wilfully strike it again;
21. Or if, in running, the wicket be struck down by a throw, or by the hand or arm (with ball in hand), before his bat (in hand) or some part of his person be grounded over the popping-crease. But, if both the bails be off, a stump must be struck out of the ground;
22. Or if any part of the striker's dress knock down the wicket;
23. Or if the striker touch or take up the ball while in play, unless at the request of the opposite party;
24. Or if with any part of his person he stop the ball, which, in the opinion of the umpire at the bowler's wicket, shall have been pitched in a straight line from it to the striker's wicket, and would have hit it;
25. If the players have crossed each other, he that runs for the wicket which is put down is out.
26. A ball being caught, no run shall be reckoned.
27. A striker being out, that run which he and his partner were attempting shall not be reckoned.
28. If a lost ball be called, the striker shall be allowed six runs; but if more than six shall have been called, then the striker shall have all that have been run.

29. After the ball shall have been finally settled in the wicket-keeper's or bowler's hands, it shall be considered dead; but when the bowler is about to deliver the ball, if the striker at his wicket go outside the popping-crease before such actual delivery, the said bowler may put him out, unless (with reference to Law 21) his bat in hand, or some part of his person, be within the popping-crease.
30. The striker shall not retire from his wicket, and return to it to complete his innings, after another has been in, without the consent of the opposite party.
31. No substitute shall in any case be allowed to stand out or run between wickets for another person without the consent of the opposite party; and in case any person shall be allowed to run for another, the striker shall be out if either he or his substitute be off the ground, in manner mentioned in Laws 17 and 21, while the ball is in play.
32. In all cases where a substitute shall be allowed, the consent of the opposite party shall also be obtained as to the person to act as substitute, and the place in the field which he shall take.
33. If any fieldsman stop the ball with his hat, the ball shall be considered dead, and the opposite party shall add five runs to their score; if any be run, they shall have five in all.
34. The ball having been hit, the striker may guard his wicket with his bat, or with any part of his body except his hands, that Law 23 may not be disobeyed.
35. The wicket-keeper shall not take the ball for the purpose of stumping until it have passed the wicket; he shall not move until the ball be out of the bowler's hand; he shall not by any noise incommode the striker; and if any part of his person be over or before the wicket, although the ball hit it, the striker shall not be out.
36. The umpires are the sole judges of fair or unfair play, and all disputes shall be determined by them, each at his own wicket; but in case of a catch which the umpire at the wicket bowled from cannot see sufficiently to decide upon it, he may apply to the other umpire, whose decision shall be conclusive.
37. The umpires in all matches shall pitch fair wickets, and the parties shall toss up for choice of innings. The umpires shall change wickets after each party has had one innings.
38. They shall allow two minutes for each striker to come in, and ten minutes between each innings, when the umpire shall call "play." The party refusing to play shall lose the match.
39. They are not to order a striker out, unless appealed to by the adversaries;
40. But if one of the bowler's feet be not on the ground behind the bowling-crease and within the return-crease when he shall deliver the ball, the umpire at his wicket, unasked, must call "no ball."
41. If either of the strikers run a short run, the umpire must call "one short."
42. No umpire shall be allowed to bet.
43. No umpire is to be changed during a match, unless with the consent of both parties, except in case of violation of Law 42; then either party may dismiss the transgressor.
44. After the delivery of four balls the umpire must call "over," but not

until the ball shall be finally settled in wicket-keeper's hands; the ball shall then be considered dead. Nevertheless, if an idea be entertained that either of the strikers is out, a question may be put previously to, but not after, the delivery of the next ball.

45. The umpire must take especial care to call "no ball" instantly upon delivery, and "wide ball" as soon as it shall pass the striker.

46. The players who go in second shall follow their innings if they have obtained 80 runs less than their antagonists, except in all matches limited to only one day's play, when the number of runs shall be limited to 60 instead of 80.

47. When one of the strikers shall have been put out, the use of the bat shall not be allowed to any person until the next striker shall come in.

The Laws of Single Wicket.

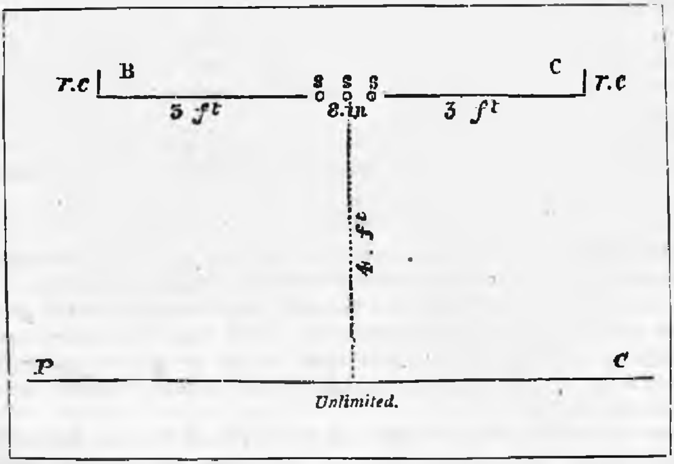
1. When there shall be less than five players on a side, bounds shall be placed 22 yards each in a line from the off and leg stump.
2. The ball must be hit before the bounds, to entitle the striker to run, which run cannot be obtained unless he touch the bowling-stump or crease in a line with his bat, or some part of his person, or go beyond them, returning to the popping-crease, as at double wicket, according to Law 21.
3. When the striker shall hit the ball, one of his feet must be on the ground and behind the popping-crease; otherwise the umpire shall call "no hit."
4. When there shall be less than five players on a side, neither byes nor overthrows shall be allowed; nor shall the striker be caught out behind the wicket, nor stumped out.
5. The fieldsman must return the ball so that it shall cross the play, between the wicket and the bowling-stump, or between the bowling-stump and the bounds; the striker may run till the ball be so returned.
6. After the striker shall have made one run, if he start again, he must touch the bowling-stump and turn before the ball cross the play, to entitle him to another.
7. The striker shall be entitled to three runs for lost ball, and the same number for ball stopped with hat, with reference to Laws 28 and 23 of double wicket.
8. When there shall be more than four players on a side, there shall be no bounds. All hits, byes, and overthrows shall then be allowed.
9. The bowler is subject to the same laws as at double wicket.
10. Not more than one minute shall be allowed between each ball.

Observations on Rules.

DOUBLE WICKET.

Rules 3, 4, and 5.—The accompanying diagram will explain, better than many words, the arrangement and method of marking the various creases, which are usually marked out on the turf with a mixture of chalk or whiting and water.

It is well to practise always with the creases duly marked, and in strict observance of all rules connected with them, as the mind thus forms a habit of unconscious conformity to them, and the player is not embarrassed, as too many are when they come to play in an actual match, by the necessity of keeping a watch over his feet as well as over the ball. Many a good bat, especially amongst boys, allows himself to be cramped in his play in this very unsatisfactory manner.



S S S, the Stumps (the three together forming the *Wicket*); B C, the Bowling-crease; R.C, the Return-crease; P C, the Popping-crease.

The purposes of the several creases are as follows:

The BOWLING-CREASE marks the nearest spot to the striker from which the bowler may deliver the ball.

The RETURN-CREASE prevents the bowler from delivering the ball at an unreasonable distance laterally from the wicket; and the two together mark out within sufficiently exact limits the precise spot from which the striker may expect the ball.

The POPPING-CREASE, while giving the striker ample space to work in, puts a check upon any attempt to get unduly forward to meet the ball; it forms, too, a distinct and convenient mark by which to judge of a man's being on his ground, and of his having run the requisite distance between wickets. It is unlimited, to avoid the confusion between strikers and fieldsmen, which must inevitably be of constant recurrence were the strikers required to run directly from wicket to wicket.

Rule 13.—"All runs obtained from wide balls to be scored to wide balls." This does not include hits, as, by the latter part of Rule 12, "if the batsman bring himself within reach of the ball, the wide does not count." Hits, therefore, made off wide balls score to the striker.

Rule 17.—The popping-crease itself, it must be remembered, does not form part of the ground; the bat or part of the body must, therefore, be *inside* it; *on* it is not sufficient to meet the requirements of the rule; if the bat or some portion of the body be not *on the ground inside* the crease when the wickets are put down, the player is out.

Rule 20.—The striker may block or knock the ball away from his wicket after he has played it, if that be necessary to keep it from the stumps. The rule only forbids striking it a second time with intent to make runs.

SINGLE WICKET.

The accompanying diagram shows the ground marked out for single wicket with less than five players on a side.

B, the Bowling-stump, Crease, &c.; W, the Wickets, with Popping-crease, as in double wicket; *b b*, the Boundaries.

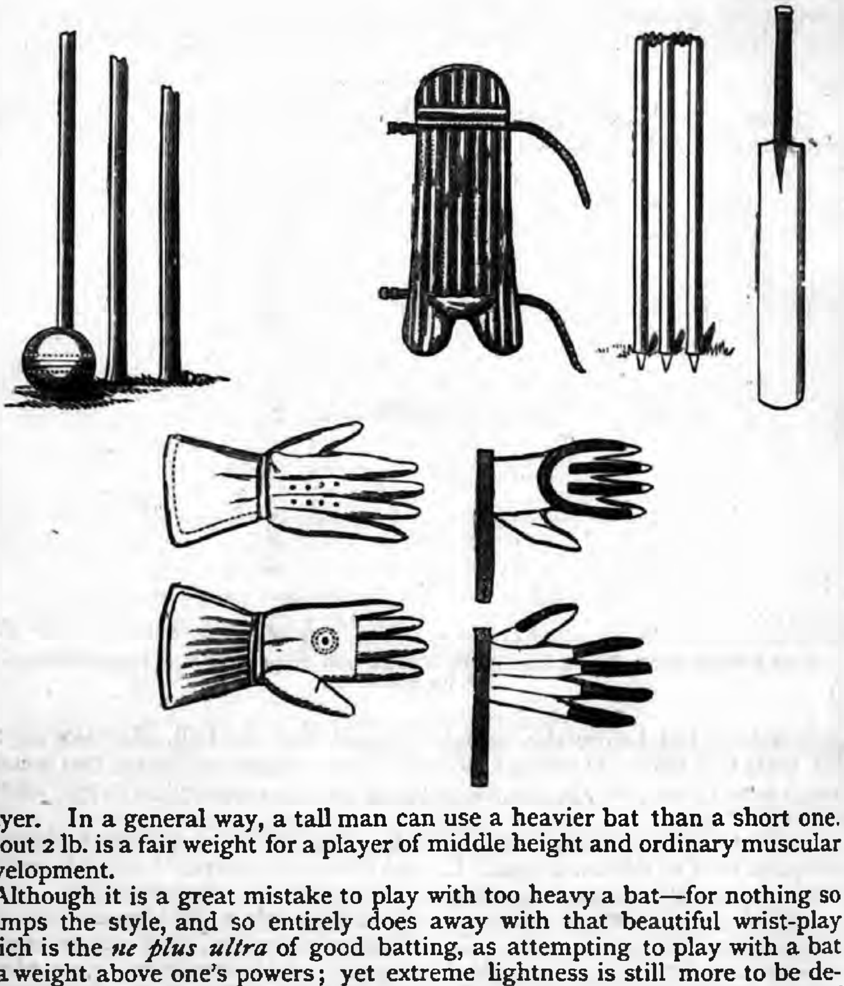
Rule 2.—"Hit before the bounds" means that the ball, after leaving the bat, must first *touch the ground* in *front* of the line marked by the two bounds, which line, by the way, is, like the popping-crease, supposed to extend illimitably either way.

Single wicket is chiefly valuable in dearth of sufficient players to form an adequate field at double wicket. It is so inferior in interest to double wicket, that it is hardly ever played, unless when the latter is impracticable.

A good game at single wicket, though, where only a few players have met for practice, is far better, and infinitely more improving, than any amount of the desultory knocking about which is usual on such occasions. For a player deficient in driving and forward hitting of all kinds the practice it affords is invaluable, and to such a good course of single wicket is strongly recommended.

IMPLEMENTS.—A few words upon the choice of bats, balls, gloves, &c. Too much pains cannot be taken by a cricketer in thus providing his outfit. None but experienced hands *can* estimate the vital importance of attention to all such details:—that the bat is the right weight and size, and properly balanced; that the gloves, shoes, pads, &c., are perfect in their fit and appointments; in fine, that the player stands at the wicket or in the field fully equipped for the fray, yet in nowise impeded or hindered by ill-fitting garments, clumsy shoes, or cumbersome pads.

First, then, for the bat. This is limited in Rule 2 both as to length and width; but the thickness and weight are left to the fancy and capacity of the



player. In a general way, a tall man can use a heavier bat than a short one. About 2 lb. is a fair weight for a player of middle height and ordinary muscular development.

Although it is a great mistake to play with too heavy a bat—for nothing so cramps the style, and so entirely does away with that beautiful wrist-play which is the *ne plus ultra* of good batting, as attempting to play with a bat of a weight above one's powers; yet extreme lightness is still more to be deprecated: it is useless for hard hitting, and can therefore do little in the way of run-getting against a good field; "shooters," too, will be apt to force their way past its impotent defence.

The points most to be looked for in a bat are these:—First, weight suited to the player. The young player should play with a heavier bat every year, until he attains to his full stature. Don't let him think it "manly" to play with a full-sized bat before he is thoroughly up to the weight and size: it is much more manly to make a good score.

Secondly, good thickness of wood at the drive and lower end of the bat, *i.e.*, at the last six inches or so.

Thirdly, balance. Badly balanced bats give a sensation as of a weight attached to them when they are wielded, while a well-balanced one plays easily in the hand. Experience alone can teach the right feel of a bat.

The outward appearance of a bat must not always be taken as a certain indication of its inherent merits: varnish and careful getting up may hide many a defect. There are many fancies, too, in favour of different *grains:* a good knot or two near the lower end is generally a good sign; but, after all, nothing but actual trial of each several "bit of willow" can decide its real merits or defects.

Last, but not least, the *handle* is a very important consideration. Cane handles, pure and simple, or in composition with ash or other materials, are the best: some prefer oval handles, some round. The handle should, at least, be as thick as the player can well grasp: a thick handle greatly adds to the driving power of the bat; it is also naturally stronger, and therefore more lasting. A good youth's bat costs about eight shillings.

It should be remembered that a good bat, like good wine, improves with keeping.

In purchasing balls, wickets, and other needful "plant," it will be found better economy to pay a little more in the beginning, and thus get a good article. With reasonable care, such first-class goods will last out whole generations of the more cheaply got-up articles, and prove more satisfactory throughout into the bargain.

In choosing wickets, attention must be paid to two points: first, that each stump be perfectly straight; and, secondly, that it be free from flaws or knots. The least weakness is sure to be found out sooner or later.

Great attention should be paid to the bails, that they are exactly of the right size, especially that they are not too long. The least projection beyond the groove in the stump may make all the difference between "out" and "not out,"—between, perhaps, winning a match and losing it.

Stumps and bails, with ordinary care, ought to last a very long time. The chief thing to guard against is their lying about in the wet, or being put away damp: moisture is very apt to warp them.

So that the gloves and pads *fit*, the player may be left pretty much to his own discretion in selecting a pattern. Vulcanized India rubber is the best for gloves.

Spiked or nailed shoes are a *necessity*. The player may please himself in the vexed question of spikes *v.* nails. Many players keep two pairs of shoes —with spikes for wet and slippery ground, with nails for dry ground.

It is hardly worth while for a boy in the rapid-growing stage to set up a regularly built pair of cricketing-shoes: an admirable substitute may be found, though, in the ordinary *canvas shoes*, as used for rackets, &c., price half a crown; a few nails will make them answer all the purposes of the more legitimate article.

Parents and guardians may be informed that a proper costume of flannel and shoes is actually better economy than condemning a boy to play in his ordinary clothes; and for this reason—flannels are made to suit the exigences of the game, loose where they should be loose, and *vice versâ*, without regard to the exigences of fashion; they are cheaper, and are nevertheless more lasting, than ordinary cloth clothes; they never get shabby, will wash when dirty, and will carry a darn or patch without detriment to their dignity; they are not injured by perspiration or wet; and, above all, they are great preservatives against colds and other ailments.

Shoes may put in much the same claim. Cricket is marvellously destructive of the ordinary walking-boot; is it not then better to substitute a cheaper and more durable article?

If spikes be chosen, they should be arranged thus:  not, as is more usual, thus:  A very short experience will show the "reason why." In choosing spikes, care should be taken to obtain good length and small diameter; a squat, clumsy spike is an awful nuisance. If nails be the choice, they should not be put much nearer than at intervals of an inch, otherwise they will be liable to clog.

PRELIMINARY OBSERVATIONS.—Before entering upon the science of the game, I would especially impress upon the minds of my young readers the desirability of doing things in the *right way.*

If they play cricket, let that cricket be their very best; any little extra trouble at first will be more than repaid by the results. It is not given to every man to be a first-rate cricketer; but most men might play far better than they do, and many men, who now hardly deserve the name of players, might, with very little expenditure of trouble in their younger days, have been now men of mark in the cricketing world.

Be it remembered, then, that there is a *right way* to perform each function of cricket, and a *wrong way*, or perhaps I should rather have said, innumerable wrong ways.

Now, this *right way* will hardly come of itself: cricket, by the light of Nature only, would be a prodigy indeed. The beginner must, therefore, first ascertain what this *right way* is, and thenceforth strive continually to practise and perfect himself in it, whether it be in batting, bowling, or fielding, until habit has become a second nature.

And not only must the learner cultivate *good* habits, he must diligently eschew all *bad* ones; for bad habits are wonderfully easy of acquirement, but, once acquired, can hardly ever be completely shaken off.

It is all very well to say, "I know the right way, and that is enough," and then, from sheer laziness or indifference, go the wrong; but when it comes to the point of practical experience, it will be found that the bad habit will have an uncomfortable knack of coming into play at critical moments, just when it is least desired.

For cricket, it should be remembered, is a series of surprises. Give a man time to think, and he can decide between the right way and the wrong; but *time to think* is just the very thing a man does *not* get at cricket: instant, unhesitating action is his only chance.

If he has habituated himself to one only method of action, he *must*, he *can*, only act in accordance with it; but if there be several conflicting habits, who shall say which shall be the one that comes first to hand in an emergency?

Let the young cricketer then—and the old one, too, for the matter of that—make this his rule and study, to make every ball he bowls, he bats, or he fields, one link more in the chain of good habits, one step farther on the road to success.

SCIENCE OF THE GAME.

BATTING—BOWLING—FIELDING, ETC.

BATTING.—Like boxing, fencing, &c., batting is quite as much an affair of the legs and of the body generally as of the hands and arms—at first sight, the parts almost solely concerned.

The beginner, therefore, must not think that, when he has learnt to hold his bat correctly, and to wield it with tolerable facility, he has mastered the main principles of the art; he has, indeed, scarcely even acquired the most rudimentary knowledge of them.

Every kind of ball—it may almost be said *every* ball—demands for its proper treatment a distinctly specific attitude of the whole body, by which, and which only, the bat can be brought to bear with the fullest attainable effect, or, indeed, with any effect worth speaking of at all; and this attitude, to avail the batsman anything, must be assumed with unhesitating promptness and decision the instant a correct judgment of the ball can be formed, which should be almost as soon as it has left the bowler's hand. A really fine player "forms," as the phrase goes, at the very instant the ball is delivered.

Demosthenes, being asked the three chief essentials of good oratory, replied, "Firstly, action; secondly, action; and, thirdly, action." And so of batting: the first, second, and third essentials for a good "bat" are attitude, attitude, attitude; or, in more hackneyed and familiar phrase, "Attitude is everything."

It would be impossible, if, indeed, it were necessary, to describe and figure in the short space of a few pages, every conceivable attitude that can be assumed by the batsman; but the young beginner will find the succeeding cuts and accompanying explanations and instructions more than sufficient for all his wants.

A slight expenditure of time and trouble in mastering their leading principles and details, and a little well-directed zeal and perseverance in reducing them to practice—care being always taken not to form bad or conflicting habits—will, in a wonderfully short time, enable even a mere boy to acquire a style and precision to which very many players only attain after years of hard practice, and to which, sooth to say, the large majority never attain at all.

Let the young batsman only beware of two things—of falling in with the too common custom of mere desultory batting and bowling, than which nothing is more prolific in the formation of bad habits, fatal to all correct play; and, secondly, of aspiring to play with a bat of a weight and size in excess of his powers—an ambition only to be gratified at the expense of acquiring and confirming a heavy, ungainly, and, therefore, incorrect and inefficient style.

HOW TO HOLD THE BAT.—Grasp the handle firmly from behind, near the shoulder, with the right hand, bringing the fingers well round in front, the thumb meeting them from the other side, and passing beyond but on the lower side of the forefinger, and firmly pressed against it; then, placing the lower end of the blade on the ground, with the face towards the bowler, and the handle inclined a little forward, bring the left hand down to the *front* of the handle, and grasp it above the right hand, the knuckles to the front, and the thumb pointed downwards. The handle of the bat must lie along the inside of the left wrist, and only slightly out of the line of the fore-arm (see Fig. 1). This attitude of the hands appears at first to the unaccustomed novice cramped and ungraceful; but a little practice will render it not only perfectly easy, but, if he so please, perfectly graceful too.

But this is not the only way in which, in wielding the bat, the hands grasp the handle; if so, the bat would have little play, and its only possible movements would be those of a pendulum. By shifting the left hand round from the front to the rear of the handle, still retaining the grasp of the right, a wonderful addition of power is obtained over the bat: instead of the arms and bat forming one long rigid line, rotating only at the shoulder, there will

FIG. 1.

FIG 2.

now be added motion of the elbow and perfectly unlimited capacity of action at the wrist.

This shifting the hand from front to rear of the handle and back again, to be done smoothly and with perfect facility, will require some trouble and attention before it is mastered; but, as it is the very *sine quâ non* of scientific and, therefore, of effective batting, it will well repay the trouble expended upon it.

The beginner will find it a useful plan to exercise himself in these and the following practices and positions at odd times, when he has a few minutes to spare, with a bat only; or a stick will do. A very fair mastery of the bat may be obtained without ever playing a ball, as a man may acquire some proficiency as a marksman without firing a shot.

The next point to which the learner must direct his attention is POSITION. In standing at the wickets, he must first ascertain—from the umpire at the bowler's wicket, if any umpire there be—the exact spot on the popping-crease at which his bat, when held upright, conceals the middle stump of his wicket from a person standing where the bowler will deliver his ball: this spot is called the "guard."

Having found this "guard" (by the way, he should carefully mark it by scratching the crease in some way, as most convenient), he must take up his position as follows. Holding the bat as in Fig. 1, he must ground the lower end of it at guard; the right foot must be planted just inside, and parallel with, the popping-crease; the toe about two or three inches from, and slightly in advance of, the bat; the left foot must be advanced slightly, its toe pointing in the direction of the bowler, both feet planted firmly on the ground, the weight resting chiefly on the right, both knees straightened up, the body as upright as the position of the bat will allow, the left elbow well up, the left shoulder turned towards the bowler, the head erect and looking over the left shoulder watching for the ball. This is called the first position (see Fig. 2), and ensures an upright bat—the great desideratum of safe play—and gives the striker a command over any awkward twistings or shootings of the ball unattainable by any other means. It does not, however, put him into a position to strike with any effect: some change has to be made. As the ball is delivered, the striker throws back the point of his bat to the bails, shifting his left hand from front to rear of the handle as above described, using the right wrist as a pivot: in this position the striker is ready for anything. Should the ball rise or twist, there the bat is waiting for it; should it give an opening for a hit, the hit will be made with all the more force and effect; or should it shoot along the ground—most deadly of possibilities—the bat's own weight will almost alone bring it back to the safe position of "guard." This position is called "make ready" (see Fig. 3). As it is the bowler's first object to knock down the wickets, so it must be the batsman's first object to keep them up: the integrity of his wickets is the prime necessity of the striker's existence; *defence*, therefore, before *defiance*, must be the learner's motto.

FIG 3.

Many balls, if they do not possess any further element of danger than their straightness, may be safely met and played in the form of Fig. 3; but a good bowler will take care to pitch the ball in such a manner as to make this defence, if not impracticable, at least extremely hazardous. A ball that pitches from a yard and a half to two yards from the bat, according to the speed of the bowling, is called a "length ball," because it pitches just the right length to be most puzzling to the batsman; and it can only be met with reasonable safety in one of two ways—either by playing forward and stopping it at the pitch, or by playing back, and thus gaining time to judge its flight after it takes the ground.

It should be remembered that the only puzzling part of a ball's flight is after it takes the ground, not only because, having less distance to travel, it gives the striker less time to judge it, but because any bias or spin imparted to it by the bowler can only take effect when it comes into contact with the ground.

By forward play, the batsman is enabled to smother the ball before this bias has time to produce much effect; and by back play he gains time to prepare for, and meet, any unexpected eccentricity in its line of flight.

Forward play is only of service when the pitch is so near that the batsman can, by reaching forward, get so well over it as to render it next to impossible

FIG. 4.

FIG. 5.

for the ball, however much it may twist or shoot, to evade the bat; if he cannot safely reckon upon this, he had better have recourse to back play.

Every ball *may* be met by back play, and now-a-days it is the more favoured method; but, none the less, forward play, where it is applicable, is not only the safest, but the most effective play.

By reaching forward, it will often be possible to make a good hit off a ball that it might otherwise be difficult to keep from the wickets; whereas, in playing back, it is hardly possible to do more than pat the ball away for one run.

FORWARD PLAY (see Fig. 4) is managed thus: The striker being in the attitude of "make ready," keeping his right foot, of course, on the ground inside the popping-crease, strides out with his left, and, leaning well forward, thrusts his bat in front of him in the path of the ball.

In doing this the bat must be kept rigidly in line with the middle stump, the handle inclined neither to the right or the left, or it may leave an unguarded spot for the ball to get past; the handle must, however, be inclined well *forward* towards the bowler, that, in case the ball should rise a little too quickly, it may be beaten back again to the ground, lest flying off the bat it fall a prey to some ready fieldsman.

In this attitude *both* hands will be behind the bat, and both, more especially the right, should hold it in a firm grip; the left shoulder must be thrust forward, and the left elbow be well up.

The learner should practise this and, indeed, all the other positions by himself, without a bowler, until he can assume them mechanically, and so be free to concentrate all his thoughts upon the bowling.

BACK PLAY (see Fig. 5) is, as its name implies, the opposite in every way of the preceding. The *left* foot stands fast; the *right* is thrown back almost up to the wicket; the upper part of the body leans over the right knee; and the bat hangs suspended perpendicularly from the wrists, its shoulder level with the bails, the hands grasping the handle as in Fig. 1. Thus posed, the batsman waits for the ball: if it shoot, he can be down on it; if it rise, he meets it by a slight movemant of his wrist at the moment of contact (the bat, by the way, in this and all other cases, must never be allowed to hang a dead weight in the hands), plays the ball down if it be perfectly straight, or away into the field if it be not.

The young player must learn to make these changes of position with unwavering smoothness and certainty. The least unsteadiness of hand or foot will almost inevitably prove fatal.

He must, above all things, keep constantly before his mind the golden rule, that the only safety to his wicket lies in rigidly *straight play*, that is, in meeting the ball with a bat always, as far as inclination to one side or another is concerned, accurately perpendicular.

HITTING.—The next thing for the beginner, after learning the method of handling his bat, and the most advantageous method of standing and preparing for the ball, is to learn how to hit. This is not so simple a matter as might be supposed. Anybody, it is true, can, the first time he handles a bat, strike the ball with it with more or less force, according to his muscular strength and natural aptitude; but this is not *hitting* in the cricketer's sense of the word.

In the first place, a hit, to be "clean," requires that the ball should leave the bat at a distance of from five to eight inches from its point; and the bat itself must by no means be made to swing round in a huge circle like a sack or a one-armed windmill, but must be wielded with a short, vigorous, combined action of the wrists, arms, and shoulders.

In hitting, there are four leading principles to be always kept in mind: hit *hard*, hit *late*, hit *low*, and hit by *sight*, not by *guess*. Every hit should be made with all the force you can bring to bear upon it, since every yard that the ball is driven adds to the chances of a run, and every run lost or gained is so much gain or loss to the fortunes of the innings side.

The young batsman should especially cultivate the knack of dropping down heavily upon "shooters," *i.e.*, balls that, after they pitch, run or shoot along the ground, instead of rising. Most players are content merely to "block" such balls, that is, to bring the bat down to meet them, with only sufficient force to stop them or drive them back a short distance, content with merely rendering them innocuous. But, with a quick hand, a good eye, and a little practice, the young player may learn to do better than this; he may learn not only to play these, the most deadly of all balls, with confident security, but even to drive them away with such force as to make runs from them.

To do this, he must follow the ball carefully with his eye every inch of the way from the bowler's hand to his bat, and, waiting till it is just on the point of passing him, bring his bat forcibly to meet it, giving a kind of push or shove forward at the moment of impact. It is astonishing how far a ball, blocked in this manner, can be driven by a skilful player.

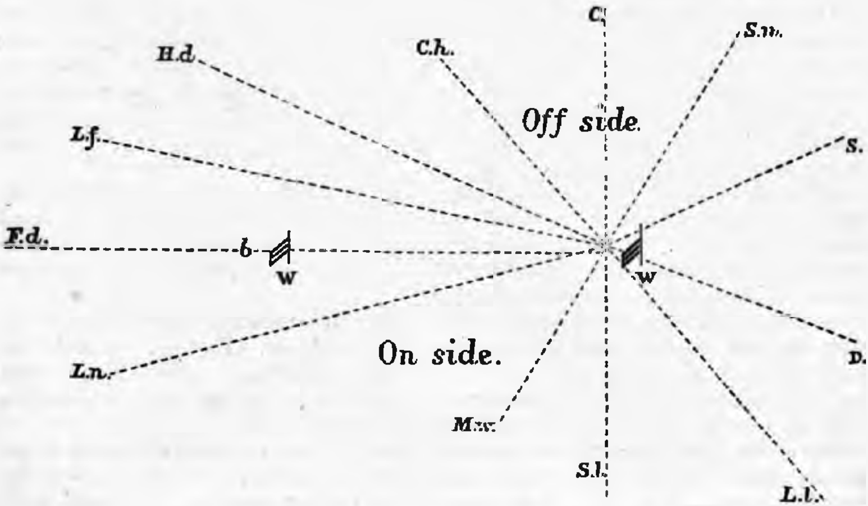
Hitting should be always as *late* as possible, that is, the ball should in most cases be allowed to be level with the body at the moment the bat meets it, because in that way alone the full force of the stroke is expended in propelling the ball; whereas, if the hit be made a little earlier, as is mostly the case with ordinary players, or too late, much of the strength is wasted in the air.

Hitting should be *low*, that is, the ball should be rather sent skimming along the ground than soaring in the air, partly, as may be well understood, for safety, that the striker may not be caught out, and, partly, because in that way, on good ground, the same expenditure of force drives the ball farther than by "sky-hitting."

Sky-hitting is more attractive to the novice, and far more applauded by the uninitiated outsiders, than low ground hitting; but the latter is the safer and the more effective, and therefore indisputably the *correct* method. A dashing, slashing sky-hitter may occasionally, with good fortune, make a good score; but the low hitter is the safe man, and, *cœteris paribus*, will in the long run make better scores.

And, above all things, hitting should be by *sight*, not by *guess*. Too many players, some even among the very best, habitually hit, not at the spot where

DIAGRAM C.



w w, Wickets; *b*, Bowler; s, Slip; *Sn.*, Snick; c, Cut; *C h.*, Cover-hit; *H d.*, Harrow-drive; *L f.*, Long-off; *F.d.*, Forward-drive; *L.n.*, Long-on; *M.w.*, Mid-wicket; *S.l.*, Square-leg; *L l.*, Long-drive; D, Draw.

N.B.—The dotted lines only indicate the general direction of each hit.

they *see* the ball is, but where they think it will be. It is true that, if their calculation be correct, they are thus enabled, by being beforehand with the ball, to hit well away many that would be otherwise highly difficult to get away at all.

A good eye and good judgment may enable a man to pursue this course with considerable impunity, or, indeed, with some success for a time; but it does not pay in the long run: he is sure, in the end, to have his share of "luck," in the shape of "shooters," and against them he is powerless, for he can only hit on the chance of the ball rising.

The ball, too, will constantly, after it pitches, change its direction, or unexpectedly rise higher than ordinary. Fortunate, in these cases, must the guess-hitter be who does not "put up a catch" for the expectant fieldsmen.

Every ball, according to its greater or less accuracy to the distance of the point where it first pitches from the batsman, and to the manner in which it comes in from the pitch—whether, that is, it rise, twist, or shoot—requires a totally distinct method of treatment, a different action of the bat, and a different attitude of the body.

As it would be impossible, as I said above, to figure and describe here in detail every hit upon the ball, the leading and representative hits only have been delineated and described, while the less marked variations have received only a passing, but perhaps amply sufficient, notice.

HITS.—The accompanying Diagram C will show, without need of further explanation, all the hits that are on the ball.

The hit is said to be made *on* or *off* as the ball is driven into the field on the left or right side of the batsman as he faces the bowler.

SLIP.—Properly speaking, slip is not a hit at all, inasmuch as the ball acquires no additional impulse from the bat; it is only from fast bowling that it can in any way be of much effect in obtaining runs. In order to make it, the batsman has only, in case of a rising ball, to let a ball passing a little wide of the off stump (*i.e.*, the stump farthest from the batsman, the others being called "middle" and "leg" (glance from his bat, and, if it have any speed, it will do the rest for itself. He must. however, be very careful, in doing this to a rising ball, to slant the handle of his bat well over the ball, so as to play it on to the ground before it reaches the ready fingers of "short-slip," who else may bring his innings to an untimely close.

FIG. 5.

If the ball be along the ground, the bat should be brought down hard upon it, and more of a hit attempted. This will, in all probability, drive it between "slip proper" and "cut," where the field is generally somewhat unguarded.

If a low or ground ball be some six inches or so wide of the wicket, a modification of the "slip" may be advantageously employed. The striker must wait until the ball is well up, and then, stepping back with his right foot, and facing in the direction of "cut," bring the bat down upon it with a sharp, quick action of the wrists; the ball will fly off in the same direction as the preceding. If well timed and skilfully executed, this hit is most effective. Its technical name, somewhat expressive, but far from graceful, is "snicking."

CUT.—The cut proper (Fig. 6) is not employed so freely now, in these days of round-arm bowling, as it used to be in the olden days of underhand, not because the requisite skill is wanting, but because the present style of bowling does not favour its use; none the less, it is a useful variation to know and to practise, for there are some balls, especially if the bowling be in any degree loose, which can be effectively hit or, in cricket parlance, "made use of" in no other way.

The cut is only suited to a ball somewhat to the off, and should, except by a skilled player, be only attempted with one that is distinctly at least three or four inches wide of the off stump; a ball much nearer to the wicket can be much more safely, and mostly quite as effectively, played with an upright bat.

The cut proper is made by dropping back the right foot towards the wicket, throwing the bat back over the right shoulder, and then lashing at the ball just as it is passing the wicket. Some players, in delivering the cut, employ a quick motion of the wrist: this hit is very neat in appearance, and possesses this advantage over the former, that it can be made more quickly, and therefore allows more time to judge the ball and to guard against accidents; it has not, however, the driving power of the cut proper, and is, therefore, less effective. The cut proper can only be made from a rising ball.

The other variety of the cut is, on the whole, preferable to the above. It is suited to any off ball that "gets up" at all from the ground; it is much safer, as it always offers a straight bat—the great desideratum of all true defence—to any twisting or other dangerous peculiarity of the ball, and at the same time, especially with a tall player, it is little less effective in propelling power. It has this further recommendation, too, by no means to be despised, that it gives the batsman a greater power both of playing down the ball and of "placing" it.

COVER-HIT.—This hit is useful with an over-pitched off ball. Let the young player play hard forward at the pitch, in the attitude of Fig. 3, stepping, of course, slightly across the line of wickets with his left leg, and the hit will result of itself. To avoid accidents in the way of catches, the handle of the bat should be brought well over the ball.

To give full efficiency to this and all similar hits, the bat must be grasped *tightly* in the hand, and the ball not only struck, but pushed vigorously forward by a combined action of the right arm and shoulder, after the manner of a shoulder-hit in boxing.

HARROW DRIVE, OFF-HIT, FORWARD DRIVE, ON-HIT.—A ball is said to be *driven* when it is sent back from the bat in, or nearly in, the direction in which it came; all the above, therefore, come under the category of "drives." They are all the result of the same form of play, and derive their distinct names solely from the direction in which the ball is propelled.

An over-pitched ball somewhat nearer in line of the off stump than for cover-hit, would go for harrow drive; one on, or almost on, the off stump, for off-hit; one quite straight, for forward drive; and one a little to leg (*i.e.*, either in a line with or a little wide of the leg-stump), for on-hit.

If the ball be only a little over-pitched, the hit may be made as in cover-hit; but if pitched well up, so that the point at which it takes and leaves the ground is well within the batsman's reach, he has two choices before him—either, with the full swing of his bat, to pick it up at the "half-volley," that is, just as it rises from the ground—the most effective method of hitting a ball—and lift it well over the heads of all the outlying fieldsmen—a magnificent and telling hit, if successful; or, by stepping a little forward with his left foot, bring his left shoulder well over it, and drive it all along the ground.

The latter of these two, though less showy, is in general quite as effective, and assuredly infinitely safer. They are both valuable in their degree, though to the young beginner the drive along the ground is more particularly commended for practical use. The soaring hit may occasionally be dangerous: the drive along the ground is always safe.

Some players will even go forward to meet some balls, and, taking them at half-volley, make over-pitched balls of them. This, however, is only safe on a perfectly true ground, and hardly even then; for a mistake, it should be remembered, can hardly fail to be fatal. Perhaps the chief peril of this "going-in" lies in its extreme fascination. A successful hit is at once so brilliant and so profitable—for the ball is sent to the least guarded part of the field—that the temptation is almost irresistible to try the same hit again; and in cricket, as in other matters, success has a strong tendency to make men rash. It is extraordinary how many wickets are lost, even in our great matches, through this "going-in." It is, however, a useful variation; and, with loose bowling, piles up the runs at a ruinous rate. Of course, if there be no wicket-keeper, more liberties may be taken.

MID-WICKET HIT is either a variety of the on-hit, and is the result of precisely similar play on the part of the batsman, a little extra wideness of the ball to leg carrying it out into mid-field-on instead of long-on; or it is brought about by the

CAMBRIDGE POKE (Fig. 7)—so called from its invention and principal cultivation being assigned to the credit of the Cambridge players. It is, as will be seen, not a very elegant style of hitting, but, with those who have acquired a mastery over it, it is far from ineffective; but, on the whole, it is scarcely of such utility as to make it worth the beginner's time and trouble spent in learning it—the more so, that almost any ball which can be met by the Cambridge poke can be played with equal ease, accuracy, and success in other and more ordinary forms.

FIG. 7.

SQUARE LEG, like many other hits, may be made in two ways, either by meeting forward, with a straight bat, a ball a little wide of the leg-stump, thus causing it to fly off almost at right angles to its former course, or as in Fig. 8, by stepping out with the left foot, "swiping" round at the ball, the bat pointing directly to the pitch. This latter is a very effective hit, and, if care be taken to hit rather over than under the ball, and thus avoid the fatal error of "skying" it, a reasonably safe one. The same form of hitting will, if the bowling be fast, and the ball be hit a little late, result in LONG LEG. But the surest, safest, most effective, and most brilliant method of hitting leg-balls, specially suited for those pitched well up, is, with both feet planted firmly on the ground, the left about a foot or a foot and a half in front of the right, its toe pointing to the bowler, to swing the body and shoulders round on the hips, and catch the ball with full sweep of the bat just on the point of passing. To do this with fullest effect, the body should be drawn up to its full height, and the whole frame well balanced and set firm on both feet. A slight

FIG. 8.

rise and fall on the toes just at the moment of striking imparts considerably additional impetus to the sway of the bat.

DRAW.—Like "slip," this hit depends mainly for its effect upon the speed of the bowling. A ball on, or scarcely wide of, the leg-stump is met with a full, straight bat, as in the attitude of back play (Fig. 4). A slight action of the wrist, impossible to describe, but easy to exemplify practically, just at the moment of contact, confers much additional life to the ball.

Draw, of course, will only be employed when the pitch and character of the ball render it difficult to make use of it otherwise.

Before we take leave of the subject of hitting, we would again remind the young player that, to be of any continued good service, all hitting, even of the most brilliant kind, must be subordinated to a rigid defence. It is of no use to have the knack of hard hitting, if the first straight ball finds its way to the wicket, and puts a stop to all hitting whatsoever.

Many a fine hitter bewails his *bad luck* in not getting some of that loose bowling he sees an inferior player knocking about at will, when he should in truth blame his *bad play* in not keeping his wicket up, and thus getting the chance that has fallen to another. Let a man only keep his wickets up long enough, he is sure to have a sufficiency of loose balls to afford ample scope for his hitting capacities.

The young player must beware of taking a fancy to one particular hit, and practising that to the detriment of others. All are equally valuable in their place, and deficiency in any one point is certain to tell disadvantageously in the long run. Moreover, a man of one hit soon becomes known; the field is set accordingly, and his speciality completely neutralized; whereas a player with a fair average power of hitting all round is always dangerous, for no arrangement of the field, however skilful, can by any possibility guard every point, and where the field is weak, there will the all-round hitter be careful to send the ball.

The learner should endeavour to find out the *weak* points in his hitting, and endeavour to strengthen them by careful practice and imitation of better players. His strong points he need not trouble about—they will take care of themselves.

And, lastly, let me repeat the injunction to hit hard: try to make every run a six, and it will surprise you how many threes and fours you will make. A hard hitter is always dangerous at a critical moment: in a match, a hard hitter will often save the game, purely by the force of his hard hitting. Therefore, above everything, when you do hit, hit *hard*.

BOWLING.

The art of bowling naturally divides itself under two heads, underhand and round-arm. The earliest bowling was entirely underhand, and so it continued even within the memory of living men. The round-arm at first met with much opposition, but gradually forced its way, until, a few years back, underhand bowling was almost driven from the field, and, except in county elevens, was scarcely to be heard of; but of late years it has come back into favour, and asserts almost an equality with the round-arm, until now no eleven is considered complete without at least its one underhand bowler.

As every cricketer should be able to bowl as well as bat and field, the young beginner should early devote his attention to the subject. His first consideration must be of *style*, whether he will bowl underhand or round-arm. In coming to a conclusion on this point, he must take many things into consideration.

Does round-arm come natural and easy to him? Will he have time for the unremitting, sedulous practice which alone can make him a proficient? and is he likely in after-life to be able to keep it up? If he cannot answer these questions in the affirmative, he will do well to rest satisfied with underhand. There is not so much *éclat* attached to it as to round-arm, especially amongst juvenile players. But it is surely better to bowl in a style which, if somewhat despised, is yet difficult to play, and get wickets, than not to bowl at all, which is the actual position of the large majority of so-called round-arm bowlers. They can *hurl* the ball at the wicket after a fashion which they are pleased to call *bowling*, and may occasionally deliver a good ball, and may often too—for bad bowling makes bad batting—find their way to the wickets; but they cannot *bowl*, and, what is more, they never will.

No bowling is worthy of the name which is not mainly straight on the wicket; and no bowler deserves the name who does not add to straightness accuracy of pitch, and possess the power of varying it at pleasure. Yet what proportion of the so-called round-arm bowlers one meets on every cricket-ground have mastered even this first preliminary of reasonable straightness? while on every village green may any day be seen three or four underhand bowlers, mere country clodhoppers, who will deliver ball after ball dead upon the middle stump, with a certainty of pitch and a regularity of action that would make the fortune of half your amateur round-arm bowlers.

The case, then, rests thus: If the beginner have not a reasonable prospect of attaining fair proficiency in the round-arm, it is better to become an average underhand bowler than to form one of the large army of failures in round-arm—not to take into consideration the possibility of perhaps attaining to a place amongst first-rate underhand bowlers.

The subject has been thus treated at length to impress upon the young reader the importance of making a good choice in the matter of bowling, to prevent his risking a failure where success might otherwise be possible.

Wherever practicable, the advice of older and more experienced players should be asked and acted upon in this choice of style. Where such advice is not to be had, the young player must fall back, as we all must, sooner or later, upon his own judgment; only, when he has made his election, he must, if he hopes to excel, confine himself to the practice of that style, and that alone. Nothing is more certainly fatal to the attainment of true excellence in this department than an ambitious attempt to master two styles at once.

THE BOWLER

A good style of bowling—and the same may be said of batting—is only to be attained by training the muscles of the body into one unvarying system of action; and this can be effected only by continuous practice in one form, and one form alone. The simultaneous practice of two or more styles can only result in another illustration of the truth of the old adage, "Jack of all trades, master of none."

ROUND-ARM.—The bowler must take the ball, not in the palm of the hand, but in the fingers only, the thumb being only employed to retain it in its place. He must then advance, more or less swiftly, according to his style, with a pace half-run, half-walk, and, with a horizontal swing of the arm straight out from the shoulder, launch the ball at the opposite wicket, just as he strides, left foot first, across the bowling-crease.

The ball should not be allowed to leave his fingers all at once, but should be made to roll off them, as it were, receiving just at the last moment of contact a final impulse from their tips. This imparts to it a spinning motion, which, when it touches the ground, will make it fly off suddenly at an angle, just as does a top from a wall, to the great discomfiture of the batsman.

The bowler should accustom himself always to bowl from exactly the same distance behind the wicket (he will find it a useful plan to mark his starting-point with a stick or straw), and should always take precisely the same number of steps in his advance; his body should be erect and well balanced, and his eye fixed steadily upon the opposite wicket: above all, his movements, however rapid, should be unhurried, perfectly steady, and under complete control.

Accuracy of direction is, of course, the first and most important requirement in bowling; but straightness alone will avail little, if attention be not also paid to accuracy of *pitch*.

A ball coming directly from the bowler's hand to the wickets, technically termed "a full pitch" or "toss," is, of all balls, the easiest for the batsman to judge and hit away; and one that takes the ground little more than half-way between the wickets (a long hop) is scarcely less simple.

All that the batsman requires is time, and that the bowler must make it his special care not to give him.

The most difficult ball for the batsman to hit, and therefore the very best for the bowler to send him, is one that pitches from four to eight feet in front of the popping-crease. This distance varies with the pace of the bowling: the slower the pace, the nearer must the ball be pitched to the crease, and *vice versâ.* It varies also with the height and style of the striker: a tall player with a good forward reach leaves the bowler no option but to pitch shorter.

Balls pitched within these limits are called *length*-balls.

The learner will find it good practice to mark, with a piece of paper or a dab of chalk, the exact spot on which his ball ought to pitch to be a good length, and steadily set himself to acquire the art (for it is to be acquired) of dropping the ball either upon or close upon this mark with unvarying certainty.

However simple his style may be in other respects, this accuracy of pitch and direction will always render him formidable to any batsman.

In bowling, it must be kept in mind that every batsman has his strong and weak points: one man, for instance, is a hard leg-hitter, but weak in defending his off stump, while another can play well forward, and another only back; and the bowler must give his whole mind to find out these strong and weak points, to avoid the one, and persistently attack the other.

There is one maxim more for the bowler, perhaps the most important of all. "Always pitch as near to the striker as he will let you." The nearer he allows the ball to pitch without hitting it away, the less time does he get to judge it after the pitch. If he allow it to come too near, his play is cramped and his hitting powers paralysed.

A really first-class bowler will, to this intent, pitch nearer and nearer to the batsman, creeping in inch by inch, until he finds out the exact spot beyond which he dare not go, and, having thus decided it to his satisfaction, will methodically settle down to work upon it with undeviating pertinacity, until the fall of the wicket crowns his labours.

Men have been known, in this manner, to wear away the turf in a bald patch, by the reiterated pitching of the ball in the same spot.

The bowler will find it well to study the art of varying the speed and the curve with which the ball passes through the air, without making any corresponding visible change in his action. Nothing is more deceptive, and, therefore, more fatal to the batsman, than a judicious unexpected variation of pace.

The great art consists, not in *constant* changes—for then the batsman is on the alert--but in allowing him to get used to one particular pace, and then, with the second of two balls, following each other in rapid succession (it loses half its effect after a hit), suddenly increase or slacken the pace: the fall of many a wicket will reward this manœuvre. Only it must be borne in mind that the attempt must not be too often repeated, or it will defeat itself. Nor must the change of pace be too palpable, for the sole object is to catch the batsman unawares.

A very slight increase or decrease of velocity is quite sufficient for all purposes; the change, too, is thus less easily detected, and therefore infinitely more deceptive and destructive, than more extreme variation.

UNDERHAND.—The above observations, so far as the *art* of bowling is concerned, will apply equally well both to underhand and round-arm. It will not, therefore, be necessary to offer any extended observations upon underhand as a speciality.

It is in the delivery of the ball only that the distinction between the two styles lies; and all the above directions hold good, with the exception that, in the act of launching the ball, the arm swings perpendicularly from the shoulder like a pendulum, instead of being swung round horizontally. All the directions as to pitch, &c., apply equally to both.

The beginner need not think that, in taking up underhand, he must of necessity sacrifice pace. "Underhand" and "slows" are not necessarily convertible terms. There was very fast bowling to be had long before "round-arm" was even thought of; and at this present time may be found in all parts of the country many an underhand bowler whose pace need not shrink from comparison with that of any but the very Tarrants and Jacksons of the round-arm school.

BIAS-BOWLING.—Bias-bowling, if good, is not only hard to hit, or even to stop; it has in addition a great knack of flying off the bat in unexpected directions, and so giving "chances" to the field, the chief places of danger being at the wickets and "point;" it is very difficult, too, to hit effectually without in some sort "skying" the ball; and as the field (see Diagram C, p. 136) is mostly in front of the wicket, the ball can scarce escape being caught.

The bowler should take special care to make the out-fielders stand *deep;* it is a common fault to stand in too near, and thus not only runs, but many catches, are lost: and, above all, a bias-bowler must himself be almost ubiquitous between the wickets to field his own bowling.

It would be very difficult to describe, in a thoroughly intelligible manner, the various methods by which bias is imparted to the ball; but, though difficult to describe, the peculiar turn of the wrist and play of the fingers is wonderfully easy to exemplify practically, and almost as easy to acquire. The difficulty lies in combining the bias with accuracy of pitch: any cricketer could furnish the requisite information, and to such source must I refer the young aspirant to bowler's fame.

As long as the ball, in passing from the bowler's hand, deviates neither to the right nor to the left from the right line, but depends solely for its efficiency upon its pitch and straightness, a "good bat" will find comparatively small difficulty—on good ground, that is—in defending his wicket; but, if it can be made to fly off from the pitch at an angle more or less decided, its dangerous qualities will be enormously enhanced.

Most bowlers in some sort impart this bias or twist to the ball; but there are many—and the number is rapidly increasing—who concentrate their attention almost solely upon this one quality, as, for instance, Old Clark, in days gone by, and V. E. Walker, E. M. Grace, R. C. Tinley, &c., in our own times.

Space would fail me to enter fully into the subject of screw-bowling: a few short hints must suffice.

First, as to *pace.* Medium pace possesses a great advantage over fast, in the power it gives the bowler of varying the curves with which it passes through the air, and thus deceiving the batsman by altering the pitch without his perceiving it; for he naturally, at first sight, expects a ball that rises high in the air to come farther than one of lower flight, and may often be thus led into fatal error.

But it is in bias-bowling that the superiority of medium pace chiefly lies. Of absolutely slow bowling I do not speak; for on good ground, and against anything like scientific and hard-hitting batting, it is the most egregious failure possible, and, indeed, any player with a good eye and a strong arm may do with it pretty much as he will; therefore, I at least will none of it. In very fast bowling the ball merely glints on and off the ground so rapidly, that any spin it may have upon it has hardly time to act, whereas a slower ball not only gives more time for the ball to "bite" the ground, but, falling more perpendicularly, actually takes the ground in a more advantageous manner.

The slower the ball, then, the more effective will be the bias; but pace and bias combined are the great desideratum, and each bowler must find out for himself the point at which he obtains most effect; only be it remembered that any very exceptional twist—save, perhaps, now and then as a surprise—is quite unnecessary, nay, even undesirable—a break of a few inches, six or seven, being quite sufficient for all ordinary purposes.

A ball is said to "break in" when it pitches to the leg side and turns in towards the wicket, and to "break back" when it pitches to the off side and comes in. The latter is by far the more dangerous bias, and a man who has such a command of the ball as to make it "break in" or "back" at pleasure may do pretty well what he likes with the batsman; only be it remembered that the most perfect accuracy of pitch is indispensable to success. Loose bowling is always bad: in fast bowling the very pace may prove its safety; but, with medium pace, pitch alone can yield it immunity from punishment.

Fielding.

The art of fielding, though of no less importance than that of batting and bowling, and an acquirement of paramount and vital necessity to the would-be cricketer—without which, indeed, cricketing itself would cease to be—yet it does not, for its due inculcation, demand or, indeed, admit of the same extended and detailed instruction as has been above bestowed upon these, its compeers.

With the single exception of the wicket-keeper, and perhaps in some degree also of the long-stop, it makes little or no difference to the player, so far as the theory of the art is concerned, what place he may take in the field. "Out-fielding," it is true, makes greater demands upon one set of qualities, as speed and hard throwing, and "in-fielding" upon another; but, in all, the duties required are the same—to stop the ball, catch it if possible, and return it with all speed to the wickets; and, in performing these three functions—whether the player be far out in the field or close in to the bat—his action and attitude will be, and must of necessity be, the same.

A short general summary, therefore, of the various methods of practical fielding—of catching, stopping, and throwing—and a few concise details as to the special peculiarities of the several places in the field, will be all that the young learner will need to set him in the way of at least making a beginning in this indispensable art.

Catching.—The ball may be caught either with one hand or two: the latter is, of course, the easiest and safest way. To catch with both hands, it is well to wait till the ball is just within reach, and then thrusting out the hands well forward, with the fingers extended, to receive it into them as into a bag or net, at the same time allowing the hands to yield, more or less, in proportion with the speed of the ball.

The hands should not be extended too soon, or the arms become rigid and less able to bear the shock of the ball: it is less easy, too, to correct any error that may have been made in judging the flight of the ball. A golden rule in all catching is to hold the hands in readiness, and dart them out from the side at the very last moment.

If the ball come in lower than the chest, the hands should receive it as in a cup, palms uppermost, little fingers together and slightly overlapping: if it come above the chest, the hands must be formed in the same manner; but the thumbs must now be brought together, instead of the little fingers, and the fingers must point upwards.

Great care must be taken never to allow the fingers to point in the direction in which the ball is coming, under penalty of risking highly unpleasant fractures or dislocations.

In catching with one hand the same general principles will apply: the ball should be received well into the palm.

The beginner should specially study catching, and indeed all points of fielding, with the weaker hand; the other is sure to go right.

STOPPING.—A ball stopped in mid-air comes under the category of catches, for which instructions are given above. In stopping a ball along the ground, the player must, if possible, get in front of the ball, and, just as it reaches him, draw his heels together as in the position of "attention," and reach down suddenly to it—his hands in the first attitude given for catching, the fingers being pointed to the ground; the very motion of the ball will help to close the fingers upon it. The main difficulty here is to *time* the ball—a difficulty only to be overcome by practice.

The beginner must also learn to pick up the ball, in like manner, in the right or left hand as it passes him, to run across the path of a ball at an angle, and stoop and pick it up without stopping, to take the ball at half-volley, *i.e.*, just at the bound within a few inches of the pitch (a very difficult matter), and to throw it in. Many other ways will naturally occur to him in practice. which need not be more particularly dwelt upon here.

One rule of good fielding requires specially to be dwelt upon. When the ball is sent towards any fieldsman, he must not wait for it to reach him, but must run swiftly forward, scoop up the ball without stop or hesitation, and, continuing his run towards the wicket, send it in sharply home. As every second lost in the field is so much added to the batsman's chance of a run, so every second saved is so much taken from it, and so much pure gain to the outing side.

THROWING.—The out-fielders will, of course, throw in the usual way (it need scarcely be described); but the in-fielders should practise a quick, sharp, underhand throw.

In all throwing, there are two objects to attain—one to get the ball in as quickly as possible, and the other to send it in in the manner most convenient to the wicket-keeper; both these requirements are fulfilled when the ball is sent as straight, *i.e.*, with as little curve in the air, as possible to the top of the stumps. If the distance be too great to do this with certainty, it should be made to pitch some ten or fifteen yards from the wickets, and so come in a long hop.

Accuracy of return to the wickets is one of the first requisites of good fielding, and should be cultivated accordingly.

All "wild" throwing is to be eschewed; but, above all, let the fieldsman beware of throwing in to the wicket-keeper's toes, which is, of all bad ways, the very worst.

The young player must not think, as it has been too much the fashion of late to think, that good fielding is of less importance than batting; still less must he fall into the habit of those half-hearted cricketers, unworthy of the name, who look upon all fielding as a *bore.*

Let him bear this in mind, that "a run saved is a run gained."

Now, the very best bat is never sure of *making* even a single run, while even a moderate field is certain to *save* a great many; so that, comparing a good "field" and a good "bat" together, the "field" will generally in the long run be found to have been of most service to his side.

Fielding, moreover, is first-rate practice for batting, so that the young player need not suppose that all the time he devotes to the one is taken from the other; while, on the contrary, practice in batting is of next to no assistance in fielding.

Let the young cricketer's first ambition be good fielding and bowling, and the batting will follow as a natural consequence.

In discussing the specialities of various places in the field, the accompanying diagrams, D and E, show the field placed for fast and slow bowling respectively. More than the usual eleven places are given in each, to allow for the changes that may be necessitated by peculiarities in the bowling or batting.

LONG-FIELD requires quick running, hard throwing, and certainty in catching balls hit hard and far through the air. To be of any real service, long-field must be able to "cover a great deal of ground," that is, be ready and active in his movements, so as to make it impossible for a ball to pass on either side nearer than 20 or 30 yards, or to make one falling anywhere within that distance a certain catch.

He must stand well out, that the ball may not be hit over his head: no greater mistake can be made than standing too far in. A good field can stand a surprising distance out, and yet save the second run: he is not placed to save the one, and so need not trouble himself about it.

To stand well out, watch the ball, and be ever on the alert, are the chief requisites of a good long-field.

The same remarks apply to all the out-fieldsmen. Cover-point and long leg will find that the ball, when it takes the ground, has a tendency to curl or twist at a sudden angle, and in both cases in the direction of the long-stop; that is, with cover-point, a ball coming to his right, might break away and pass to his left, while with long leg a ball coming to the left might pass to the right. The same holds good of point, third man, the slips, square leg, and draw.

In all these places, therefore, the player must be on the look-out for this peculiarity, and be prepared to meet it, or the ball will assuredly elude him like magic, and he will find, to his shame and confusion, that he has "muffed" it.

POINT.—This is one of the most important places in the field; with some bowling, the most important.

A good deal of misapprehension exists about the place and duties of point. The real fact is, they shift and vary with every change of bowling and every change of batting.

With some bowling, point plays close up in front of the bat, with others almost in the place of short-slip, while fine off-hitting, unless the bowling be exceptionally true, will drive him right away out into the field.

Point's distance from the bat must be left to the judgment of each individual player. Some are quicker at catching, and can, therefore, stand nearer

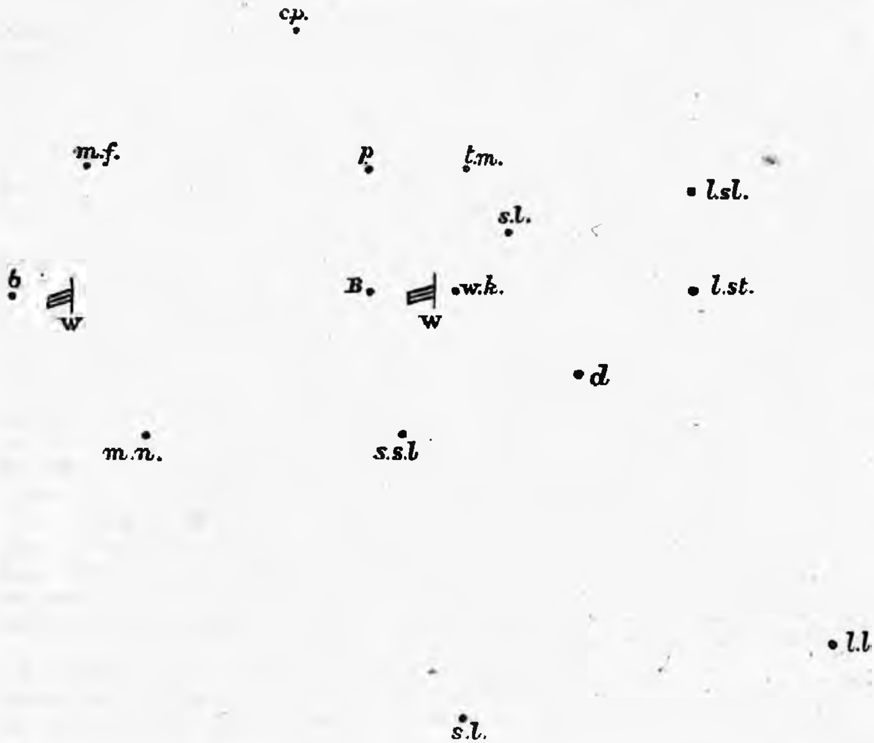


DIAGRAM D.
FAST BOWLING.

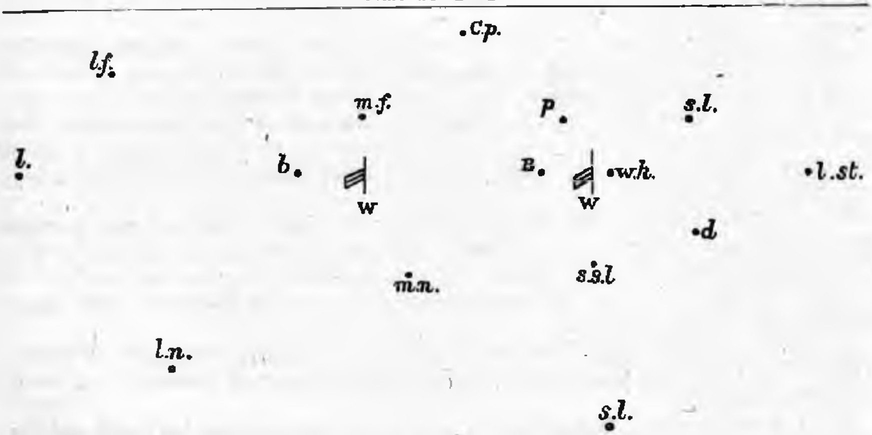


DIAGRAM E.
SLOW BOWLING.

W W., wickets; B., batsman; *b.*, bowler; *w.k.*, wicket-keeper; *l.st.*, long-stop; *sl.*, slip; *l.sl.*, long-slip; *t.m.*, third man; *p*, point; *c.p.*, cover-point; *m.f.*, *m.n.*, mid-wicket, off and on; *l.*, long-field or cover-bowler; *l.f.* & *l.n.*, long-field, off and on; *s.l.*, square leg; *s.s.l*, short square leg; *l.l.*, long leg; *d.*, draw or short leg.

in than others. A man's sight, too, varies quite sufficiently to make a perceptible difference from day to day; one might almost say, from hour to hour.

Point cannot make a greater mistake than by standing in nearer than he can see to catch with certainty. The catches he might by possibility lose by standing farther out will be more than compensated for by the increased number of runs he will be enabled to save.

Point and all the near-fieldsmen must watch the ball all the way to the bat, and hold themselves in readiness to spring to either side, or up in the air from either foot, without an instant's thought or hesitation, or to dive down and stop the ball, as it comes spinning and curling off the bat, with both or either hand indifferently.

Great alertness, activity, and concentrated attention are indispensable qualifications of a near-field.

LONG-STOP has a great burden laid upon his shoulders; for not only has he to stop and return every ball that passes the wicket-keeper—no slight labour in itself—but every mistake he makes, with sharp men at the wickets, counts one or more against his side.

His vigilance, therefore, must never for one moment tire or slacken: though all the rest of the field take it easy, he alone and the bowler can know no relaxation or remission.

With good ground, true bowling, and fair wicket-keeping, the long-stop's post need not be a very hard one; but should there be failure in any one of these items, especially the two former, his place at once becomes the hardest and most responsible in the field.

In any case he must study to field every ball "clean," that is, to take it at once into the hands, without any fumbling or clumsiness. A ball fumbled is a safe run, if the striker be only on the alert.

To be really good at long-stop, a man should be able to pick up a ground ball as it passes, with either hand, right or left, with the same ease and certainty as he would with both.

Instant return to the wicket-keeper should be invariably practised. Dallying with the ball not only wastes time—of which, in most matches now-a-days, there is not too much—but it very often gives a chance of a run, and it certainly encourages the striker by a show of slowness in the field.

THE WICKET-KEEPER.

WICKET-KEEPER stands close behind the wicket, in a stooping posture, the right foot advanced and close upon the wicket, the hands held in readiness for the ball just in rear of the bails, the head brought down till the eyes are within a foot at most of the top of the wickets.

The ball, as it is taken, should be invariably, and as part of the same action, brought to the bails, so that a mere turn of the wrist may take them off should the striker offer the least chance of a "stump out."

Every ball that *can* be taken should be taken, if only for the sake of saving the long-stop; but the wicket-keeper will do well to exercise a little discretion with balls that are almost out of reach, since, if he fail to handle them satisfactorily, he may, instead of stopping them, only succeed in deflecting them from their course, and thus, perhaps, send them out of the reach of the long-stop too.

If the long-stop knows beforehand that balls passing outside a certain point will be left to him, he will find no difficulty in meeting them.

Great care must be exercised that too great eagerness in taking the ball do not lead the wicket-keeper into violating the 35th rule.

When the ball has been hit, or in any other way a run is being attempted, the wicket-keeper must at once place himself so that the wickets are between him and the ball. This enables the fieldsman to detect at once the whereabouts of the wickets—a very important point—and also gives the ball, if well thrown, a chance of hitting the wickets before it reaches his hands.

This rule of getting behind the wickets, though of the first importance, is one that is more commonly neglected, to the loss of many a good "run-out," than it is observed; it requires, therefore, to be the more strongly impressed upon the young learner.

A few words of parting advice. Whatever place is taken, whether batting, bowling, or fielding, the player should give his whole mind to the duties and responsibilities thereof.

The companion of the striker should remember that the score depends almost as much upon his promptitude in backing up, as on the hitting powers of his *vis-à-vis*.

In running, the first run should be made with rapidity and decision, the bat grounded just over the crease, and the body turned and held in readiness for the next, should the chance occur. The runner should never overrun his crease, unless in the last extremity; the bat in is quite sufficient.

The yard or so thus gained in turning may make all the difference between a run made or a wicket lost.

At practice the young player is earnestly exhorted to eschew all loose knocking about of the ball: wherever and whenever practicable, sides should be chosen and a game made.

The really useful practice for batting, and for bowling too, though in a less degree, is in actual playing for runs.

If sides be not to be had, the bat and ball had better be resigned to those who are less patient of advice, and a good spell taken at long-stopping or other fielding.

Loose practice forms loose habits, and it is easier to form a dozen new good habits than to break through one bad one already formed.

The game should be always played with full vigour—umpires, creases, &c.; in this way, observance of rules becomes second nature.

The decision of the umpire, however it may go against the grain, should always be obeyed at once, and without comment; remonstrance, if any be needed, is the part of the captain of the side.

Last, though perhaps not least, whatever be the player's fate—run out, caught, bowled, stumped, even if it be first ball—he should. above all things, keep his temper. An easy temper is a tower of strength.

Indoor Games.

WE now turn to games which may be played indoors. Of course, many of them may be played, and are played, out of doors; but as they can be played under shelter, they are here mentioned, so that in wet weather the boys who read this work may know how to find amusement.

GAMES WITH MARBLES.

We will begin at the beginning, and describe the marble itself. This toy is seldom now made of marble, only a few, which are called "alleys," being made of different coloured alabaster. These are the most valuable, and are always reserved to be used as "taws," *i.e.*, the marble actually used by the players. In our younger days, a pure white alley with delicate pink streaks was considered the very best taw that could be procured, and we used to place an almost superstitious reliance on its powers.

Next to the alley comes the stone marble, or "stoney," which is made of some hard stone, and which is generally as round and smooth as an alley, though not so pretty. Stoneys are often of different colours, though a plain grey is perhaps the best. They answer very well for taws.

Next come the common or clay marbles, which are only made of clay rolled into a sort of roundness, and then baked. They are usually called "commoneys," or "clays," and can be bought at a very cheap rate. There is also a very large marble, mostly of pottery-ware, nearly as large as a tennis ball, and painted of different colours. This is called a "bounce," or "troller," and is of little real value, not being used in the legitimate games, and being too large to be properly "shot."

Shooting the Marble.—We lay great stress upon this point, as the proper mode of holding and shooting the marble seems to be sadly neglected. Boys have got into a lazy way of throwing or bowling the marble, a practice which was not allowed "in the days when we were young." We had to "knuckle down" fairly, and if the hand moved forward, the opponent would not allow the shot to be a fair one

In order to hold the marble properly, place the hand as shown in the illustration; the tip of the thumb being held under the bent middle finger, while the marble rests upon the tip of the finger and the joint of the thumb. By flinging out the thumb with a sharp movement, the marble can be sent to a considerable distance; and in a short time the young player will be able to aim very truly with it. Some boys have a stupid fashion of holding the marble in the bent joint of the forefinger, but those who do so cannot send it to any distance, or with a true aim. We used to call such boys "muffs," and to laugh at them so much, that they soon learned to hold the marble properly.

In shooting the marble, the hand ought not to move forward in the least, and if it does so the opponent has a right to make the player take the shot over again. Moving the hand is called "fubbing," and we always used to enjoin "knuckle down, and no fubs." By "knuckling down" is meant placing the knuckle of the forefinger on the ground, and not lifting it until the marble has left the hand.

In our opinion, the king of all games at marbles is RING-TAW, provided that it is played fairly and according to rule, as, indeed, all games ought to be played.

All that is required in this game is a moderately level surface of tolerable size, and whether the floor be boards, gravel, stone, or cement, does not matter in the least. Any number can play at it, but when there are more than four, the game is apt to be rather tedious. Suppose that four players are engaged, they proceed in the following manner: They first draw a circle on the floor, if possible using chalk for the purpose, because it makes no groove and shows out plainly. Each player then puts a marble in the ring, arranging them at equal distances from each other. Sometimes the player who begins is obliged to put another marble in the middle of the ring. A straight line is then drawn on the floor at some six or seven feet from the ring; and from this line, which is called the "offing," "bar," or "baulk," the players have to start.

The game begins by knuckling down on the offing-line, and shooting the taw at the marbles within the ring. If one of the marbles be knocked out of the ring, the player may take it up and shoot again, not returning to the offing, but knuckling down at the spot where his taw rests.

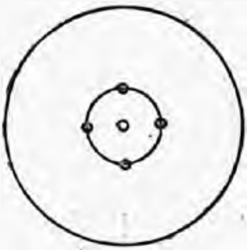
As soon as he fails to strike a marble out of the ring, the next player begins, and so on in succession until the ring is cleared.

This, however, is not the whole of the game. If the taw of any player remain within the ring, he is called "dead," and is out of the game. He has, besides, to put into the ring all the marbles which he has won, and one also by way of fine. If, however, the player shoot the last marble out of the ring, and his own remain within it, he does not lose, because the fact that the ring is empty shows that the game is over. Again, if one player can shoot at and hit the taw of another, he "kills" his antagonist, who is obliged to hand over all the marbles which he may have won in the game. If a player kill the last opponent, he not only takes his marbles, but gets all those that are left in the ring.

There is much more skill in this game than is generally thought. A good player will not content himself with merely hitting other marbles, but takes care *how* he hits them. For example, he will shoot at a marble in the ring, and strike it so as to lay his own taw near that of an adversary, whom he can kill. Or, if he be tolerably near another taw, he will hit it in such a manner as to bring his own taw near the ring. Then, great judgment may be shown in placing the taw out of danger, and yet near enough to the ring to give a good chance.

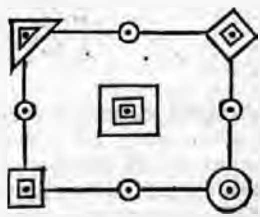
As having the first shot is a great advantage, the players "lag" for it, *i.e.*, they shoot from the offing-line, and try to put their taws in the middle of the ring. Whoever is nearest to the centre wins the first shot.

Another method of playing this game is by having two rings, one of six feet diameter, and another of one foot diameter; the little one inside the large one.



In this game the players are allowed to start from any part of the outside circle. The game is played exactly as the last-mentioned, but with one difference. No one is allowed to kill an adversary until all have had one shot. The reason of this rule is, that the last player would otherwise have the best chance, because the other players would probably leave their taws so close to the line, that they could be easily hit and killed before they have had a fair chance.

FORTIFICATIONS.—This is a variety of ring-taw, and is mostly played in France. Instead of a simple ring, the ground is marked out as shown in the illustration, and the players try to knock the marbles fairly outside the lines.



Each player may start from either of the outside lines, and must make his first shot at the marbles in the "fortress," *i.e.*, the oblong figure in the middle. As in ring-taw, if his marble remain within the fortress, the player is dead, and places in the fortress all marbles which he has won. In some places he is obliged to leave his own taw within the fortress, and to pay the marbles to the player who drives it out of the lines. He has also to pay another marble as ransom for his taw.

PYRAMIDS.—This is a good game for teaching accuracy of shooting.

A rather large ring is made—say three feet in diameter—and in the middle are four marbles, three put closely together, and the fourth on the top, so as to form a pyramid.

One player is called the banker, and puts the four marbles into the ring. The other players then shoot at the pyramid in succession from a spot agreed upon by the banker and the players. If they hit it, they receive as many marbles as they can knock out of the ring; but if they miss, they forfeit one to the banker for each shot. When all the marbles are shot out, another player becomes banker, and so on until all have had their turn.

In some places the banker sits on the ground, with his feet widely apart and the pyramid between them. The other players shoot at the pyramid at a stipulated distance, and pay the banker a marble for each shot. If they knock down the pyramid, they get all the four marbles, but do not have the marble which was paid for the shot. Therefore, a player who wishes to win at this game ought to be tolerably certain of hitting the pyramid every other time.

DIE-MARBLE.—This game is not very unlike the last. Two marbles are used, one of which is rubbed on a stone until it becomes a perfect cube, like a die. The other is only slightly squared, so as to form a support for the die. One player takes charge of the die, and allows the others to shoot at it from a certain distance. He receives one marble for each shot. If the die be not overthrown, the player loses the paid marble; but if he can succeed in knocking it over, he receives one marble for each spot on the uppermost face of the die.

It is better to procure an ivory die than to make one out of a marble. It is very difficult to make a perfect cube, and if one side be a little smaller than the others, it is nearly sure to come uppermost.

We do not think very much of this game, because there is too much chance in it. An indifferent player, who only hits the die once in six shots, may win six marbles, because it falls with the six or "size"-side uppermost; and a good player, who hits it five times out of six shots, may only win five marbles, because the "ace" or one-side of the die happens to come uppermost. Still, as the game is in use in some places, we have inserted it.

BRIDGE-BOARD.—This is another game which is arranged on the same principle as the last, but which is a better game, because there is more skill and less chance. Instead of the pyramid or die-marble, the banker has a

little bridge, such as seen in the illustration. Nine little arches are cut through it, each being large enough to allow a marble to pass through easily. The arches are all numbered from 1 to 9, the lowest numbers being always in the middle, and the highest outside.

The players shoot at the bridge from a given distance, paying the banker one marble for each shot. If the taw pass through either of the holes (or arches), the player receives from the banker a number of marbles equal to the number which is written over the arch. If the taw should not pass through an arch the player receives nothing, and if he miss the bridge altogether, he pays another marble as a fine.

In order to win the prize, the taw must pass completely through the arch. The method of testing whether the taw has fairly passed, is by taking a knife-blade, or a straight piece of wood, and scraping it along the outside of the bridge. If it touch the taw in the least, the player is considered to have missed, and wins nothing.

The banker generally wins at this game.

PICKING PLUMS.—This game is identical with bridge-board in principle, but can be played without any bridge. The banker draws a line on the ground, and lays nine marbles, or "plums," on it in a row, the space between them being just wide enough to allow two marbles to stand side by side. The players pay the banker three marbles for six shots, and shoot out the "plums" from a stated distance, keeping all those which they can knock off the line.

Sometimes there is no banker, and then the players put on the line one or two marbles each, as the case may be, and then go on shooting until they have picked all the plums. This is not at all a bad game, as it teaches accurate shooting, and the players are not afraid of being killed by their opponents. It used to be a favourite in our early days.

THREE HOLES.—This game used to be very popular at one time, and is not a bad one when the ground is level, and when there are no large stones or other obstructions.

The players make three little holes in a row, each hole being about two inches in diameter and one inch in depth, the distance between them being three or four feet, or even more, if the players are skilful. A line is drawn about a yard from the first hole, and answers the purpose of the offing or baulk-line in ring-taw. The players knuckle down fairly at the baulk-line, and

try to shoot their taws into the first hole. If a player succeed, he may try for the next hole; and the player who puts a taw into all three holes wins the game and takes all the remaining marbles.

After the players have secured the first hole, they may shoot either at the next hole or at the taw of an antagonist; and if they hit him, he is put out of the game and has to forfeit all marbles which he has won.

The stakes are managed differently in different parts of England. In some places each player has to deposit a marble for each hole, and this we think to be the fairest mode. The marbles are put into another hole called the bank, and taken out when won. If a player be killed, he forfeits to his successful opponent all the marbles which he has won; and if he has not won at all, he pays one marble as a fine.

Although a player who has not gained the first hole cannot kill an antagonist, he is at liberty to shoot at any taw so as to drive it away from a hole near which its owner has placed it. A good player will therefore take care, not only to place his own taw in a good position, but will drive away those of his opponents which have been placed near either of the holes. It sometimes happens that a boy wins the game by taking all the three holes in succession, and sometimes by hitting all his adversaries in succession, only taking the first hole. Generally, however, the game is won by a judicious combination of taking holes and killing opponents.

There is, perhaps, no game which is played in so many ways as three holes. It is in use in almost every school in England, and in almost every school upon by the banker and the players. If they hit it, they receive as many marbles as they can knock out of the ring; but if they miss, they forfeit one to the banker for each shot. When all the marbles are shot out, another player becomes banker, and so on until all have had their turn.

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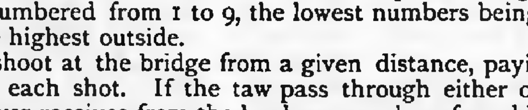

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There is, perhaps, no game which is played in so many ways as three holes. It is in use in almost every school in England, and in almost every school there are different ways of playing it. That which is already given is the most common, but we will mention one or two variations.

In some places, when a player has gained the first hole, he can make his opponents place their taws successively in front of the first hole, and then shoot at them from the offing. If he hit the first taw, its owner is killed, and the next in order has to put his taw in the same place. If he miss, the next player goes on from the offing as usual.

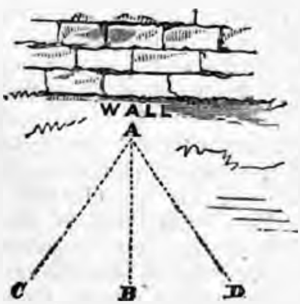
Another variation requires that the winner shall hole his own taw nine times. In this mode of playing the game, each player puts down two or three marbles, as the case may be, and then shoots from the offing-line. If he win the first hole, he may put his thumb into it, and stretch the little finger of the same hand as far as he can towards the second hole. This is called "taking a span." If he can thus gain all the three holes, he goes back again, and so on until his taw has been holed nine times. The player who first succeeds in doing this wins all the marbles.

In this variation of the game there is no killing of adversaries, but it is lawful, after gaining a hole, to shoot at any taw: if it be hit, the shooter goes on again from the place where his own taw stops. Thus the player gains a double advantage from hitting an adversary's taw: he drives it away from the hole, and places his own in a favourable situation.

SPANNERS.—This is a very simple game, and is only played by two opponents. The first shoots his marble to the distance of a few yards, and the other tries to strike it with his own. If he can succeed in doing so, he wins one marble. But there is another point in the game. If No. 1 can place his taw so close to that of No. 2 that he can span the distance between them with the fingers and thumb of one hand, he wins the marble just as if he had hit it. Attempting the span, however, is rather a dangerous plan to follow, as, if it fail, the antagonist is sure to be able to place his own taw so as to secure a span.

Sometimes this is played with the large marbles called "bounces," or "bonses," which are as large as tennis balls, and are bowled instead of being thrown. We do not, however, recommend the bounces, and think that they have no right to be considered as marbles at all. They are, in fact, nothing but small earthenware bowls, and are used in precisely the same manner.

LAGS.—This is another game at marbles which bears some resemblance to the preceding, chiefly because the span is introduced.



In this game three or four players take their stations opposite a wall, and the first player shoots or throws his taw at the wall, so as to make it rebound. The next throws his taw in a similar manner, and if it rest within a span of the first taw, its owner wins a marble. They all play in the same manner, always throwing the taw from the spot on which it rests, and making it rebound from the wall. If it should happen to hit another taw as it rebounds, the owner of the struck taw has to pay a marble. In some places, however, when a taw is struck its owner is killed—is put out of the game—and has to pay to the owner of the victorious taw all the marbles which he may have won in that game.

This pastime is called by various names in different parts of the country.

and we have chosen that particular title under which we ourselves used to play it. We do not think very much of lags, but it has the advantage of teaching angles, and so of training the eye to observe. Of course the ground in front of the wall ought to be very smooth.

CONQUEROR.—We describe this game, because it is played in some places, but we cannot recommend it, as it calls forth very little skill, and depends upon the accidental qualities of the marble rather than on the skill of the player.

In this game a smooth and rather hard piece of ground is selected, care being taken that it is free from stones. The first player now lays his taw on the ground, and the second throws his own at it with all his force. If he succeed in hitting it and breaking it, the owner of the broken taw pays him a marble, and the winning taw is called a Conqueror of One, one of the halves of the broken taw being taken as a proof, and the other half smashed by its owner in order to prevent it from being used as a trophy.

Sometimes it happens that the marble which is thrown at the other is broken, and then great is the rejoicing of the winner.

Then comes a curious point. Any taw which breaks another is entitled to add to its own score all those which the vanquished taw had previously broken, together with the addition of one for the taw itself. Thus, supposing that your taw, which had conquered thirty, were to break mine, which had also conquered thirty, yours would take rank as a Conqueror of Sixty-one, *i.e.*, my thirty added to your thirty, and one for my taw besides. I have also to hand over all the half-taws which my broken taw had previously won.

Boys often play this game with different materials, among which the most popular are chestnuts and cobnuts. A hole is bored through the nut, and a string is passed through the hole and secured by a knot. A jacket is then folded up, and placed on a bench or on the ground, and each player successively lays his nut on the jacket, and allows the others to strike it. Perhaps some of my readers may remember a humorous sketch of sailors just paid off indulging in this game, but using watches instead of nuts.

In the spring and summer conqueror is often played by means of the plantain-stalk, each player trying to cut off the head of the other's plantain with his own. There is some little amount of knack required in this game, as a properly-delivered stroke will often conquer a stronger stalk, just as a smart blow from a stick will sever a stout branch. In this game the chief point is to bring down the plantain with a smart whip-like stroke, drawing it towards you as it descends. The thickest stalk is seldom the best, as it is mostly very green, well nurtured, and soft. Choose a long thin stalk that has grown in a dry place, and you will find it so tough, that after it has been fairly broken across, the fibres will not yield, but become twisted into a sort of rope, and will stand almost any amount of ill-treatment.

There are other games at marbles, such as tipshares, bounce, teetotum, &c., but we do not describe them, because we hold them to be utterly unworthy of attention. The first of these games consists in throwing a handful of marbles at random into a hole, and seeing whether the number is odd or even. The second consists in dropping a bounce on a heap of marbles, and keeping all that are knocked out of a small ring. The third is played by spinning a teetotum, and by taking as many marbles as accord with the number which happens to come uppermost. There is not the least skill in any of these so-called games, which are, indeed, only an introduction to gambling. So we advise our readers to have nothing to do with them.

We conclude with a few words of practical advice.

We have always held to the opinion that in no game ought marbles to be projected in any other way than by fair shooting. Shooting is not only the most correct, but by far the most certain method of projecting a taw. The skill that is needed does not take long of acquirement, and when once acquired, it never forsakes its owner. The knuckle of the forefinger resting on the ground gives a steadiness to the aim which can never be acquired as long as the hand is allowed to move in the slightest degree; and it is really beautiful to see a well-shot taw describing its arc of a circle, and descending plump upon the marble at which it is aimed.

When we began to write this treatise on marbles, we had not touched a taw for some fourteen or fifteen years; yet, our right hand had not forgotten her cunning, and after a few minutes' practice, we were able to clear a ring of its marbles with as much precision as when we were acknowledged one of the kings of the marble-ground.

Here are a few hints on taw-shooting. Do not aim directly at the marble, because you are always apt to use a little too much strength, and then the taw flies over the marble, and misses it altogether. Aim at the ground about a quarter of an inch in front of the marble, and then you will seldom miss. Even if you should strike the ground half an inch short, no harm will be done, the taw being sure to touch the top of the marble as it leaps from the ground; and, if you should shoot a little too low, your taw will alight plump on the marble, and drive it to a distance. If you can possibly avoid it, do not let your taw *roll* towards the marble which you mean to strike, because any impediment or obstacle will be sure to turn it aside.

If you are too far off to make tolerably sure of hitting the marble, do not try to do so, but merely place yourself in a position whence you will have a chance when your turn for shooting comes round. Moreover, if you let your taw roll, it may be turned aside and directed towards the taw of an adversary, who will kill you when his turn comes, and put you out of the game.

It is worth every boy's while to practise taw-shooting, if only for five or ten minutes a day. He will soon gain an amount of precision and confidence which will thoroughly repay him for the trouble which he has taken. It must be borne in mind, that the reputation of being a certain shot at marbles is most useful. Your adversaries will be afraid of you. They will not dare to take any liberties with the game. They will keep themselves at a respectful distance from your taw for fear of being killed; and so you may frighten them away from the ring, and pick out all the marbles at your pleasure.

One great advantage of the correct style of shooting is, that your own taw has a kind of spin imparted to it as it leaves the hand, and therefore it does not "stop dead" on hitting another marble, but is sure to go off at an angle. Those who "lob" their taws often get killed by remaining in the ring when they have struck a marble in the middle.

As to the size and material of the taw, we recommend a moderately-sized alley. If too large, it is easily hit by the adversary; if too small, it cannot strike other marbles with sufficient force to drive them fairly out of the ring.

The surface of a good alley is exactly the very thing that is required for shooting. It has a sort of velvety feeling, which affords a capital grasp for the finger and thumb, and it is sufficiently polished to enable it to be shot without clinging to the finger or thumb. We had one favourite alley—milk-white, with pink veins and a pink circular line—and this we valued beyond price.

GAMES WITH TOPS.

Tops have always been favourites with boys, and rightly so, because they require some skill in their management. There are no games of mere chance with tops, because it is absolutely necessary to make a top spin, and to do that requires some little skill.

Tops may be divided roughly into three kinds, namely, those which are spun by being thrown from the hand, those which are spun by means of a handle and a string, and those which are spun by means of a whip. Of these games, the first require the most practice, the second are the easiest, and the third afford the most exercise. The common peg-top, the humming-top, and the whip-top are examples of these three divisions.

We will take peg-top first, and begin with

PEG IN THE RING.—This is the queen of all games with tops, just as is ring-taw with marbles; but before we describe it, let us tell the reader how to spin his top.

He should have a piece of stoutish whip-cord, with a knot at about an inch from one end, and a large metal button attached to the other. Hold the top in the left hand, unravel the end of the whipcord beyond the knot, and slightly wet it. Then lay the wetted end along the top just above the peg, and hold it down with the thumb. Now take the string in the right hand and wind it round the top, beginning at the upper half of the peg, and winding gradually upwards. When you have wound up all the string, put the button between the middle and third fingers, place the thumb under the peg and the fore and middle fingers on the top, and take care to keep the string tight, as otherwise it will become unwound, and all your labour will be lost.

Now, if you merely throw it down, one of two results will happen: either the top will roll away on its side, or it will spring back, by the elasticity of the string, and hit you on the head. But it certainly will not spin. If you want to make it spin, you must hold your hand high—we always used to hold it above the head and at its full stretch —and then bring the arm down with a bold swing from the shoulder. You will then find that the top flies off the string with a kind of "swishing" sound, and comes down on its peg with very great force. A little practice will make you perfect in spinning the top, and if you know the length of your string, you can make it strike the ground exactly where you please merely by measuring with your eye the distance from the point where you stand to the spot on which you want the top to strike.

Peg in the Ring is played as follows:

A circle about five or six feet in diameter is first drawn. This is very simply managed by tying a loop at the end of the top-string, putting it round the peg of a top, and getting some one to hold the top firmly on the ground. You then roll the other end of the string round a sharp piece of stick, and go round the top with it, keeping the point of the stick on the ground and the string always at full stretch. In this way a perfect circle is drawn without any trouble. If you are playing on boards, use a soft pencil instead of the stick. Then draw a little ring, only a foot in diameter, in the middle of the large ring, and all is ready.

The game begins by the first player throwing his top at the ring and allowing it to spin. If, when it falls, it remains within the large ring, it is called "dead," and the owner is obliged to lay it in the little ring, where any one may aim at it with his own top. The same penalty is incurred if the top fails to spin, and the owner may not have his top again until it has been knocked out of the ring.

The great object in this game is to split the top belonging to somebody else. Any top may be "pegged" at as long as it remains within the large ring, no matter whether it spins or has fallen down. The object of a good player is, therefore, to try to break his neighbours' tops and to get his own out of danger as soon as possible.

In order to perform the first feat, it is best to have a top made of very hard and heavy wood, such as box, ebony, or lignum vitæ, and to have the peg made tolerably sharp. If it be too sharp the top will not spin properly. Then, the peg should be a long one, because a long-pegged top runs about when spinning and generally gets out of the ring rapidly, besides offering so shifting a mark that it is not easy to hit. Moreover, when it falls, it rolls so far and so fast that, even if it should fall in the ring, it is sure to roll out, unless it should happen to be arrested by other tops.

Some very skilful players have a way of throwing the top in such a manner that, if it should miss the top at which it is aimed, it leaps out of the ring at a single bound, and no one has a chance of hitting it. This feat is performed by drawing the arm smartly towards the body just before the top reaches the ground. It is not very easy to do, but it is so useful that every one ought to learn it who wishes to excel at this capital game.

Generally each player has four or five tops, and pegs them into the ring as fast as he can wind them up, so that as many as six or seven tops may be seen spinning at once, besides the dead tops that are lying in the small circle.

In order to guard our top from being split, we hit upon a device, which was afterwards taken up rather extensively. Generally the upper part is flat, and is often ornamented with a seal, a wafer, or some such brilliantly coloured object. Now, if an enemy's top happens to come on the centre of this flat spot, the top generally flies off in two pieces, and the owner of the conquering top takes the peg and keeps it as a trophy.

Having this in mind, we went to a turner's shop and got him to make a top according to our ideas. It was a trifle larger than the usual size, was made of lignum vitæ, and the upper part, instead of being cut off flat, was formed into a conical shape; so that whenever it was struck by another top, the peg of the enemy glanced off without doing any damage. At first our companions were inclined to denounce the top as being unfair; but they soon took a wiser course, and had tops made for themselves on the same principle.

The rules of this game are very like those of "Conqueror" at marbles, the winner being entitled to count as many pegs as the vanquished top had already conquered in addition to its own, and one more for the split top. The pegs are always kept as trophies, and some lads used to be very proud of their bags full of pegs.

Although, when a top is dead, it must be placed in the inner ring, it can always be ransomed by another. A top of some kind must be placed in the ring, and it must be a *bonâ fide* top; but there is no necessity for placing in the ring the particular top that was dead. The usual plan is to have several cheap tops at hand, and then, when a peg-top is dead, to place one of the cheap tops in the ring. The criterion of a fair top is that it can be spun, and the player who puts a cheap top into the ring may be called upon to spin it before it is accepted.

The peculiar mode of spinning which has been already mentioned, and which causes the top to leap out of the ring, is exceedingly useful for another purpose. If you have been obliged to put a dead top in the ring, you are, of course, anxious to get it out again before it has been split by one of the enemy. The best way of doing this is to aim your own top about half an inch beyond the dead top, using at the same time the "leaping" throw. If this is done properly, both tops fly out of the ring like magic, and almost in the same line.

In some places marbles are combined with tops, and whenever a top falls dead, a marble is placed within the small ring, and becomes the property of any one who can strike it with his top and drive it out of the large circle. We do not recommend this mixture, preferring that tops and marbles should be kept distinct.

CHIP STONE.—This is one of the names for a game with tops, of which some players seem to be very fond, though we ourselves could never take much interest in it. A wooden spoon is needed in this game.

A large circle is made, or two lines are drawn on the ground some five or six feet apart. Some smooth stones, about as large as horse-beans and much of the same shape, are then placed in the middle. The first player then spins his top in the usual manner, slips the bowl of the spoon under it, and lifts it off the ground. He then drops it on one of the stones, and tries to drive it towards the boundary-line.

He may pick the top up in the spoon and drop it on the stone as often as he likes while it continues to spin; so that if a top be properly spun, it may be dropped six or seven times on the stone, and drive it fairly across the boundary. When this is done, he keeps the stone as a trophy of success, or, in some places, he wins a marble from his antagonist. If four or five are playing, each has to pay a marble to the fortunate player who succeeds in "chipping" the pebble over the line.

Some players are wonderfully dexterous in the management of the top, and can fling it up in the air when they spin it, and catch it on the palm of the hand instead of letting it come to the ground. In this case they always hold the top with the peg upwards, and spin it in the "underhand" position, *i.e.*, by throwing the top nearly horizontally and jerking the string backwards at the same time. The Japanese jugglers can do almost anything with a top, and can make it run along their arms, over the back, and traverse the body almost as if it were a living creature.

WHIP-TOP.—We now come to the whip-top. Every boy knows the shape of this familiar toy; but it is not every boy who knows how to use it properly. In choosing a top, take care that it is not too high in proportion to its width, as such a top is apt to overbalance itself; and, if it be too short, the whip-lash will not cling to it properly. There used, once upon a time, to be a whip-top which had the upper half twice as wide as the lower, but we have not seen one of these for many years. The wood of which they are made should always be tolerably hard, and, in order to secure a good, rounded, and smooth point, we always used to arm the point with one of those hollow-headed brass nails which are so largely used in furniture.

The whip is the next point. You can make a whip out of many substances. Soft buff leather makes a capital whip; and we often used to employ a very simple whip made of three or four leather boot-laces lashed to a handle. But by far the best whip is that which is made of an eel's skin.

It is easily made, and is unapproachable for efficacy. Get an eel-skin just stripped off the fish; have a wooden handle about fourteen inches in length, and slip the smaller end of the handle into the eel-skin, introducing it at the opening made by cutting off the fish's head. Then lash it very tightly with string, and your whip is complete. A good eel-skin whip is wonderfully lasting, and it will survive even leather whips, if it is properly used. It should not be allowed to get so dry as to be stiff, and, when in condition, the player may do wonders with his top.

The player must remember, by the way, that the illustrations which represent boys playing at whip-top are nearly always wrong. They invariably make out that the boys are holding their whips at arm's length above their heads; whereas nothing can be more absurd than such an attitude. The real stroke of the whip comes more from the wrist than the arm; and, indeed, when a good player is watched, it will be seen that the upper part of the arm, from the shoulder to the elbow, scarcely moves at all.

In playing the game, tuck the whip under the left arm, and take the top between the hands, the fingers pointing downwards; then place the point on the ground and give it a smart twirl from right to left, which will make it spin for a second or two. As soon as you have made it spin, snatch the whip from under the arm, and give it a smart lash at the top, drawing the hand towards you as you strike. If you hit the top fairly, this stroke will make it spin strongly, and you can then do what you like.

Sometimes boys are fond of fighting their tops. They stand about twenty yards apart, and lash their tops towards each other, so as to make them come in contact. Of course, each player tries to knock over the top of his adversary with his own. If, however, he touch the adversary's top with his own whip, he is adjudged to have lost.

Another plan is to race the tops against each other, trying to drive the top as far as possible with each stroke. Some good players at this game will lift the top fairly off the ground at each stroke and send it flying through the air for several yards.

During our boyhood we had an enormous whip-top, hooped with iron to prevent it from splitting. It required at least two players to keep it up, and four were often employed on it at once. Setting it up was a difficult business; but when it was once fairly at its speed, it would go on spinning for a wonderful time. The principal difficulty lay in timing the strokes so as to allow the second, third, and fourth players to take their places.

HUMMING-TOPS.—These are spun on the same principle as the peg-top, except in the one case the top is thrown, and in the other is held by a handle until the string is drawn away from it. Most of these tops are hollow, and have a hole at the side, so that as they spin they produce a deep humming sound, from which they derive their name.

Several kinds are known, some of which are intended to spin for a very long time. The tops with which the Japanese do such wonders are made on this principle, and are heavily loaded with some heavy metal, in order to give them greater weight. The astounding Japanese top, which runs over bridges, climbs stairs, opens doors for itself, and rings bells, is made almost entirely of metal.

Many of these tops have the peg passing loosely through the top, so that there is no need of a handle. When the top is to be spun, the peg is held in the left hand while the string is drawn sharply with the right. The body of the top then revolves on the peg until it is placed on the table, when the two revolve together. By this plan the top may be picked up by the peg, carried about the room, put down, or even placed upside down, and will still continue to spin.

We have a whole series of these tops, the use of which was taught us by the Japanese professor of the art. One of them can be spun without even a string, a properly applied turn of the wrist sufficing to make it spin for more than a minute.

The so-called FRENCH TOP is in fact a Japanese top. It consists of a case within which are a number of shallow, hollow, conical tops. Motion is given to them all by the same pull of the string, and a skilful player can keep them going for an astonishing time.

PUFF AND DART.

This is a weapon of warfare—and a terrible one, too—reduced to the condition of a toy.

Strictly, the game consists in blowing a dart out of a tube like an enlarged pea-shooter at a target similar in arrangement to that used in archery, but of course much smaller; but the tube may also be used and do much execution with clay pellets instead of the darts. For this purpose the tube is much used by the youth of Paris and other towns of France, and tubes form a regular article of sale in the toy-shops, where they may be had of all degrees of excellence, from the simple roughly got up metal tube to the highly finished production—a piece of bamboo with a copper tube running through the centre, and a screw top and ferule to protect it when not in use, exactly like our walking-stick fishing-rods.

Our own toy-shops now furnish the article, but, as there is less demand for it, at a somewhat higher price than it may be procured in Paris.

The natives of Borneo and of the tropical parts of South America use tubes and darts as weapons of warfare and the chase; but the tubes are of much greater length, ranging up to ten or even twelve feet; and the darts, quite insignificant in size, derive their whole efficacy from the terrible poison in which

their points are dipped—a poison so deadly that a mere flesh wound is sufficient to seal the doom of man or beast.

Very efficient darts, for all the purposes of the game, may be made as follows: Get a few penholder sticks, and cut them into lengths of about two inches; next take some worsted, and bind it firmly to one end of each stick, leaving a series of loops projecting beyond: the exact quantity for each dart must be ascertained by experiment. Now for the spike. Take a common brad, file up the sharp end into a good point, not too fine; dip the point into the grease of a candle, and hold it in the flame till it is nearly red hot, and then plunge it into cold water: this will harden it. Now file off the projecting piece of metal at the end, and, having bored a hole somewhat too small in the end of your stick, force the blunt end of the nail into it, and then bind it round firmly with waxed thread. A little sealing-wax varnish over all will both improve its appearance and add to the strength of the binding. Now trim the worsted off carefully with a pair of scissors, and your dart is complete; a far better one, too, than those ordinarily sold in the shops. Such a dart from a three-foot tube will go through an almost incredible number of sheets of paper at ten or twelve paces distance, and will, if carefully made, fly with wonderful accuracy.

There is, however, a kind of dart you may buy in the shops, which is far superior to anything likely to be produced by home work. It consists of a sharp, bayonet-shaped steel spike, almost two inches in length, fitted into the smaller end of a funnel-shaped piece of gutta-percha (see figure). The gutta-percha, being thin, readily takes the shape of the bore, and the cavity gives an extraordinary purchase for the action of the wind.

In holding the tube nothing is gained in steadiness by throwing one hand out along the tube: both hands should be held close together as in the figure, and the aim should be quick and decided; an attempt at an exceptionally long and steady aim is certain to result in an exceptionally bad shot—the end of the tube is sure to "wabble."

The aim, it must be remembered, is not taken as with a rifle: it is taken more by a species of intuition than by actual sighting. No reasoning from analogy with rifle-shooting, therefore, can hold at all good; we must go rather to the bow and arrow for an illustration.

A little caution may not be out of place with regard to the irregular use of these tubes: the novice will do well to make himself thoroughly acquainted with the powers and capacities of his weapon before he begins to take liberties with it, or he may, without the least intending it, inflict some serious injury, or do some irreparable mischief, before he is quite aware of what he is about.

WATCH-SPRING GUN.

The manufacture of a watch-spring gun out of a bit of old slate-frame, a quill, and a piece of damaged mainspring, was, in those old days when boys were boys and toys were toys, and when a piece of old watch-spring was a valued and envied possession, a source of intense interest and excitement not only to the eminent artist himself, whose skill in such productions made him an object of respectful admiration to his less gifted compeers, but also to a large circle of personal and private friends, who would gather round and watch with untiring zeal every detail of its construction, from the first rough-hewing of the stock to the final finishing-touch which turned it into a complete work of high art.

But those old days, whether for good or evil, are past; now-a-days, despite, or perhaps in consequence of, the immense increase of the resources at their command, in India rubber, for example, and other materials, boys seem to have almost forgotten the art of making all sorts of ingenious contrivances which the last generation produced in endless variety.

The decadence of those pocket-knife and slate-frame times is owing, perhaps, more than anything to the more liberal scale on which boys are now supplied with pocket-money than in the days gone by, and to the consequent rise of a superior kind of toy-shop, where everything that a boy can possibly desire, or even think of, is to be bought at no very exorbitant price, and of such superior style and finish to his own less artistic efforts that he feels it hardly worth his while to waste time and patience upon turning out some little toy that he can purchase, of an infinitely superior make and construction, perhaps for a few pence, at the nearest toy-shop.

Thus it has fared with watch-spring guns amongst the rest. Such a first-rate article, all in metal, is turned out by the shops at such an extraordinary cheap rate that but little surprise need be felt at the consequent depression of the home manufacture.

If, however, any of our young readers wish to construct a watch-spring gun for himself, we will here give him a few instructions to assist him in so laudable an enterprise. For tools and material he will want a pocket-knife, a piece of slate-frame or similar piece of wood, a brad-awl, a file, a supply of waxed string, or, better still, thin copper wire, and last, not least, the indispensable piece of watch-spring. To these may be added, if you wish to be very elaborate, a quill, or, which is far better, one of those iron tubes used as slate pencil-holders, to be used as the barrel of the gun; but this is unimportant.

With your pocket-knife work the piece of wood for your stock into the shape you may see in the stock of a regular cross-bow: a watch-spring gun is, in fact, only a small cross-bow with a butt-end that is like a gun, and a groove where the barrel would be, taking care to leave sufficient thickness of wood at the muzzle end to admit the watch-spring, which serves as your bow. To avoid splitting the wood, it is better to make this hole while the stock is yet in the rough and before it has been finally thinned down. The watch-spring, duly filed and inserted in the hole, for the correct position of which you must again refer to the cross-bow, should be firmly wedged into its place, and then strongly bound with string or wire, as the case may be, of course taking care not to pass the string or wire *over* the groove in which the shot is to move.

The spring should be inserted with the concave side towards the butt, and will be immensely strengthened by a second piece of not much more than half its length inserted the reverse way, and thus pressing it back; this adds very much to the quickness of the recoil in the spring, and is stronglv to be recommended.

The rest of the construction is exactly the same as in the cross-bow, and therefore needs no further detailed description. The only difficulty will be found with the trigger. If a regular trigger prove too difficult, a movable piece of wood with a flat head will be a very efficient substitute, and will answer all purposes (but appearances) almost equally well.

A gun with a six-inch spring, backed by a second, as described above, and loaded with No. 1 shot, will make very good practice at fifteen or even twenty yards.

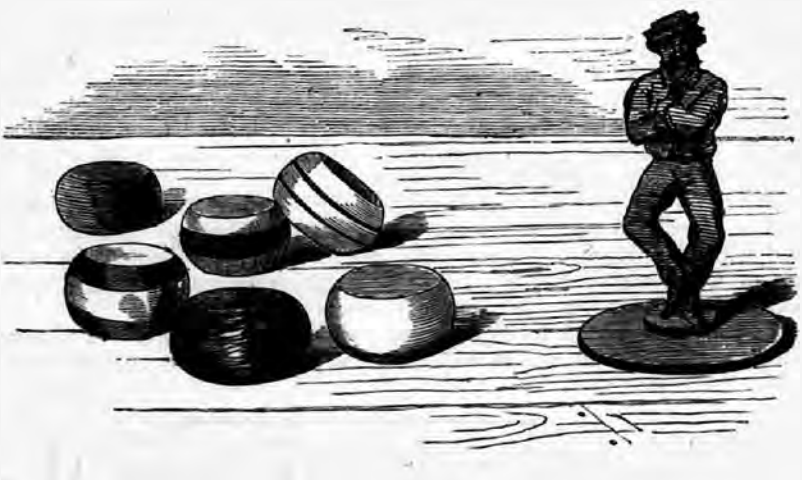
RING THE BULL.

This amusing game requires more care and delicacy of touch than at first seems to be the case.

The apparatus of the game is very simple, consisting of a bull's head painted on a board, with a hook in its nose and another on each horn. In the top of the board is fixed a horizontal rod, to the end of which is suspended a ring by a piece of string. The players stand in succession in front of the bull, take the ring, and try to fling it so that it shall be caught on the hook in the bull's nose. Each player has nine throws, and he who succeeds the greatest number of times wins the game.

It is tolerably easy to throw the ring on the hook, but not easy to throw it so that it shall stay there, and the "knack" of the game consists in throwing it with only just sufficient force to reach the ring.

In another modification of the game the string is lengthened to twelve or fifteen feet, and has a slip-noose at the end. The other end of the string is not fastened to the end of the horizontal rod, but held in the left hand, while with the right the player tries to throw the loop over the two hooks in the bull's horns. If he can catch them both he scores two, and if he catch only one of them, he scores one. Each player has six throws



JACK'S ALIVE.

In this very amusing game little is required except the Jack, *i.e.*, the figure of a sailor cast in metal, so as to be very heavy, a number of coloured balls, and three drawing-pins.

Before commencing the game the three drawing-pins are stuck into the floor in a line, the Jack being placed on the central pin, which is generally some five paces from each of the others. The whole of the space behind the line of the three pins is called "Jack's ground." Sometimes the game is played on a lawn, and in this case three wooden pegs are substituted for the drawing-pins. The following are the rules, as entered at Stationer's Hall, by Messrs. Jaques and Son:

Laws and Instructions.—The game of Jack's Alive can be played by eight or a lesser number of players: each player to take a ball of distinctive colour, and retain it during the game; Jack to be placed upon his stand ten or twelve yards from the throwing-point.

These points settled, each player stations himself at the starting-peg and pitches his ball towards Jack. The unlucky player whose ball shall be decided to be the greatest distance from Jack, becomes "Jack's master." The game now begins. Jack's master has the active duty to perform of keeping Jack on his stand whilst the other players amuse themselves by continually knocking Jack down by pitching their balls (after the manner of quoits) at him from the starting-point. Every time Jack is knocked off his stand, that player who has so knocked him off scores one.

When a player has delivered his ball he has then to fetch it back to the starting-point: in so doing he must pass within either of the pegs defining Jack's ground.

If Jack's master capture any player in returning to the starting-point whilst Jack is alive or on his stand, that player becomes Jack's master. Jack is alive when on his stand; but if knocked off he is dead, and, when dead, any player can return with his ball to the starting-point with safety.

In returning to the starting-point each player must take up his ball fairly with his hand or hands: if he once touch it, his ball is alive or in play, and Jack's master can capture the player.

The game may be made twenty-five, fifty, or any number up. If a sweep-stake be played for, the player who first scores the number agreed upon as game claims the stake. If all players should have delivered their balls, so that no player remains within the starting-point, Jack's master may in that case—Jack being alive—regain the starting-point if he can, and if he does so before any other player he ceases to be Jack's master. A new master is determined as at first.

Any player going outside the pegs defining Jack's ground in returning to the starting-point is guilty of foul play.

Any attempt to remove the balls by kicking, or other means than the one above expressed, is foul.

Any player detected at foul play must at once become Jack's master; and in all cases of dispute the matter must be instantly decided "fair" or "foul" by a show of hands of all the players.

When Jack is replaced upon his stand, the next player, before delivering his ball, must call out "Play!"

Modifications of these rules can be arranged and agreed to, but they should be clearly understood at the commencement of the game. This exciting pastime can be played almost anywhere if there be space enough. It requires no previous tuition, and it invariably provokes laughter and good spirits: the exercise, though not fatiguing, is sufficient to circulate the blood and produce good health.

CANNONADE.

This game depends mostly on chance, but there is still some skill required in the player.

The castles being placed in their respective positions, and the balls placed in the centre of the board—whither they converge on account of the sloping surface—the teetotum is wound and spun just like a humming-top, and allowed to fall into the board.

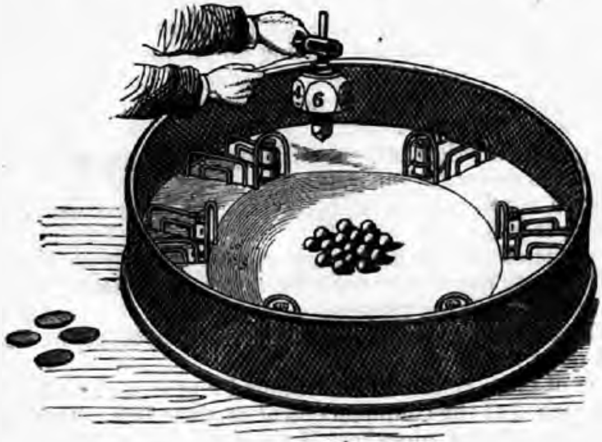
As soon as it does so, it flies about as if it were alive, dashing from one part of the board to another, and driving the balls about as if fired from cannons. Some of them are sure to strike the castles and knock them down, and for each fallen castle the player scores one point.

The great object in the game is to wind up the teetotum properly, and to give it as much spin as possible, as the destruction of the castles depends greatly on the length of time during which it spins. Owing to the slope of the board, the teetotum, as well as the balls, has a tendency to seek the centre, so that the last few turns of the teetotum are often as useful as the first.

While it is in full spin the balls and teetotum dash about in the most ludicrous manner, looking as if every castle must be down in an moment. The wires, however, protect the castles unless they are struck in front, and the consequence is, that two or three generally hold out for a considerable time. Sometimes they are all knocked down except one, which seems to bear a charmed life in spite of all the balls that are dashing about the board. Gradually the teetotum becomes slower and slower in its movements—it staggers—recovers itself—staggers again—rolls over—and, just as it gives its last turn, off flies a single ball, and knocks down the remaining castle.

There are various modes of playing this exciting game.

By one method each player takes a castle, and stakes on it as many counters as he chooses to venture upon it, while one takes the teetotum and is called the Gunner.



When a castle is knocked down the owner waits until the teetotum has fallen, and then pays to the gunner the number of counters which he staked, multiplied by the number on the uppermost side of the teetotum. Thus, if the owner of a fallen castle had originally staked five counters, and the uppermost figure of the teetotum happened to be 5, the owner of the castle will have to pay twenty-five counters to the gunner.

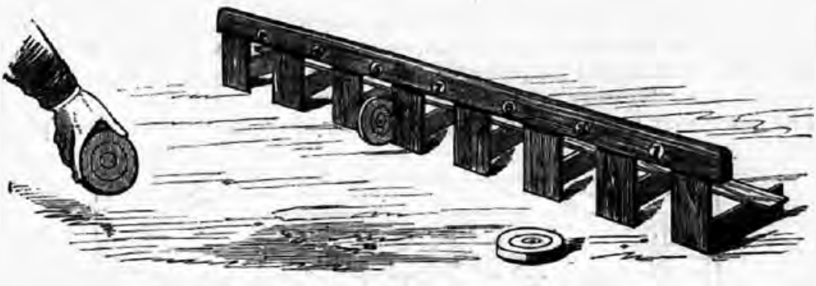
Whenever a castle is left standing the gunner has to pay double its stake to the owner.

Should, perchance, the gunner knock down all the castles, he receives double the stakes from each player; so that if, as before, the player had staked five, and the teetotum falls with its number 5 uppermost after knocking down all the castles, the player will have to pay to the gunner fifty counters instead of twenty-five.

Each player becomes gunner in succession.

By another mode of play, as soon as the teetotum has ceased to spin the owner of each fallen castle pays to the gunner a number of counters equal to the uppermost number of the teetotum, while the gunner has to pay six counters to the owner of every castle which is left standing.

The value of counters can be settled among the players. The usual plan is to arrange that all white counters rank as one, all red counters as six, and all blue counters as twelve. This, however, is left entirely to the discrétion of the players. Should there be fewer players than castles, the best plan is that each player in succession should take two or more castles.

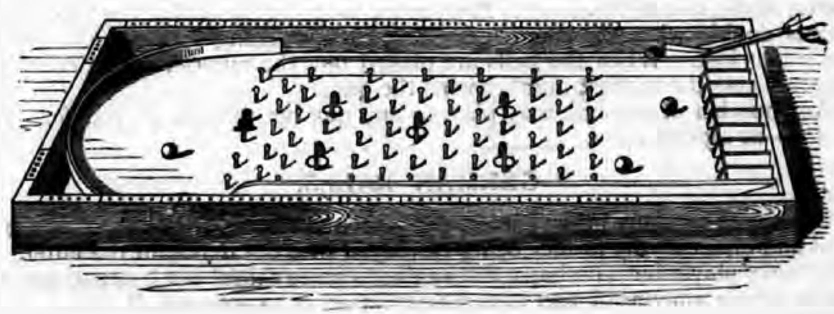


NAVETTE.

This game is identical in principle with the bridge-board, figured on p. 157. Instead of marbles, the players use circular discs of wood, sometimes painted of different colours, and sometimes all coloured alike. The colour, however, matters but little.

The bridge has arches large enough to allow the discs to pass easily, and the best bridges have the arches leading into boxes, so that there can be no doubt respecting the arch through which the disc has passed. The usual mode of playing this game is, that each player in turn takes the disc, and tries to bowl from a stated distance through the numbered arches. When he has delivered all his bowls, the numbers are added together, and he who has the highest score wins.

Sometimes it is played by fixing a definite number—say 100—as the winning number, and he who first reaches it wins the game.

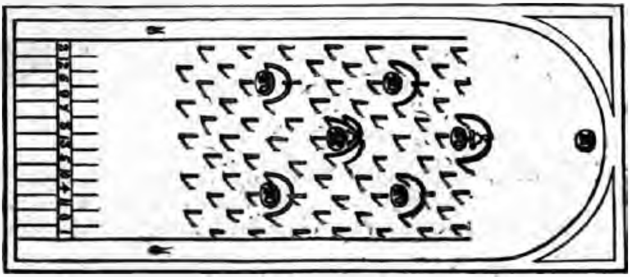


COCKAMAROO.

This game is in many places a very popular one, as it combines a certain amount of skill with a good deal of chance. It is played with a cue or mace, and two balls of different colours. Place the red ball on the cup marked No. 10; the white ball to be thrown up on either side of the board by means of the cue. Endeavour to strike the red ball, which counts ten: if you succeed in removing it, it multiplies ten times wherever it may go.

If the white ball be struck too hard, and rolls down the opposite side, the adversary counts ten; and if not sufficiently hard to prevent its returning, the adversary will also count ten: if it pass under the bell so as to ring it, into whatever number it may go, it will count double. If it pass into any hole without either of the above, it will only count the number of the cup or figure. If the white ball should lodge against any wire or bridge in its passage down the board, the adversary counts five.

The game may be 300 or 500 up, according to the discretion of the players.



GERMAN BILLIARDS.

The construction of the board for German Billiards is similar in principle to that which is used for cockamaroo, but the game is played in a different manner. In the first place, a greater number of balls are used, and in the second, they are struck with a spring, and not with a cue. The rules are as follow:

The game is played with seven balls, thus: Place one of the balls on the spot at the top of the board, the remaining six balls to be played singly by the spring at the side of the board. Endeavour to strike the ball at the top, which counts double wherever it may go. Any ball returning into the channel at the side is lost. When the balls are played out, the numbers to be counted: whoever gets the highest number wins the game.

Any number of persons may play, or any number may be played for—300 or 500—as agreed upon.

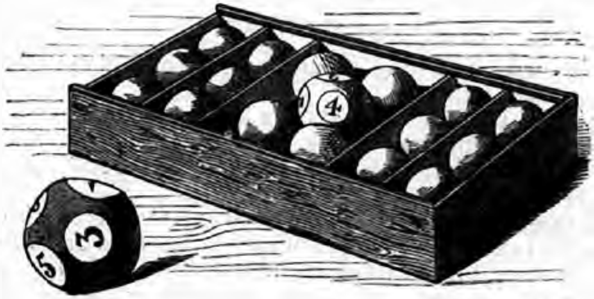
GERMAN BALLS.

In this, as in many other games, the principal charm lies in the mixture of skill and chance—the former being employed in order to obtain the latter. A very lucky player may, perhaps, win against a more skilful but less patient one, but a certain amount of skill is necessary in order to score at all.

The game is a very simple one, and is in reality little more than an extension of the die-shot at marbles.

The die is placed on the ground, with the figure 8 downwards, and the players each take a ball and bowl at it in succession. If they miss it they score nothing (in some places paying a stake to a pool), and if they hit it they score the number on the side which comes uppermost.

By some rules each player puts a stake into a pool, and he who attains the

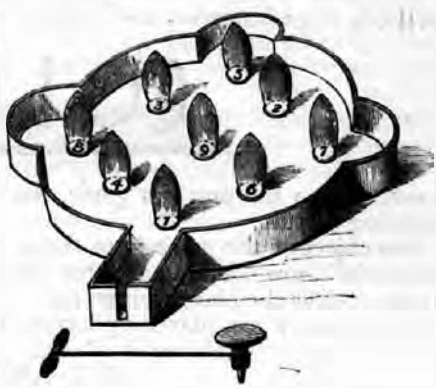


highest number in a certain number of throws wins the pool. If, however, any one succeed in turning up the number 8, he takes the pool at once, and the game begins afresh.

This game may be played equally in or out of doors.

SKITTLE CANNONADE.

This game is played much after the same principle as the cannonade game already described. No balls, however, are used, the skittles being in themselves sufficiently heavy to cause the top to fly about in a most amusing manner as soon as it touches them.



Nine skittles are used, each of them being placed on a small circle inscribed with a number. In playing the game, the skittles are first set up in their places, and the top is carefully wound up. The top is then placed inside the little gallery that projects from the board, and the string drawn through the groove. The top is held in its place by the left hand, while the handle of the string is grasped in the right. The player then draws the string smartly towards him, so as to cause the top to spin, and then leaves it to its devices.

Even were the board a circular one, the course of the top would be erratic enough as it bounces from one skittle to another, pushing them down, and flying off them as they roll over the board; but, in order to increase this eccentricity of movement, three curved additions are made to the board, so that there are eight angles, inclusive of those formed by the ends of the gallery.

Each player spins the top in succession, and scores according to the numbers which are laid bare by the skittles being knocked off them. In this game, as in cannonade, the great point is to give the top a smart jerk when spinning it, so as to make it retain its power of movement as long as possible. Very often the last roll of the top as it falls knocks down a skittle that has escaped the top while it was flying and spinning about the table.

ROYAL STAR.

This game is useful in testing accuracy of eye and aim, and is a decided improvement on Aunt Sally.

The machinery of the game consists of a large wooden star with eight long rays, each painted of a different colour. The rays are not fixtures, but their bases are merely slipped into grooves in the body of the star, so that they can be easily knocked out.

There are also eight wooden balls coloured in accordance with the rays of the star. In order to play the game, each player takes the balls, and, standing at a specified distance, throws them at the star, so as to knock out the rays. If he succeed in striking out a ray of the same colour as the ball, he scores two points but if the ray and ball are of different colours, he scores one point. If he should miss the star altogether, three points are deducted from his score.

When he has thrown the eight balls, the rays are replaced and the next player takes the balls.

Sometimes each player pays a counter into a pool, and instead of deducting three points from his score when he misses the star, he pays three counters into the pool. He who has scored highest takes the pool.

When this game is played a curtain should be arranged behind the star to stop the balls.

REVOLVING RING.

This game is played something like lawn billiards, except that there are six revolving rings instead of one, and that the ball is thrown and not pushed with

a cue. As in the previous game, the rings and balls are painted of corresponding colours.

The object of the game is to throw the six balls through the rings, each successful throw counting as three; but when a ball passes through a ring of its own colour the player scores six.

This game is best played by having a pool, as mentioned in the royal star.

CUP AND BALL.

In this game there is no infusion of chance, the whole interest of the game lying in the dexterity of the player.

The cup is a piece of wood or ivory, with a point at one end and a cup—the shallower and smaller the better—at the other. The ball is solid, with the exception of a hole, which ought to be just large enough to receive the point, and no larger. The ball is connected with the stem of the cup by means of a string, which, if possible, should be of soft silk, so as to avoid "kinking," which is obstructive to all play.

The learner should begin with catching the ball in the cup. He should take the stem by the middle, taking care to hold it as lightly as possible between the ends of the fingers and thumb, and not to grasp it firmly. Many good players pass the string over the forefinger; but we believe, after long experience, that the ball can be thrown more accurately if the string hang directly from the stem. The ball should be thrown upwards by a slight jerk of the wrist, not of the whole arm; and, if properly done, it falls of its own accord into the cup. Just as the ball touches the cup the right hand should be allowed to drop a little, otherwise the ball, though it may fall into the cup, will roll out again.

When the player can make sure of catching the ball in this manner, he should hold the stem by the very point between the forefinger and thumb, and practise catching the ball as before. He will find this rather difficult, as the cup is apt to yield to one side or the other, and to let the ball roll out. In order to avoid this, the cup should be rather *balanced* than held, so that it is perfectly upright when the ball comes into it.

The next feature is to *swing* the ball into the cup instead of throwing it; and the most difficult feat that can be accomplished with the cup is to jerk the ball into the air as usual, and then rapidly pass the cup under the left wrist, so that when the ball settles in the cup the wrist is encircled by the string. A good player ought to be able to catch the ball in the cup with his eyes shut.

Now we come to catching the ball on the point, which is a very difficult matter, and yet, difficult as it may seem, a moderate player ought to succeed ten times in twelve. We have often caught it on the point thirty times in succession.

In order to do this properly, hold the stem as represented in the illustration, and with the fingers of the right hand give the ball a smart spin. Let it spin as far as it can in one direction, and allow it to spin back again for ten or twelve times, watch that it is quite steady, and then throw it up as before. Turn the point upwards as if you were aiming at the spot where the string enters the ball, and just as the ball touches the point let your hand sink slightly.

If this be done properly the ball settles itself on the point almost mechanically, and the proof of a really good catch is that the ball revolves several times after it has been caught.

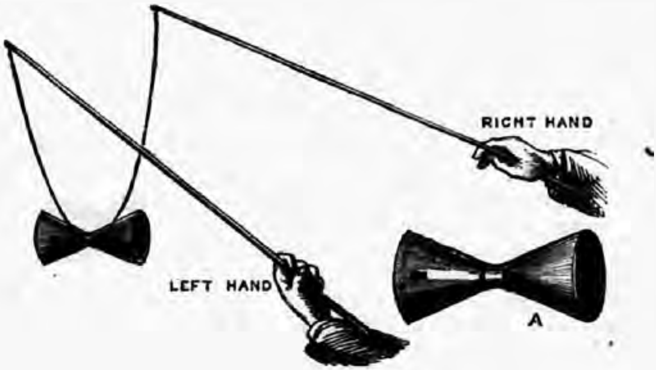
This game is invaluable for giving lightness of touch, dexterity of hand, and quickness of eye.

THE FLYING CONE.

This singularly pretty toy is managed on precisely similar principles as the last, namely, the revolution of a piece of wood or ivory round its axis.

In shape it resembles two cones united at their points, and for convenience sake it is usually made hollow, with a hole at one side so as to produce a humming sound when spun rapidly.

The mode of playing this toy is as follows: Take two slender sticks—those used for "Les Graces" will answer the purpose admirably—and tie a string about a yard in length to their tips. Lay the cone on a table or on the floor, take one of the sticks in each hand, and slip the string under the middle of the cone, taking care that the cone is near the right-hand stick. Now lift up the



string with a steady fling of the right hand, so as to make the string communicate a revolving motion to the cone. Continue the process by a sort of whipping movement, so that the cone is spun horizontally, just as a whip-top is spun vertically; and as soon as it begins to hum it may be considered as fairly settled to its work.

When a good player has made the cone hum, he takes all kinds of liberties with it: sometimes he flings it high in the air, and catches it on the string, which he stretches tight, and on which he makes the cone leap and spring like a rope-dancer; sometimes he throws it on one of the sticks, and makes it roll upwards from the point of the stick to the arm; sometimes he whirls the sticks, string, and cone round his body, the cone continuing to spin, and retaining its place as if endued with life.

We very strongly recommend this toy, as it gives plenty of exercise, and combines the neatness of hand and precision of eye required for cup and ball with an amount of continuous muscular exertion which cannot be obtained by the cup and ball alone.

THE BANDILORE.

This toy, simple as it looks, and easy as it is when properly managed, requires some little skill to make it play properly.

It consists of two discs united in the centre, and having a string wound in the groove formed by their junction. In order to play the bandilore properly, wind up the string until the groove is nearly filled with it, and then let the bandilore drop, as shown in the illustration, so that the string is unwound, and makes the bandilore revolve rapidly. Just before it reaches the end of the string throw the hand gently but firmly upwards, so that the revolution of the bandilore may wind up the string again, but in a reverse direction. It can thus be kept flying up and down for any length of time. A skilful player can mark the string at different intervals, and cause the bandilore to wind itself up to any mark that may be fixed upon.

About the beginning of the present century the bandilore became suddenly a fashionable toy under the name of Quiz, and scarcely any person of fashion was without one of these toys.

THE WATER-CUTTER.

This very simple toy is made on the same principles as those which have preceded it, and can be easily made by any boy.

Get a circular piece of tin, three inches or more in diameter, and cut it round the edges in the form of a star. Bore two holes through it about an inch and a half apart; pass the two ends of a string through the holes; tie them, and the toy is complete.

Hold an end of the doubled string in each hand, as seen in the illustration, and spin the tin star, or "cutter," as we shall call it, until the string is twisted as far as it will bear. Now separate the hands, and the cutter will revolve rapidly, and, when the hands are at their full extent, will come to rest as shown in the illustration.

But if, instead of allowing the hands to reach their fullest extent and to remain there, they are brought gradually together again, the cutter will revolve in the opposite direction and wind itself up again. Thus it may be made to wind and unwind itself as long as the player likes, just as is done with the bandilore.

This toy is called the water-cutter because, if spun over a basin of water, and allowed to dip as it spins, it cuts through the water and sends a shower of spray from it over the operator when it spins in one direction, and over the spectators when it spins in the other.

CUPOLETTE.

This game does not require quite so much skill as some of those which have been mentioned, but is nevertheless amusing.

It consists of a board with a number of cups, a ball for each cup, and a movable arm from which a heavy ball is suspended by a string. The cups are numbered.

The players begin by placing the balls in the cups, and the first player then turns the arm in any position which he thinks best, draws the suspended ball out to the full length of the string, and allows it to swing back again, so as to strike the balls out of the cups.

For each ball knocked out of a cup he scores one point. Each cup is numbered, and if a player can strike a ball out of one cup into another, he scores as many points as are indicated by the number in the cup. A ball struck off the board is lost, and scores nothing.

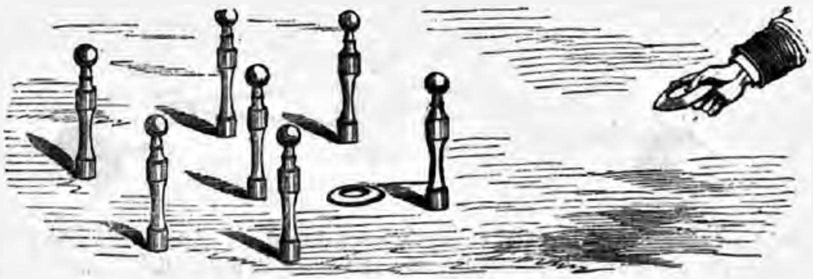
The second player replaces the balls in the cups, and commences in the same way.

Each player has four strokes. Threescore and one is a medium game; fivescore and one a long game.

LAWN CUPOLETTE.

This game is played by means of seven pins, made so that they may either be driven into the ground or fixed on a board. Each pin is numbered, from one to seven. There is a slight cup at the top of the pins.

To play the game, six of the pins are fixed in a circle, with the seventh in the middle; and the players, standing at a given distance, take the wooden



quoits, with which they try to knock the balls out of the cups. Before playing, they must name the pin at which they aim, and if they strike off the ball belonging to any other pin, the score goes to the adversary. If, however, he knocks off the ball at which he aims, and by the same throw strikes off one or more besides, he may score them all.

In another version of the game, if the player can strike off the seven balls and have one or more quoits to spare, he may try to throw the quoits so as to fall upon the pins, and for every case in which he succeeds, he adds the number of the pin to his score.

PARLOUR RINGOLETTE.

This is entirely a game of skill.

As may be seen from the illustration, it is played with pegs which can be fastened firmly into a board, and with a corresponding number of wooden rings or quoits. When the pegs are set in their places, the first player takes the quoits, and, standing at a specified distance, endeavours to throw the rings over the pegs. For every ring that fairly encircles a peg the thrower scores the number which is attached to the peg; but should more than one ring fall on the same peg, the score goes to the opponent.

In this, as in all games where a ring has to be thrown, the ring should be held just like a quoit (see p. 57), so that a spin may be communicated to it, and make it fly steadily to its mark.

RULES.

1. The game of ringolette is adapted for two or more players.
2. The first player being decided upon, he places the board in the centre of the table, and standing about three feet or more from the board, commences his play.
3. Each player takes the eight rings, and plays by pitching the rings on the pegs.
4. Each ring that is fairly on the pegs counts according to the number indicated on the board.
5. Should a player place more than one ring on each peg, it scores to the opposition.
6. Threescore and one is a medium game; fivescore and one a long game.

These rules may be modified by agreement among the players, but not otherwise.

SCHIMMEL.

This is an amusing game and full of interest, though it is merely a matter of chance. The rules, as furnished to us by Mr. Cremer, Jun., are as follow:

RULES.—Any number of persons may play. Begin by throwing the numbered squares: whoever throws the highest number takes the office of Cashier.

The cashier distributes an equal number of counters to each player; he then takes the hammer in his hand, and having called silence, puts up for sale the five cards separately, and disposes of them to the highest bidder: the produce is to be put into the pool, to which each player must pay four counters.

The cashier has the privilege of first throw, and also of choosing who shall be the second, third, and fourth players, always allowing the ladies to play before the gentlemen.

When all blanks are thrown, each player pays one to the holder of the white horse.

If with the blanks the bell or hammer, or both, are thrown, the possessor of such cards pays one to the holder of the white horse.

When numbers are thrown with the bell or hammer, the cashier is to pay from the pool the amount of such numbers to the holder of the card.

When numbers and blanks are thrown, the cashier pays the amount of such numbers to the player from the pool.

When the pool is nearly empty, there arises an advantage to the inn; for if the amount of the numbers thrown exceeds what is in the pool, the player pays the overplus to the owner of the inn.

If all blanks are thrown after the inn begins to receive, the player pays nothing, but the owner of the white horse pays one to the inn; and should the bell or hammer be thrown with blanks, the holder of such card pays one to the inn; and if numbers accompany the bell or hammer, the owner of such card must pay to the inn the number thrown above those remaining in the pool.

The game is won by one of the players throwing exactly the same number as what is remaining in the pool, who takes the contents thereof, and is cashier for the next game.

DUTCH RACKETS.

This toy exercises both eye and hand. It consists of a top and a racket, with one face plain and the other furnished with several little numbered cups. There is also a cup at the end of the racket. To play this game, wind up the top exactly like a humming-top, place it against the upright peg, as shown in the illustration, and draw the string smartly, so as to make the top spin.

Change the racket quickly from the left to the right hand, throw the top in the air, and reverse the racket so as to catch it on the other side.

Now throw the top from one cup into the other as fast as possible, and add together, as you do so, the numbers of the cups into which the top is received. He who can count the highest number before the top falls, wins the game.

When the players are proficient in this mode of playing, which is really very easy, they ought to complicate it by catching the top in the cup on the end of the racket between each throw into the numbered cups. Should the top fall to the ground, the player gives up the racket.

SUCKER.

The sucker is rather a scientific toy than such a plaything as English boys love. For an hour or two, or in extreme cases for a day or two, it may afford some pleasure; but when its possessor has lifted with it everything there is to lift, and fitted it on to every practicable place, his interest in it is apt to come suddenly to an end.

A sucker, however, is very easily made, and even though its interest lasts only for an hour or two, it is quite worth the small amount of trouble that must be expended in its construction.

Get a piece of stout leather, cut it into as perfect a circle as you can achieve, bore a hole in the centre, and through this pass a piece of stout string with a large knot, or, better still, a small button of leather, at one extremity, to prevent it passing through the hole; steep the whole concern thoroughly in water, and your sucker is ready for use.

Apply your sucker while still wet to any stone or brick you may find with a tolerably smooth surface, press it down firmly with your foot so as to exclude all the air between the leather and the stone; then, supposing your sucker to be about three inches in diameter, and well made, the stone must be heavy indeed that will defy its powers.

The scientific explanation of th.s would take too long: suffice it to say that the lifting, or rather adhesive power, of the sucker is due to the pressure of the atmosphere, which presses it and the stone together with a force of about fourteen pounds weight for every square inch of its surface.

SQUAILS.

This game is a kind of table bowls, or, perhaps, rather a cross between bowls and curling.

It is like the latter in that the squails are discs instead of balls, and are slid along a smooth surface instead of rolled along over turf; in all other respects the game is exactly like bowls.

It is by no means a bad game, and promised to achieve no little popularity: but the Fates willed it otherwise.

For about one season it seemed as though, like croquet, it would take the world by storm; but in some way or other it soon lost its hold upon society, and even its most enthusiastic votaries grew cooler and cooler in their attachment, until now it is only ranked amongst the rank and file of table games, instead of holding, as it once promised to do, a leading place amongst them.

This is owing chiefly, in our belief, not to any inherent defects in the game itself, but—for, as we have before said, it is a good game, a very good game—to a mistaken attempt to make the game amusing by a forced jocularity of technical phrases. The terms "process," "swoggle," "ex-squeezle," and the like, are not *very* funny in themselves and add but little to the amusement to be derived from the game; but they give it an appearance of being a mere childish pastime, instead of, as it in reality is, a game of real skill, and thus keep off many who would otherwise have taken it up and made a thoroughly good game of it.

We are afraid the only chance now of making it a success is to change its name and bring it out again with some slight alterations and a perfectly new and simple set of technical terms.

We have such a good opinion of the game that we would gladly devote some time to it, did the other demands upon our space permit. We must content ourselves with a few short directions.

The squails are discs of wood about the size of a crown piece, and marked or numbered in pairs like bowls.

The players, who should be at least four or six, and may be eight or ten, in number, are provided each with a pair and sit round a table—a round one with straight-cut edges is the best; the "process," which is a stumpy cylinder of white metal and answers to the "Jack," is placed in the centre, and each player plays one squail up for first turn; the squail nearest the process leads off.

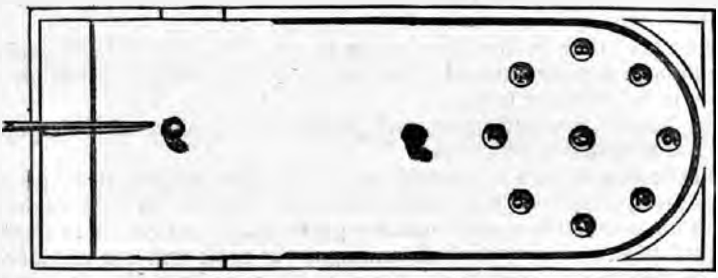
The players are divided into two sides, and sit one of each side alternately, and the turn goes round from right to left.

The squails are played by placing them so that they project slightly over the edge of the table, and then striking them with the palm of the hand. The player may play with either hand, and so long as he remains fairly seated may reach along the edge of the table on either side to the full extent of his arms.

The game is played exactly as in bowls, the same rules holding good throughout.

There is generally a penalty of two points to the opponents for knocking the process off the table, or, what counts as such, within three inches of the edge; and a squail that, after being played, goes off the table, or within three inches of the edge, is dead for that round.

We can confidently recommend this game to our young readers as one that will afford them a very pleasant indoor amusement, and one, too, that will, by its constant variety, retain its freshness for months.



BAGATELLE.

Like billiards, Bagatelle is played with a cue and ivory balls, but there are nine balls instead of three, and instead of pockets there are small cups sunk in the board.

The game is a very simple one, and consists in playing as many of the balls as possible into the cups. When the board is levelled, which may easily be done by pushing two or three small wedges under it, the first player takes the black ball and places it on the ivory spot just in front of the cups. He then takes one of the other balls, places it either on or anywhere behind the ivory spot at the end of the board, and with the cue aims it so as to strike the black ball.

Should he miss, the white ball is called "dead," and is removed from the board. Should he strike the black ball, he plays all the other seven in succession, trying to get them into the cups; and when he has played all the balls he counts up the number of points indicated by figures painted in the bottom of each cup, and adds them to his score.

The great point of this game is to get the black ball into the central cup, because it counts double the number painted on the cup, so that if it goes into 8 it scores sixteen, and if it goes into 5 it scores ten; whereas if, as is often the case, it drops into 1, it only scores two, and hinders play with the other balls besides.

The numbers 8 and 7 are best got by playing the ball against the side of the board just opposite the 4 and 6 cups, so that it comes off at an angle and falls into the cup. It must be played with only just strength enough to reach the cup, or it will roll out again. The best way to get the black ball into the 9 is to strike it with one of the other balls against the top of the board, so as to make it recoil either between the 5 and 3 or the 5 and 2, and come somewhere between the 4 and 9 or the 6 and 9, when a very gentle touch will drop it into the desired cup.

It is hardly possible to play too gently at this game. In the first place, if a ball be played so hard that it comes back beyond the middle of the board, it is called dead, and is taken off the board. The middle is indicated in those boards which fold up by the two hinges, and in those that stand on legs by a spot on each side, and a line of fine stitches on the cloth.

Moreover, with hard play, the balls may get into the cups, but will not stay in them.

There is only one case where hard play can do good. Sometimes the balls are very obstinate, and utterly refuse to go into the cups. They roll round them, they stop short on the edges, they roll in and out again, and when the last ball has to be played there is a whole assemblage of balls gathered together at the top of the board. The only chance then is to drive the last ball among them, so as to cause a general scattering, and take your chance of some of them falling into the cups. If you played the last ball gently ever so well, you would at best get the 8 or 7; but by scattering them you have a good chance of getting four or five of them into the cups.

Never lose temper at bagatelle. There is a vast amount of luck as well as of play, and it is very mortifying to a good player to score only six or eight each turn, while his antagonist, who can scarcely play a stroke, scores his thirty or even forty. But in the long run luck is tolerably sure to equalize itself, and then the superior skill begins to tell, so that towards the end of the game the score of the better player creeps quietly on, while that of his opponent decreases in proportion.

SPILLIKINS.

This is a game of pure manual dexterity, and is rare practice for cultivating steadiness of hand and delicacy of touch.

Its worst fault is that in the very nature of the game a constant series of dead-locks are inevitable, only to be overcome by the self-sacrifice of one or other of the players.

This is a great drawback to its popularity; it is, we are afraid, however, inherent in its very constitution, and therefore beyond the power of reform.

The spillikins, or "jack-straws" as they are made familiarly and vulgarly called, are a number of thin narrow slips of wood, bone, or ivory, each more or less notched, sometimes cut into fantastic shapes, and numbered.

These being held together in a bundle, are allowed to fall on the table, and the players, two or more in number, each in turn pull them out one by one with a small hook. As long as a player can go on abstracting from the heap, without in any way shaking or disturbing more than one spillikin at the time, his turn continues, and all he thus secures he keeps; at the least shake his turn ceases, and the next player goes on.

When all the spillikins have been thus abstracted, each player counts his heap, each spillikin being valued at the number inscribed on it, and he who has most wins.

Evening Parlour Games.

THE OLD FAMILY COACH.

This is a very good old game, but it depends entirely for its spirit upon the inventive faculties of the person who tells the story upon which the game hinges.

The players sit in a circle, and all but the story-teller take names, each of some part of the coach or its equipment; door, step, boot, wheels, coachman, horses, traces, &c.

The story-teller—when all are ready and know their respective names—begins a long tale about the adventures of this old coach, bringing it to all sorts of grief, and making the story as humorous as possible. The story ought to be told fluently, but not too fast to be readily followed by the audience. Every time any part of the coach is mentioned, the player who has assumed its name must rise from his seat and sit down again, under penalty of a forfeit; and every time the old coach is mentioned the whole party, with the exception of the story-teller, must do likewise.

The game may be played with a railroad instead of a coach if it be preferred.

TWIRL THE TRENCHER.

This is a game for almost any number of players—the more, within reasonable limits, the better. The players seat themselves in a great circle in the middle of the room, each assumes the name of some town or beast, or they are numbered one, two, three, and so on. One of the party now twirls or

spins a wooden trencher upon its edge, and leaves it spinning, calling the name or number of one of the circle, who, under penalty of a forfeit, must spring up and prevent the trencher from falling, twirling it in turn, and calling another name or number.

This is a very good game for forfeits, as the players are apt to forget their names till too late. A change of names should be made every dozen twirls or so, as from mere practice the players get too familiar with them, and so half the fun is lost.

PUSS IN THE CORNER.

A very good game for a small number of players. All the players but one, who is called "Puss," take their places, each in one corner of the room, while the puss stands in the middle.

The fun consists in the endeavours of the several players to exchange corners without letting puss supplant them. If puss can get into a vacant corner, the player who is left cornerless becomes puss in his stead.

The game must be played with spirit; too great caution in leaving corners soon makes it fall exceedingly flat, whereas if the players evince a noble disregard to the danger of being cut off from their corners, and plenty of activity, it may be kept up for a long time with undiminished zest.

To those timid spirits who fear to leave their corners until assured of absolute safety we have only one piece of advice to offer, and that is simply to abstain from playing; for if all went on the same principle it is very evident there could be no game at all. If, therefore, they cannot play with some spirit, and without this selfish sensitiveness to their own personal position in the game, they are very much better out of it.

HUNT THE SLIPPER.

For this game at least ten or a dozen players are required to get any continued fun out of it.

One player stands up in the middle of the room, and the rest sit on the ground in a circle, with him in the centre. A slipper is given to one of the seated players, who passes it under his legs to the next, and he to the next, or back again, and so on, being careful the while not to give the one who is standing any indication of its whereabouts.

After a short interval the one who first took the slipper cries "Ready!" and the hunt begins. The hunter tries to detect the actual holder of the slipper and to seize his hands, while, of course, all conspire to baffle him in the search. All sorts of means are employed to deceive the hunter, one player pretending to be very busy and mysterious, while the slipper is actually on the other side of the circle; or, on the opposite principle, to be very quiet, and so excite his suspicions, and bring him down on a bootless quest.

The hunter, if he have his wits about him, may generally give a pretty shrewd guess as to the position of the slipper by watching the countenances of those in the circle: there are sure to be some two or three, at least, who have but slight control over their features, and who, therefore, will certainly, by conscious looks, betray themselves whenever the slipper comes to them. A useful maxim for the hunter is to watch the less clever players closely, and leave the clever ones to themselves.

If hunter and circle are well matched, and all play pretty much alike, the game is a very good one—the contest of wits becomes a source of great amusement, and the attack and defence assume a character almost scientific.

BLIND MAN'S BUFF.

This is one of the best of indoor games, giving plenty of healthy exercise, affording lots of food for laughter, and yet not so rough but that boys and girls may join in it on tolerably equal terms.

It is played thus: One of the party is blinded by having a handkerchief tied over his eyes, which operation should be very carefully performed, or he will be able to see quite distinctly, and all the real fun of the game be lost. Fairly blinded, he is taken into the middle of the room, turned round solemnly three times, and let loose to catch whom he may.

If he succeed in catching one of the others, and in guessing the name correctly, the person caught becomes blind man in turn. The blind man may feel the face and dress of his captive—who, if once fairly caught, is required to stand still until finally released—and is allowed to make one guess at the name, which if he fail to do correctly, he must let the player go, and try his luck again.

The other players may touch the blind man, and call his attention by talking to him; but they must not push or pull him, or, in fact, use any violence under any pretence. They may, however, employ any device they can hit upon, within fair bounds, to mislead him as to their persons, such as exchanging coats, altering their collars, the dressing of their hair, and the like. But they must not put themselves in any way out of his reach, and if any of them leave the room during play the blind man must be apprised of the fact.

The room should be carefully prepared beforehand for this game by removing as much of the furniture as possible altogether, and piling up the rest out of harm's way, especial care being taken not to leave anything over which the blind man might trip up: a hearthrug is a very common source of danger on this head, and should be invariably removed.

If possible, there should be no fire in the room; if, however, it be unavoidable that there should be one, the blind man must be warned every time he approaches, and at least a wire guard must be kept before it.

A good blind man is guided more by his ear than anything else, and watches not only for footsteps, voices, the rustling of dresses, and the like, but for all indications which the presence or absence of noises in special parts of the room afford him of their being vacant or occupied: a sudden raid into a very quiet corner—too peaceful in his opinion to be natural—will often reward him by the capture of some specially crafty individual. A sudden lull, too, in the tumult, when he is bearing down upon some point, is an almost invariable sign that he has struck a "warm corner," and the interest is so intense that all the rest have stopped to look: if head and hands only work together then, he ought to be secure of a capture.

The blind man may, if he gets the chance, catch two people, and, failing with one in guessing his name, may try the other; but he is bound to hold both all the time; for though the captives, when once fairly held, are forbidden to struggle, they are yet not bound to remain in durance any longer than their captor has actual hold of them.

The blind man is allowed to take his own time, within reasonable limits that is, about making his guess at the name of his captive, and may, as said above, employ his sense of touch to elucidate this matter, and he may ask questions, hoping to get a clue by the voice; but the captive, though bound to stand still, is not bound to speak, and may, like Martin Chuzzlewit's American friend, go upon the principle that "A man may ask a question, so he may," with the clear understanding "that another man mightn't answer it, so he mightn't," and may please himself about answering, which, of course, he will scarcely be foolish enough to do. The blind man is not, however, allowed to mention names, as, "It is not so and so, or so and so," hoping to get a hint from outsiders thus. The first name he mentions must be the one he abides by; only if he has given the right name, and yet said "It is *not* so and so," he is considered equally wrong as if he had given the wrong name. There are a good many more rules and regulations, which must depend a great deal upon the circumstances of the moment, and may, therefore, be left for special legislation at the time.

SIMON SAYS.

Also a very good game for forfeits. One of the party stands up before the rest like a drill-sergeant, while they keep line before him. He holds his hands before him, with the fingers clenched, and the thumbs or forefingers pointing upwards, in which the squad must imitate him.

He now cries, "Simon says, Turn down," and reverses his thumbs: all must follow suit, under penalty of a forfeit; then, "Simon says, Turn up," or "Simon says, Wig-wag," suiting the action to the words, and looking out to catch any of the squad tripping.

The squad must only obey an order prefaced by "Simon says," and the leader tries to catch them by repeating the right formula several times rapidly, and then suddenly saying "turn up," or "down" without the "Simon says;"

he is pretty sure to catch one or two each time, who, of course, must pay forfeit.

If the leader himself give a false order, telling them to do something they are already doing, he pays a forfeit himself and is deposed.

A sharp leader will make it a very difficult matter to avoid paying forfeit, even for the most cautious in the squad.

KNIGHT OF THE WHISTLE.

If well managed, this is one of the most amusing games possible; but to carry it out with all the gravity and solemnity in which is the very essence of the game, a few elder boys are almost indispensable.

An installation of Knights of the Most Noble Order of the Whistle being resolved upon, those who know the secret rites form themselves into a Chapter, and announce by a herald their gracious intention of honouring the remainder by admitting them, without an apprenticeship, free, *gratis*, for nothing, to all the honours, privileges, and emoluments of their most noble society, for which purpose they will be summoned one by one to the presence of the officers and members of the said society in Chapter assembled.

The neophytes, who must know nothing of the game, are now dismissed to another room, and the Chapter proceeds to make due preparations.

One, who should be one of the eldest and the best player, is chosen Grand Master, and assumes his seat in an arm-chair, covered with a tablecloth or other drapery, in the middle of the room; for *bâton* he may hold a ruler, walking-stick, or, if possible, a sword.

On his right sits "Grand Tongs," suitably accoutred, and on his left "Grand Fire-shovel;" while behind him stand "Grand Poker" and "Grand Hearth-brush," each with his insignia of office. The rest seat themselves in a circle in front of the Grand Master, while the "Lord High Doorkeeper" guards the door against intruders.

A cloak is now prepared by hanging a whistle by a long string to the back of it; the whistle should be light, and the cloak thick, for reasons which will be soon apparent. This cloak is handed to the "Grand Apparitor," who folds it over his arm, with the whistle inside, and takes his stand behind the Grand Master.

All being thus prepared, Grand Poker and Hearth-brush are sent to fetch the first neophyte, who is brought before the Grand Master, into the circle, which closes in round him, and there on his knees is made to take any oaths the ingenuity of the Grand Master can hit upon. Then, being duly robed with the cloak by the Grand Apparitor, who of course takes care not to let him see the whistle, receives the accolade of Knighthood, and is told to rise under the name of Sir —— (somebody or other, at the fancy of the Grand Master); not, however, to take his seat until he has discovered the holder of the sacred whistle of their Order.

As he rises, one of the players behind him sounds the whistle and lets it go. The new-made knight spins quickly round and challenges the most likely of those behind him, who shows his hands in token of innocence. Again the whistle sounds from behind, again he spins round, but of course to no purpose, for he ever carries the whistle himself behind him.

If the circle be not too eager, the fun may be kept up for some time before the bewildered knight finds out that he himself carries the whistle, to his own confusion.

Sometimes a knight gives it up as a bad job, and declines to seek any longer, under which circumstances he must be disrobed and dismissed; if, however, he discover the whistle, room is made for him in the circle, and he joins in the fun of persecuting the next victim.

More than half the fun of the game consists in the mock solemnities, which, too, have their use in bewildering the neophyte, and so making his deception more easy.

PRESENTED AT COURT.

The same preliminary formalities will do for this game as for the preceding, except that, instead of a cloak, a seat of crafty construction is prepared for the "presented" as follows:

Two chairs are placed about two feet apart, and covered, both back and seat, with some sufficient drapery, so as to make the two chairs, with the gap between them, appear like one solid seat.

The King and his Grand Chamberlain, or, if possible, his Queen, sit on either chair, leaving the gap between them vacant; and the Court stand round with due observance and respect.

The novice is now introduced by the proper officers, and kneels to kiss the King's hand, and then the Queen's, after which—with constant exchanges of compliments, in which, by the way, he must be previously instructed by the proper officer—as a mark of high honour, and in assurance of the royal favour, he is invited to take his seat between the royal pair. As he does so, the King and Queen, who have been very careful to keep his attention constantly directed to them by their protestations of esteem and regard, rise and bow; the drapery spread over the seat, and kept in its place by their weight, gives way beneath

the luckless wight, and he comes ignominiously to the ground amidst the applause of the Court and condolences of the King and Queen.

The success of this manœuvre, which requires skilful timing, and no little tact to prevent the intended victim "smelling a rat," depends almost entirely upon the King, who, therefore, must be very carefully selected.

If possible, this and the former game should be tried on the same set of novices, the difference between the traps laid for them being quite sufficient to prevent initiation into one being any protection against being duped by the other. In fact, the experience gained in the one is very likely to put the novice on a false scent for the other. To further this end, the investiture of the person to be presented in a cloak similar to the one used in the "Knight of the Whistle" will be found a very serviceable *ruse*.

Sometimes the Court are not satisfied with merely letting the "presented" down, but take pains to make matters uncomfortable for him by putting something hard for him to fall upon, or even sometimes a tub of water; but this is not fun, but mere vulgar horse-play, suitable, perhaps, for sailors on board ship, but not the sort of thing fitted for young gentlemen. Besides, it is highly dangerous, and a boy might very well be crippled for life or even killed by coming down too heavily upon the seat of honour. A cushion or folded coat should always be put underneath, for fear of accidents.

MAGIC MUSIC.

One player is sent out of the room, and in his absence the rest agree upon some simple task for him to perform, such as turning a chair round, removing it from one part of the room to the other, or the like. He is then called in, and endeavours to find out what they would have him do, being guided in the search by the sound of the piano or some musical instrument, which is played loudly or softly according as he nears or wanders away from the object of his search.

By following the guidance of the music, a quick player will soon find out first the locality of the thing, and then the thing itself which he has to operate upon, and, having discovered it, will soon hit upon the right thing to do with it.

Sometimes, in the absence of a musical instrument or a musician to play it, the other players form themselves into a band, and with the tongs, poker, and fire-shovel produce more or less of a din as a substitute for the more legitimate music. The piano, however, is not only preferable on account of the less riotous nature of the sounds produced, but also because the gradations of tone are more easily marked, and it therefore affords a better guide to the searcher.

The game may be modified by hiding something and letting the searcher find it under the same conditions as before.

SHADOW BUFF.

A very amusing game and full of incident. A sheet is hung across one side of the room, and the player who takes the part of "Buff" sits facing it at about a yard or so distance.

A lamp is placed on a table, or, better still, a chair, at the opposite side of the room, and the other players pass one by one between the lamp and the sheet, on which, of course, their shadows thus fall. From these shadows buff is required to give the names of the individuals, the actual entities of flesh and blood of whom they are the "counterfeit presentments."

The players may disguise themselves in any way they like,—by sticking out their hair, altering their clothes, improvizing impossible collars, distorting the outline of their faces by holding up their hands beside them, and the like. The latter method especially will be found very effective, as those may well divine who have seen—and who has not?—the wonderful birds, beasts, fishes, and nondescripts which may be produced, with the simple aid of a candle, by one pair of skilful hands.

A finger properly applied to the nose may change the most uncompromising of "snubs" into the most classical Roman, or turn a classical well-cut—or, as the novelists say, "chiselled"—nose into one of Bardolphian monstrosity.

But we can do no more than hint at the various ways in which the player may disguise himself and deceive the buff. Of one thing, however, we must warn him. An experienced buff will take little notice of prominent features; these are sure to be disguised; but will watch for slight indications of individuality, especially in the way of characteristic gait or gesture, and it is on this head, therefore, that the player must exercise especial caution.

When the buff guesses correctly, the player detected becomes buff, and buff joins the rest.

Where forfeits are exacted, each player as he is detected pays a forfeit, and buff pays one every time the whole party pass the ordeal undetected. Of course, it is absolutely necessary that there should be no other light in the room.

FRIGHT.

This is a very lively game, with plenty of fun and excitement in it. It is played as follows:

Supposing there be twelve players, one is chosen as Fugleman; ten chairs are then placed in a row, facing different ways, alternately back and front, and the remaining eleven players range themselves in a line round them, with their right sides to the chairs. The fugleman now gives the word "Slow march!" upon which they march in slow time round the chairs in single file; "Quick march!" and then "Slow march!" again, until, watching his opportunity when they are least prepared, he shouts out, "Halt!" At this word they must all endeavour to sit down, and, as only one may occupy one chair, and as there are only ten chairs for eleven would-be sitters, one must necessarily be "left out in the cold."

This fate entails a forfeit; the struggle, therefore, for seats is very exciting, for none is willing to be the "odd man out," and *sauve qui peut*—each one for himself—is the order of the day. The arrangement of the chairs alternately back and front adds amazingly to the perplexity of the unfortunate member in search of a seat, and it is very amusing to notice how lovingly the crafty ones cling to the chairs which have their seats towards them, how carefully they eschew the backs—how it takes at least three steps to pass the former, while the latter are easily cleared in one.

It adds very much to the spirit of the game, and, indeed, improves it very much in every way, if, instead of having a fugleman, a march is played on the piano. The players must keep time to the music, and its cessation is the signal to be seated. A good pianist will lead the players a pretty life, trying them with all sorts of time, and involving them in all sorts of troubles. A very effective plan is to make pretence with a good sounding chord or two of coming to a full stop, and then dart off into a lively quick march. One or two of the extra sharp players are sure to be taken in, and to make a dart for seats; give them just time to get out of their seats and rejoin the ranks, and then, while they are yet covered with confusion and demoralized by their mistake, stop in right earnest. A "heavy bag" may be looked upon as a certainty.

GERMAN DWARF.

This is a capital deception, and, if well carried out, one sure to please the spectators, who, unless they are in the secret, will try in vain to solve the mystery.

To produce this entertaining illusion two persons only are absolutely necessary, but the assistance and co-operation of a third will prove of great service both in making preliminary preparations and in carrying out the deception.

The other requisites are a table, of the dressing-table character, with a long cloth sweeping the ground, and a pair of curtains.

These curtains must be hung over the doorway between two rooms, or at the opening of some suitable recess, and the table, with its cloth so arranged as to allow no one to see underneath it, must be placed in front.

The exhibition should be held, if possible, in a separate room, from which the public must be rigorously excluded whilst the dwarf is being "got up." If, however, this be not practicable, another curtain should be brought over the front of the table until the dwarf is in his place; in fact, in either case, a double set of curtains, one in front and the other behind the table, is a great advantage.

The dwarf is managed thus: The taller of the two chosen to enact that part carefully disguises his face with a wig, a false moustache and beard, and a liberal application of burnt cork and rouge, and having divested himself of his coat, pulls over his hands and arms a pair of stockings, which should be

of some bright colour—scarlet for choice—and over them a pair of shoes, ornamented at the instep with enormous buckles or rosettes.

The shorter of the two then, standing behind him, thrusts his arms as far as they will go under his, the first-mentioned's, armpits, and a kind of tunic or other suitable garment is brought over all.

This tunic, of course, must be made for the purpose, and should be as extravagant as possible in colour and cut: a good-sized crimped frill or enormous turn-down collar is very effective.

Thus arrayed, the first-mentioned, standing behind the table, places his shoe-clad hands upon it, which thus represent the feet of the dwarf, and the curtains, which are fastened together a few inches above his head, are drawn apart so as just to reveal what appears to be the body of a dwarf with a most disproportioned head. By the way, a boy with a big head should generally be selected for this part, and its size should be exaggerated by art.

He must remember to lean slightly over the table; in fact, he should stand in the attitude of a man making an after-dinner speech, or the legs will not appear to support the body, and thus much of the *vraisemblance* will be destroyed.

The third accomplice, who also undertakes the part of showman, must now admit the public, and introduce to them his wonderful *lusus naturæ*.

This part of showman is, perhaps, the most important of the three, for upon his wit and readiness will depend all the real fun of the affair: the dwarf by itself can be but an object of passing curiosity, unless occasion be taken to make it a peg to hang some fun upon.

It is impossible for us to put words into the showman's mouth; we would only advise him to get up his "patter," as the showman's talk is called, as far as possible beforehand, imitating and parodying the regular professional giant and dwarf showman to the best of his ability.

Of course, the more ridiculous and impossible his statements are the better. His history, geography, &c., should be hopelessly at fault. A very good plan is to describe his dwarf as a thousand years old, and make him take part in the most incongruous historical events, jumbling up persons, localities, and dates in hopeless confusion.

This "patter" must be poured out in one continuous stream, and with perfect confidence and self-possession, or it loses half its attractions.

Both dwarf and showman, if they want to produce a really striking effect, must practise their parts together for some time previously.

If the dwarf can get up a dance, or play a short tune upon a penny whistle, or perform some other similar feat, it will add much to the success of the show.

This whistle business is difficult at first, because the hands do not belong to the owner of the mouth, and they must be guided by feeling alone, for their owner cannot see anything; but the difficulty *may* be overcome, and that without very much demand upon the learner's patience.

He who does the head and legs part must be careful not to forget his part: a momentary forgetfulness may betray him into the most ludicrous mistakes.

The writer's brother one day, while officiating in this capacity, was suddenly afflicted with an intense itching of the nose. Momentarily oblivious of his part, he lifted his shoe-clad hand to his nose to scratch the seat of irritation, an action that, of course, raised shouts of laughter from the audience, for the dwarf appeared to be "taking a sight," not with his thumb and fingers, but with his toes.

Fortunately the spectators looked upon this as part of the performance, and were proportionately delighted; but similar mistakes may not prove always equally fortunate.

THE GIANT.

This may be done in two ways; first and most difficult, by one boy standing on another's shoulders, and then putting over both a long loose garment, long enough to reach to the knees of the lower one.

This method, however, may be made much more easy by the upper player putting his feet in a kind of stirrup fastened to straps passing over the under one's shoulders, and hanging just down to the hips. Height, of course, is sacrificed, but greater safety is secured; the giant, too, can exhibit thus for a longer time, as the attitude is not so fatiguing.

The other and simpler method is to place a huge mask, which should represent a head and neck, on the top of a pole about five feet long, with a cross-piece to represent arms, and then tying a long cloak—it should be made for the purpose: any common material will do—round the neck of the mask, get bodily inside.

Now, by raising or depressing the pole, the giant may be made to attain an extraordinary stature or to shrink down again to ordinary dimensions at will.

The lower end of the cloak, about two feet from the bottom, must be fastened to the performer's waist, so that when the head is depressed the cloak may fall in folds, and not sweep the ground as it otherwise would.

There is a very entertaining illusion of this sort exhibited under the name of "The Nondescripts." Two figures with enormous heads, alternately giants

and dwarfs, run about the circus and indulge in the most surprising vagarie being able apparently to contort themselves in every imaginable direction.

Their final *coup* is to put their heads deliberately through their legs, and make their exit with their eyes thus looking over their own shoulders.

HEAD, BODY, AND LEGS.

This is a very amusing game, and will afford an almost endless fund of amusement.

Though it is a drawing game, yet it does not require that the players should be artists, or even in the ordinary sense be able to draw; a mere faculty—which nearly all schoolboys possess—of being able to scrawl some distant resemblance to a living creature, is all that is necessary; in fact, the worse the drawing of the several parts, the more amusing is commonly the result of the whole. The method of procedure is as follows:

Three or more players sit round a table, each with a sheet of paper folded into three, and a pencil. Each draws a head, of man, of beast, of fish, &c., according to the fancy of the moment, on the upper third, carrying the lines of the neck just over the fold as a guide to the next artist, and folds it down, and then passes it to his left-hand neighbour.

Each, then, on this new paper, draws a body, working from the lines of the neck above mentioned, but of course in total ignorance of the nature of the head thereto belonging, carries the lines over the next fold, doubles down, and passes the paper as before.

Each now, working from the lines brought over, affixes a pair of legs—the more eccentric the better—to the unknown body. The papers are then passed to the chairman, who opens them, and shows them for public inspection. The combinations produced in this way are most extraordinary, and often raise shouts of laughter.

The illustration is a facsimile of a drawing thus produced while describing the game to the draughtsman.

DECAPITATION.

This is a trick in essence like that of German Dwarf, and requires, like it, some little preparation. The subject for decapitation is placed on his back on a table, his head towards the audience, and hanging over the edge; or, better still, he may lie on a mattrass placed on the table, with his head hanging over the edge.

His whole body now, up to the chin, is covered with a cloak; a wig and sham forehead, previously prepared, are brought over his mouth and nose, so as to make the place where his chin is appear to be the top of his head, and a nose and mouth are carefully painted on his forehead. The head now appears to rest upon its chin, and to be quite separate from the body, only leaning with its back against the trunk.

The individual selected should have a good crop of long hair to play the part of beard, and a good thick pair of artificial whiskers should be brought down either side of his face, and made to mingle with his hair.

If, in addition to this, a reasonably presentable false nose, with moustache attached, can be procured, it will be much better than the painted one, and will greatly further the deception.

The lights also must be carefully arranged, so that, while apparently throwing plenty of light upon the subject, they are really rendering it more obscure. A little previous rehearsal with them will be necessary to effect this satisfactorily.

The head in this state, with the eyes upside down, &c., is a most ghastly sight, and it would, therefore, be desirable not to admit very young children to view the body.

Of course some suitable story must be got up and told by the showman; or it might be brought into a charade or tableau vivant.

A little flour and rouge will be found very useful in hiding the line of junction between the real and imitation flesh.

CONSEQUENCES.

This is a capital indoor table game, especially when there are some ten or a dozen players to keep the game alive.

It is founded upon the absurd incongruities that result when a number of people combine together to make one connected sentence, each taking his own part irrespective of each and all of the others.

Just as in the preceding game a connected drawing was made by uniting three several parts, each drawn in ignorance of the other two, so in this the several component parts of a sentence are written down by a number of players separately and without collusion, and then joined together in one.

We will suppose eleven players are sitting round the table, severally provided with a pencil and a strip of paper. Each writes on the top of his paper one or more adjectives attributable to a man, folds his paper down over the writing, and passes it to his left-hand neighbour, receiving one in return from him on his right; and proceeding in the same order he writes in succession,

Adjectives suitable to a man,
A man's name,
Adjectives suitable to a woman,
A woman's name,
The name of a place,
Some productions of ditto,
A date,
A short sentence suited to a man,
A woman's reply,
The consequences,
and
What the world said.

As an example we will suppose the following to have been written down on one of the papers:

The irascible and enthusiastic—Paul Pry—The pious and charitable—The Queen of the Cannibal Islands—The ball of St. Paul's—Bloaters and ginger beer—Christmas Day, B.C. 450—Have you seen Blondin?—Ask mamma—They both perished miserably—It always knew how it would be.

When all have been filled up, the president takes the papers and reads them out; the one instanced above reading thus:

The irascible and enthusiastic Paul Pry *met* the pious and charitable Queen of the Cannibal Islands *in* the ball of St. Paul's, *famous for its* bloaters and ginger beer, *on* Christmas Day, B.C. 450. *He asked her in tender strains*, "Have you seen Blondin?" *To which she replied, with a modest blush*, "Ask mamma." *As a natural consequence* they both perished miserably; *and the world said* it always knew how it would be.

ADJECTIVES.

This is also a very amusing game. One of the players writes a letter, which of course he does not show, leaving a blank for every adjective. He then asks each player in turn round the table for an adjective, filling up the blank spaces with the adjectives as he receives them.

The following short letter will explain the game better than a long description.

MY *detestable* FRIEND,

In answer to your *amiable* letter, I am *silly* to inform you that the *dirty* and *degraded* Miss Jones sends you her most *fallacious* thanks for your kindness, and bids me tell you she will always think of you as the *vainest* and most *adorable* friend she ever had. As for that *sagacious* fellow, Smith, he is such a *delightful* ass, such a *filthy* and *eminent* muff, you need not fear he will prove a very *complicated* rival.

Believe me, my *foolish* fellow,

Yours, &c.

CRAMBO.

This is a game only for those who have some facility in rhyming and versifying; with half a dozen such it will always afford unlimited amusement. It is played as follows:

The players sit round the table, each with a pencil and two slips of paper; on one he writes a question—any question that occurs to him, the quainter the better—and on the other, a noun.

These slips are put into two separate baskets or hats, and shaken up well, so as to be thoroughly mixed. The hats or baskets are then passed round, and each player draws two slips at random, one from either basket, so that he has one slip with a question and one with a noun.

The players thus furnished now proceed to write on a third slip each a practical answer to the question before him. The answer must consist of at least four lines, and must introduce the afore-mentioned noun.

For instance, supposing a player to have drawn the question, *Who killed Cock Robin?* and the noun *Jaw*, he might answer it somewhat as follows:

I, said the Sparrow,
With my bow and arrow.
If you'd known him too
You'd have wished him at Harrow:
With his cheek, and his jaw,
And his dandy red vest,
He became such a bore,
Such a regular pest!
'Twas really no joke:
Such troublesome folk
Must not be surprised if they're promptly suppressed.

Or, as a more concise example, question asked, *Do you bruise your oats?* Noun, *Cheese*. Answer,

As I don't keep a steed,
For oats I've no need:
For myself, when my own private taste I would please,
I prefer wheaten bread to oat-cake with my cheese.

Here is another example of veritable crambo rhymes. The question was, "Can you pronounce Llyndgynbwlch?" and the noun "Oil." Answer as follows:

"Pronouncing Llyndgynbwlch
My glottis will spoil,
Unless lubricated
With cocoa-nut oil."

There happened to be cocoa-nut cakes on the table.

These will be amply sufficient as guides to the method of playing the game. They are not offered as models of poetry or diction, but as just the sort of things anybody might write on the spur of the moment, and therefore better suited for our purpose than any more finished and elaborate productions.

Of course this game *can* only be played by those who will take an interest in it, and who possess some little facility of versification. A player who, after half an hour or so spent in puzzling his brain and beating about for rhymes and sense, cannot succeed in turning out a few lines of doggerel, had better, for his own sake and that of others, turn his attention to other and less intellectual amusements.

But we would not alarm any timid players—we have no wish to seem to require any great poetical gifts in the player, though, of course, the more witty and brilliant they are, the more delightful and interesting the game: the merest doggerel is quite sufficient for all purposes, and the facility of stringing verses together will be found to increase rapidly with every day's practice. None but a veritable dunce need despair of taking at least a creditable part in this very amusing game.

DEFINITIONS.

This is a game only for elder boys and grown-up people; it is quite beyond the powers of youngsters, and not all even amongst the seniors can make any figure in it.

The theory of the game is very simple, but the opening it gives for wit and satire is simply unbounded, and for pure intellectuality it stands unrivalled amongst evening games.

The players sit round a table each with a pencil and piece of paper; a noun is then selected at random from a list, or in any convenient way, and each is then bound to furnish an original definition. This done, another is given out and similarly defined.

When a convenient number have been thus disposed of, the papers are handed up to the president, who is chosen for the occasion, and the several definitions read aloud.

Some very brilliant impromptus are sometimes flung off in this manner; and we would strongly advise, where the game is much played, that a book should be kept for the enshrinement of the special flowers of wit.

We offer a few here as examples, not so much for imitation, but as illustrations of the ***modus operandi***, or perhaps we might rather say, ***ludendi***.

NOUN—MIRROR.

DEFINITIONS.

(*a*) The rarest gift the fays can gie us—
We see oursells as ithers see us.

(*b*) The vain man's most intimate friend: the wise man's acquaintance.

(*c*) The type of perfect unselfishness, giving away all that it receives and retaining nothing for itself.

(*d*) The hermit of modern life: it spends all its time reflecting on the vanities of the world.

NOUN—PROSPERITY.

DEFINITIONS.

(*a*) The reward of exertion.

(*b*) Man's greatest temptation.

(*c*) The world's touchstone of merit.

(*d*) What each man most thinks he has a right to expect for himself, and is least inclined to desire for his neighbour.

(*e*) The pass-key that unlocks the gates of society.

(*f*) A prize in the lottery of fate.

NOUN—HUMANITY.

DEFINITIONS.

(*a*) The best abused virtue in the calendar.
(*b*) The highest triumph of civilization.
(*c*) The basis of Christian charity.
(*d*) The most God-like of virtues.
(*e*) A common cloak for cupidity.

DEFINITIONS.

(*f*) The begging impostor's Tom Tiddler's ground.
(*g*) The weakness of the many, the virtue of the few.

HOW DO YOU LIKE IT?

How do you like it, When do you like it, and Where do you like it?—This is also, like "Proverbs," a guessing game. One player, as before, goes out of the room while the others fix upon a word. He then returns, and puts to them severally in turn the question, "How do you like it?" and then, having completed the circle, "When do you like it?" and thirdly, in like manner, "Where do you like it?" To each of which questions the other players are bound to return a satisfactory reply.

At the end of these questions, or at any time in the game, the questioner may make a guess at the word, being allowed three guesses in all, as before in "Proverbs." If he succeed in guessing rightly, he points out the player from whose answer he got the right clue, who, therefore, pays a forfeit and takes his place, and the game goes on as before. If he do not succeed in guessing rightly, he himself pays a forfeit and goes out again.

The great secret of the game is to select words that, though pronounced alike (spelling does not matter), have two or more meanings.

For instance, Z goes out, and the word "bow" is chosen. He asks of each, "How do you like it?" A answers "In a good temper" (*beau*); B, "With long ends" (a bow tied in a ribbon); C, "Very strong" (an archer's bow); and so on, ringing the changes upon the three different sorts of bow.

In the next round the players are not bound to adhere to the same meaning they selected before, but may take any meaning they think most likely to puzzle the questioner.

Thus, to the question "When do you like it?" the answers may quite legitimately be as follows: A, "When I am dressing;" B, "When I want exercise;" C, "When I am going to a party." And to the last question, "Where do you like it?" A answers, "Under my chin;" B, "At my feet;" C, "Outside on the lawn."

If there be only three to be questioned, this would prove hard enough to find out, though "Under the chin" might perhaps give a clue. Z's chance lies in the number of answers that have to be given to the same question, and in the short time each has to prepare a satisfactory answer—one that shall satisfy all conditions and yet give no clue to the word.

The whole fun in this game, as in "Proverbs," depends entirely upon the wit and spirit of the players. To be seen at its very best it should be played by a party of really clever grown-up people. The contest of wit is then, as Mr. Cyrus Bantam would say, "to say the least of it, re-markable."

Below will be found a few words taken almost at random suitable for this game.

Air—Heir	Band	Balm—Barm	Chest	Dram—Drachm	Pear—Pair	Note
Ant—Aunt	Aisle—Isle	Arms—Alms	Club	Draft—Draught	Fair—Fare	Poll
Bow—Bough	Bar	Bowl	Corn	Knight—Night	Sail—Sale	Roll
Bow—Beau	Bill	Cask—Casque	Drop	Hair—Hare	Rain—Rein	Sole
Flour—Flower	Ball	Cell—Sell	Gum	Mail—Male	Vale—Veil	Box
Bale—Bail	Buoy—Boy	Chord—Cord	Kite	Main—Mane	Tale—Tail	Game, &c.

WHAT IS MY THOUGHT LIKE?

This game is somewhat like the last, only that the questioner does not leave the room, and the onus of the game lies on the questioned, not on the questioner.

The players being seated in a semicircle round the questioner, he thinks of something or a person—it matters not what—and demands of each player, "What is my thought like?" The answers, of course, being given without any clue to the word thought of, are of the most incongruous nature.

This, however, is only the commencement of the fun. Having taken and noted each player's simile, the questioner now reveals the word he had thought of, and demands of each a verification of his simile under penalty of a forfeit.

As the answer must be given promptly, without time to arrange an elaborate defence, much quickness of wit and readiness of resource is required to avoid the forfeit for failure.

If the whole party succeed in justifying their similes, the questioner pays a forfeit, and a new questioner is appointed.

The decision as to an answer being satisfactory or not lies in disputed cases with the whole party of players.

An illustration of the working of the game may be, perhaps, not out of place.

We will suppose that Z, the questioner, has thought of a *baby*, and has asked the question, "What is my thought like?" all round, and received the following answers:

A, "A lump of chalk;" B, "Alexander the Great;" C, "The Great Eastern;" D, "A gooseberry;" E, "A fishing-rod;" F, "A carpet bag;" and so on;

Z now tells them he thought of a *baby*, and calls upon them each severally to justify his simile.

A, "It is like a lump of chalk because it is white." (Allowed.)

B, "It is like Alexander because it cries for what it can't get." (Allowed.)

C, "It is like the Great Eastern because it costs a great deal of money before it makes any returns." (Disputed as rather too fanciful, but finally allowed.)

D, "It is like a gooseberry because it is soft and red." (Not allowed. It had previously been likened to chalk as being white; red, therefore, cannot stand, and softness is not a sufficiently distinctive characteristic. Forfeit.)

E, "It is like a fishing-rod because it has many joints." (Allowed by general acclaim.)

F, "It is like a carpet bag because it has most elastic capacities of stowage." (Allowed after some discussion.)

Of course, it is easy enough in most cases to find some sort of justification of almost any simile if time be allowed, though even then one sometimes comes across one that would puzzle the most ingenious; but in the actual game the explanation must be found on the spur of the moment, and herein consists half the fun.

This game, like all others of its kind, is entertaining exactly in proportion to the wit and capacities of the players. Even the most witty and most learned may join in it without derogating from their dignity, and with a certainty of deriving from it a fund of endless and highly intellectual amusement.

PROVERBS.

This is a very good mental exercise for all, and is capital fun even for adults; indeed, the better educated and the more clever the players are the more fun is there to be got out of the game, as it gives ample occasion for the exercise of wit of the highest quality.

One player goes out of the room, and the rest, being seated in a circle, fix upon a proverb, which should not be a very long one. The first player being now recalled, he begins at player number one in the circle and asks any question he likes: the answer must contain the first word of the proverb. He then tries the next, whose answer must contain the second word, and so on.

He is allowed to go completely round the circle if it be a large one, or twice if it be a small one, and then must either guess the proverb or go out again and try a new one. If he guess rightly, he has to declare the answer that gave him the clue, and the player who gave it has to go out in his stead.

In answering the questions much ingenuity may be exercised, and much amusement created in concealing the key-words of a proverb. For instance, in "Birds of a feather flock together" there are three dangerous words—birds, feather, and flock—all difficult to get into an ordinary sentence, and it requires much dexterity to keep them from being too prominent. Let us take this proverb as an example. A goes out, and "Birds of a feather flock together" is agreed upon. A asks of B, "Have you been out to-day?" B, "No; but I sat at the window for a long time after sunset listening to the *birds* and watching the rabbits on the lawn; you can't think what a lot there were." A is puzzled, he has so many words to pick from, and the word, which when expected seems so prominent, falls unnoticed upon his ear. He asks C, "And what have you been doing with yourself this evening?" C, "Oh, I have been sitting with B, looking out *of* window too." Next comes D, who can have but little trouble in bringing in his word *a*, only let his answer be not too short. Then E has to bring in the word *feather*. A asks him, "What did you have for dinner to-day?" F, "Oh, roast beef, turkey, and plum pudding; but the turkey was so badly plucked, it tasted of singed *feathers*, and we couldn't eat it.' This, repeated rapidly, may deceive the questioner, who goes on to E: "I saw you with a fishing-rod to-day; what did you catch?" F—who is by no means required to adhere to absolute facts, and may draw upon his imagination to any extent—replies, "Well, to tell you the truth, I did not catch any; for there was a *flock* of sheep having their wool washed ready for shearing." F brings in the *wool* to lead A off to the proverb "Great cry and little wool," as almost his only chance of concealing the real word *flock*. A then demands of G, "Do you like walking?" G, "I do if I have a companion. When Charlie and I go out *together* we always have lots of fun; but Harry is such a duffer, it's awfully slow walking with him."

If A is at all quick, he ought to have heard quite sufficient to know the proverb; he may, however, be puzzled by the complicated sentences; but after the second round at least, when the catch-words have been repeated, he must be slow indeed if he does not discover it.

One of the party should be appointed umpire, to decide whether any answer is a fair one, and no one else should be allowed to interfere in any way; nothing is so likely to give a clue to the questioner as a dispute whether a word has been fairly introduced or not. In cases of doubt the umpire may call for a fresh question and answer. There is no reason why the umpire, who should be one of the oldest players for authority's sake, should not join in the game. He is appointed almost solely to prevent confusion, and his being a player or non-player can have no influence on his decisions.

The answers should be made with decision, and as rapidly as is consistent with distinctness—a quality upon which the umpire should insist; and the player should especially avoid giving short answers when he has a simple word, such as "of," "the," &c., and thus give the questioner the clue to the answer in which lie the catch-words, and thus aid him materially in his task. Of course, great pains must be taken not to lay any stress upon the word that has to be introduced, and not to make the answers unfairly long.

SIMULTANEOUS PROVERBS.—A very good modification of the above. No questions are asked; but the players, one for each word of the proverb, stand or sit in a semicircle, and the player who has to discover the proverb stands in front of them. One of them, who is chosen leader, now gives the time, "One, two, three;" at the word "three" they all call out simultaneously each his own word. This they may be required to repeat once or twice, according to previous arrangement, and then the guess must be made under the same conditions as above.

A long proverb should be chosen for this, if there be enough players; the greater the number of voices, of course, the more difficult it is to discover the proverb.

MESMERISM.

This is a capital game, and, if well managed, will defy all detection. To do it well, however, requires some practice.

Two persons assume respectively the *rôles* of Professor of Mesmerism and Clairvoyant. The professor must have a ready wit and a good store of language, a plentiful vocabulary at his finger ends; whilst the clairvoyant must be quick of observation and retentive of memory.

A semicircle is formed by the spectators, and the clairvoyant is seated blindfold with his back to them; and the professor, after going through the usual ceremony of mesmerizing him, leaves him and crosses to the spectators, asking them for any objects they may have about them for the clairvoyant to name and describe.

If they are both well up to their work, the clairvoyant will appear to those who are not initiated into the secret to be able to see without his eyes, to their intense astonishment and admiration.

The author once thus played clairvoyant to a friend's professor at a large charade party, and deluded the whole company into a belief in the reality of the exhibition.

Robert-Houdin, the great French conjuror, and his little boy made this clairvoyance one of the leading features of his entertainment, and brought the art to a wonderful pitch of perfection.

It would be impossible in the contracted space of one of these short notices to give full instructions how to produce this clever illusion; a mere outline of the method of procedure is all that can be attempted. This, however, will be amply sufficient for a boy of any intelligence to grasp the idea of the leading principles; the mere details he will soon learn to work out for himself. If he should desire any further particulars, he will find much interesting information in the "Memoirs" of Robert-Houdin, which may now be procured at almost any library.

The method of procedure is as follows: The clairvoyant makes it his business to observe narrowly—unostentatiously, of course—and to catalogue in his mind the persons present, any little peculiarities in their dress, ornaments, &c., the general arrangement of the room, and any little knickknackeries lying about. Practice only will enable him to do this to any considerable extent; but if he have any talent for such mental exercise, and without it he will never make a clever clairvoyant, practice will soon enable him to observe almost at a glance and retain in his memory almost all the leading features of all around him, animate and inanimate.

Robert-Houdin trained his son and himself by walking rapidly past various shops in the streets of Paris, and then writing down on paper, after passing each shop, all the articles they could remember seeing in their transitory glimpse through the window: at first half a dozen or so was all they could manage, but they rapidly rose by practice to twenty or thirty, until the young Houdin, who quite outstripped his father, would tell almost the whole contents of a large window.

Of course, such a wonderful pitch of perfection is scarcely attainable by an ordinary boy, and would not be worth his while if it were; nor, indeed, is it, or anything like it, necessary; but the instance may serve as an indication of the right method of procedure, to be worked out by each boy according to his individual bent and opportunities.

It should be understood that all this preparation and practice is not absolutely necessary before beginning to exhibit the trick. A very few rehearsals will suffice for a very respectable performance; only if anything like perfection be aimed at, some extra trouble must be taken to attain it. Of course, every exhibition will do its work of improvement.

Meanwhile professor and patient must practise the code of signals by which the former conveys to the latter any necessary information about the objects to be described.

These signs may be words or other sounds; but great care must be taken with the latter, as they are more open to detection.

The initial letter of the first, second, or last word in each sentence the professor addresses to the clairvoyant is the same as that of the object; and as the number of objects likely to be offered for description is limited, a little practice will ensure its instant recognition from the clue thus given. Some signal should be preconcerted by which the clairvoyant may be warned that the object presented is at all out of the common.

If there be any difficulty in making out the object, the professor may, by a little ingenuity and assurance, spell out in successive sentences the name of the object in his hand. To cover this manœuvre, he should pretend that the mesmeric influence is failing, and make "passes" at the patient, being careful, of course, not to go near him, and the clairvoyant must pretend to brighten up under their influence.

In the instance above referred to in the author's own experience, one of the company presented for description something very much out of the common way, a nutmeg-grater or something similar, and the professor, with the greatest readiness and the coolest assurance, deliberately spelt its name through almost to the last letter without detection.

The above, it is hoped, will be found sufficient to set the young aspirant to mesmeric fame on the right track; but an example of the actual working may, perhaps, prove more serviceable than much description.

Suppose, for instance, the object be a coin—a shilling, say, of George the Third, date 1800. The professor, who, by the way, should speak with as much rapidity as is compatible with distinctness, says sharply,

Can you tell me what I have in my hand?

A coin

Modern or ancient?

Modern.

English or foreign?

English.

Give the reign.

George the Third.

But what value?

Shilling.

How dated?

1800.

Thank you, sir! Your shilling, I believe? Right, is it not?

The first question, it will be seen, begins with *c*; this, without further explanation, means *coin.* The next two explain themselves. The fourth begins with *G* for *George*, the only possible modern English reign; and the next word beginning with *t* gives the clue to *third. B* at the beginning of the next stands for "*bob,*" or shilling, when speaking of English coins. The guesser can't be far wrong in his date, knowing the reign. In enumeration the several digits are represented by the letters of the alphabet; *h* is the eighth letter, and therefore stands for 1800. Any odd numbers might have been spelt out in similar fashion.

Both professor and clairvoyant should speak rapidly and decisively to prevent detection, and should constantly change the key-word from first to last, and so on. A knowledge of French or some other language will be of great service in concealing the machinery

FORFEITS.

In several of the preceding games we have mentioned forfeits as penalties for failure in some of the conditions.

When a player has to pay a forfeit, he gives in pledge some piece of portable property, which he will afterwards, at the end of the game, have to redeem in due order.

One player is declared judge, and, with eyes blindfold, stands with his face to the wall, while another takes up the several pledges separately and asks, "Here is a pretty thing, and a very pretty thing; what is to be done to the owner of this very pretty thing?" Or, omitting the formula, asks merely, "What is to be done to the owner of this?" The blindfolded player, who, of course, does not know to whom each forfeit belongs, and therefore cannot be accused of unfairness, assigns for each forfeit a task which must be fulfilled before the pledge can be reclaimed.

This calling of the forfeits requires no little ingenuity, tact, and judgment, and the entire success depends upon the suitability of the penalties to the company and the circumstances.

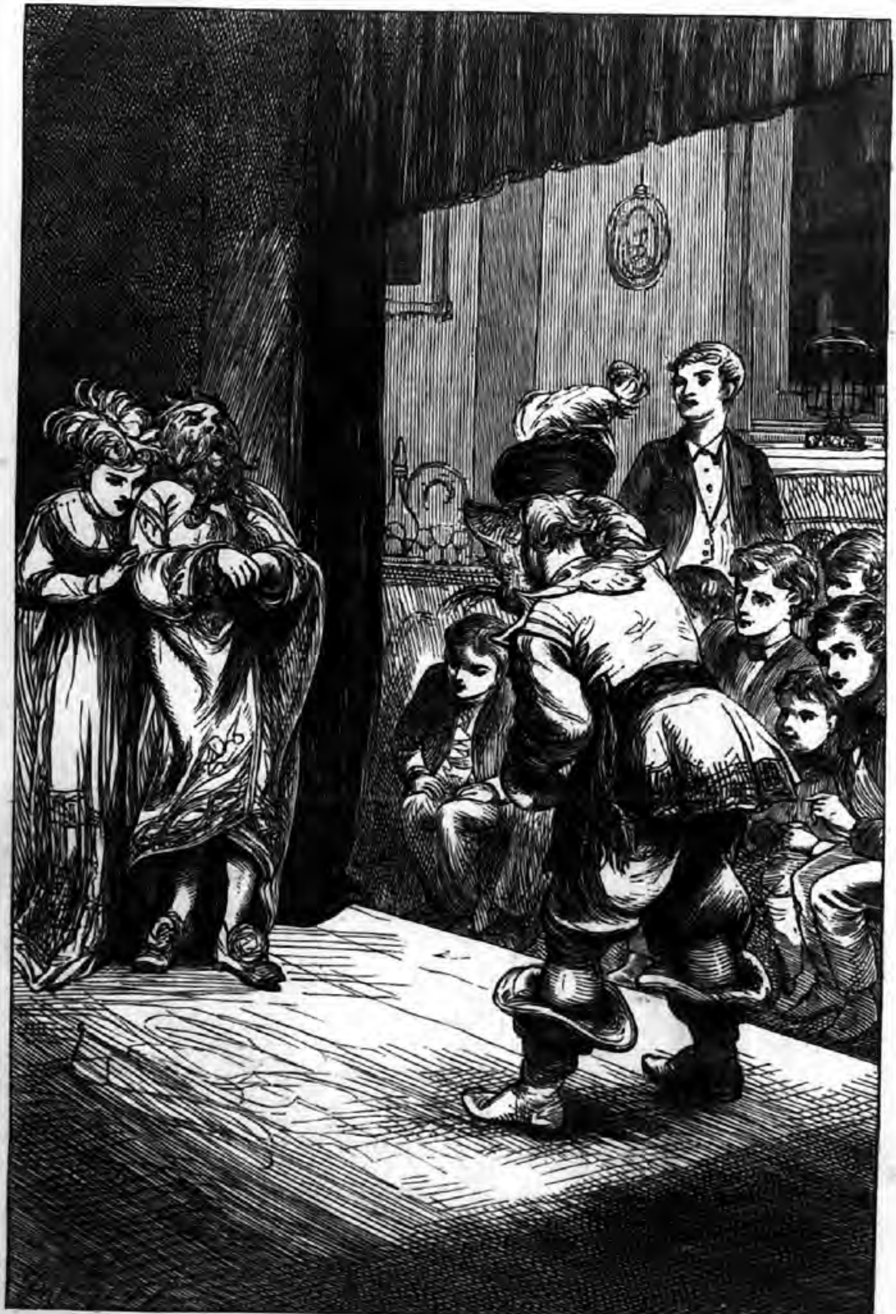
The judge must take into consideration not only wnat penalties *can* be enforced, but what will afford the most fun, and at the same time must avoid the slightest shadow of offence.

Where the party is composed entirely of boys with no great inequality of ages the task is tolerably easy; but where there is a mixed company of girls and boys, not only must the penalty attached to any forfeit be such as a girl *could* perform, but it must be such as no girl would object to perform.

In cases like this it is better to get an older person—a lady if possible—to cry the forfeits; and where such is not forthcoming, it is better not to cry them at all; or, if that be too hard a trial for the young players' philosophy, to cry the girls' and the boys' separately.

As the penalties, therefore, must depend so entirely upon the special circumstances of each occasion on which they are imposed, it would be impossible for us to find space enough to give a list sufficiently comprehensive to be of any real service as a guide to the judge in all cases.

The old stock forfeits are so well known and so stale that it would be mere waste of time and space to insert them here. We might certainly give a few new ones; but the exigencies of space would, as we said above, prevent our giving more than a very few, and we therefore prefer to leave them entirely to the ingenuity and invention of the judge for the time being, who, if he be worth his salt, will with one glance of his eye round the group of expectant pledge-owners gather more hints for penalties suited to the occasion than he would from whole pages of printed instructions.



ACTING CHARADES.

Acting Charades.

PUSS IN BOOTS.

Dramatis Personæ.

The OLD MILLER.
ARABA *(the* Miller's *eldest son).*
BARABA *(the* Miller's *second son).*
CARABA *(the* Miller's *third son).*
The CAT.
The KING.
The OGRE.
The PRINCESS.
KING'S *servants*, OGRE'S *servants*, Peasants HODGE, JENKINS, GILES, *and* LUKE.

Should there be a paucity of actors, the peasants' parts can be played by the Miller and his three sons; also the Miller may play the King's part entirely, and the Ogre's part. The Ogre should wear a horrible hairy mask, with huge teeth and bristling beard His dress should be of fur if possible; but a railway wrapper might serve as a *poncho* or mantle: some railway wrappers like leopard-skins would do. The Cat ought to be all fur if possible, grey or black; if the latter, the black should be slightly whitened, to look aged. A couple of black carriage rugs, or a large seal-skin cloak, might be contrived: the head must be a mask. The four scenes might be roughly painted by any amateur draughtsman, and hung on a large screen. They need not occupy the whole of the stage-back, being only suggestive. As each act ends, when the curtain falls, the scene is removed, and the one below is shown, which, in its turn, is taken off, till all the four have been employed. The rest of the stage background may be filled up with drapery. This is, of course, for drawing-room acting; when proper stage scenery can be had, it should be used.

Synopsis of Scenery.

ACT I.

A WINDMILL in the centre of the stage; the door open; the action takes place in front of the mill: there may be a few bushes roughly painted at the sides of the scene.

ACT II.

A RIVER-SIDE.—The river is not seen, but supposed to run behind a fringe of low copsewood, osiers, or alders, interspersed with reeds. Action goes on in front of the copsewood, and at the side when Caraba is supposed to jump into the water.

ACT III.

A CORN-FIELD with corn half cut: reapers at work. A farmyard with ricks and stacks may be painted in the distance; high road in front, where the action taks place.

ACT IV.

HALL IN THE INTERIOR OF OGRE'S CASTLE.—May be represented in Gothic style: mullioned window; lofty chimneypiece, ornamented with skulls, and an armorial shield representing a salvage man *proper*, holding half a dozen diminutive captives by the hair (something in the style of the Egyptian Kings at the Crystal Palace). On the left of the stage a large screen before the door; on the right of the stage the window; in the middle, behind the Ogre's arm-chair, the mantelpiece.

ACT V.

SAME AS BEFORE: but the screen is removed to make way for a large table spread with a banquet for the King. Door on the left wide open; servants ranged on the right; actors enter by the left in procession.

ACT I.

SCENE I.

Enter MILLER, ARABA, BARABA, CARABA, *the* CAT.

MILLER. My sons, I bring bad news: I've failed, in short,
And must be whitewashed in the Insolvent Court.
The times are hard, the harvest's rusty brown,
Corn's going up, and railways running down.
I bought too many shares—none live in clover
Whose dividends depend on lines to Dover;
So not much profit you'll get out of that.
Your mother's settlement was just the Cat;
The mill I from my father did inherit.
So, Araba, 't is yours; and see you merit [*To* ARABA, *proudly.*
The good old masonry, wind-vans, and hopper.
Take you mine ass,—don't snigger; he's a whopper,
[*To* BARABA, *apologetically.*
And donkey-power sets all the world a-going,
On a wise Saturday Reviewer's showing.
I doubt not your fortune you'll quadruple
If you can follow Long Ears without scruple.
For you, my youngest, best-beloved brat—
[*To* CARABA, *sadly and tenderly.*
Your mother's wedding portion was the Cat,
And though since then his black hairs have grown grey,
He's all the wiser in the world's wise way.
A better counsellor you cannot hit on,
For you are but an inexperienced kitten.
I've said my say; I've given all I own,
And to the workhouse now must trudge alone.
[*Exit* MILLER, *weeping.*

SCENE II.

Enter ARABA, BARABA, CARABA.

ARABA (*jingling the keys of the mill*). Don't be downcast. *I* cry not o'er spilt milk.
At any rate I'm miller of that ilk.
A good old name, a landholder of note,
And worth a little bribing for my vote;

So if you want to stand for shire or borough,
You know my price. [*Exit* ARABA.

BARABA *(disgusted, virtuously goes to the side, and kicks the ass outside the scene).* His selfishness is thorough:
He'd sell both brothers for a sack of bran—
Nought is so hateful as a selfish man!
Gee up, old Teddy! jog a little faster;
The world goes quicker with a younger master;
Stir your stiff stumps to trot a mile an hour,
Let's have a specimen of donkey-power.
We'll have no vulgar costermongering Jack:
I think you might be leader of a *claque;*
Your voice sonorous would be sure to pay—
More than one singer has a touch of *bray.*
You only need some lessons, brief and scanty,
At the Conservatoire of Mercadante.
Signor Somaro, then, I'll dub mine ass,
In Schumann's operas a double bass. [*Going.*

CARABA *(humbly).* Dear brother, I am footsore, you are strong,
Let me ride on your donkey—not for long—
Just till I reach some town, to be a tutor.
As for the cat, poor wretch! I think I'll shoot her. [*Sighing.*

BARABA *(angrily).* What! ride *my* donkey, you presumptuous elf!
No man shall mount my donkey but myself.
There's nought so hateful as a greedy lad. [*Exit* BARABA.

CARABA *(sulkily).* You called our brother selfish; you're as bad:
Oh, dear! oh, dear! my legacy's a mockery;
My cat's not worth a penny pig of crockery;
Hoary and mangy, e'en a London rough
Would scorn to steal him for a seal-skin muff.
He can't catch aught but sparrows for a pie;
Indeed, I fancy he's too old to try.

CAT *(persuasively).* What say you to a rabbit for a roast?
Or partridge, plump, served up on buttered toast?

CARABA *(startled).* Did you speak, Pussy?

CAT *(proudly).* Yes, indeed; I wis
Better than cockneys; not an *h* you'll miss.

CARABA *(doubtfully).* Were you a spaniel, and had I a gun,
Down in the stubble something might be done.

CAT *(grandly).* Game you *shall* have—a princess for a wife!
Lord—marquis—King—you shall be in your life!
Trust to your Pussy; follow Fortune's calling.

CARABA *(in ecstacies).* O Cat, what music in your caterwauling!
Cat of good omen! Cat of prophet race!
Macbeth's three witches in one whiskered face!
New strength, new hope, your promises infuse,—
Feline Thalia! deign to be my *mews!*

Care killed a cat,
But that was long ago;
Shakspeare tells us flat
Her mind she did not know.

Oh, Pussy, stupid Pussy!
  Pussy unlike *you*.
We'll hunt our fortunes, Pussy—
  Hunt, and find them too!

Care killed a cat,
  But not the jolly miller;
He cared for nobody,
  Except himself and siller.
Oh, Pussy, clever Pussy!
  Thou hast wits for two;
Find me a good place, Pussy,
  And not too much to do.

Care killed a cat;
  Care shan't kill you or me;
We are strong and fat
  As Baboo fed on *ghee*.
Oh, Pussy, clever Pussy!
  Pussy, I trust *you*,—
Find me a rich wife, Pussy—
  Rich, and pretty too!

Scene III.

Re-enter Araba, *very cross.*

Araba *(to* Caraba*)*. Clear out of this; *I*'m lord and master now;
  You've got your portion; pack your goods and go.
Cat *(consolingly)*. Never mind, youngster; we'll set out on our journey,
  Like knight and steed for mediæval tourney,
  And find a lady quite as rich and fair
  As ever knight did on his destrier;
  You only need your Sunday clothes complete,
  And *I* new boots to decorate my feet.
Araba *(roughly)*. I'd have you shod, my friend, with walnut-shells.
Caraba *(determined)*. He shall be booted like the Bond Street swells.
Araba *(sarcastic)*. You'd better sell him to a French *guinguette*;
  Mosso would find him toothsome when sharp-set;
  With sauce *piquante*, some restaurant *scapin*
  Would turn him into *gibelotte de lapin*.
Cat *(to* Caraba, *gloomily)*. If you kill me, you kill your golden goose.
Caraba *(cheering him)*. Live, Puss, and prove that you can be of use.—
  Sniff out some heiress worthy my devotion—
  A young man from the country on promotion:
  Can you not help me to a Lord Mayor's daughter,
  Like Whittington's famed cat across the water?
Cat *(disdainfully)*. Lord Mayor indeed! I hope your views point higher;
  To a King's daughter should your eyes aspire!
Araba *(pushing them away)*. Princess or mayoress seek elsewhere, I pray,
  And don't stand jabbering at my door all day.

ACT II.

Scene I.

Enter Caraba *and* Cat.

Caraba *(yawning)*. I 'm in the dumps; I wonder if I 'm spoony;
I 'm off my feed, and off my sleep, and moony.
I saw a lovely lady in a carriage, [*Sighing*.
And ever since my thoughts have run on marriage;
Though which I love, fine coach or finer lady,
I know no better than the Poet Sadi.

Cat *(aside)*. He's smitten with the Princess and her riches.
[*With dignity, aloud*.
Fine clothes look finer when beheld from ditches,
And coaches softer when we tramp on stones.
Come, leave off whining; what's the good of moans?
Strip, and jump headlong in that reedy river. [*To* Caraba.

Caraba *(starts)*. You idiot Cat! the mere thought makes me shiver!
A cold bath on this damp day of September?
I 'd have rheumatic gout in every member.

Cat *(with energy)*. Nonsense! your fortune hangs upon this minute,—
Cold water's very pleasing when you 're in it;
Trust to your Tom.

Caraba *(grumbling and taking off his coat)*. Fool that I was to heed you!
For Heaven knows where each new caprice will lead you.
Such folly's quite enough to make one swear.—
There goes my collar!

Cat. Never mind a tear;
It is the last time you shall don those rags.
There, lay them on that tuft of reeds and flags,—
Don't stop to argue, for the time is pressing;
If we succeed, you 'll give poor Tom your blessing.

[Caraba *goes, grumbling, to the side scene, and is heard to splash into the water. The* Cat *seizes his clothes, and flings them out on the other side of the stage, as if into the water.*

He's in; then follow, thou clodhopper tweed!
If he wants clothes now, he with Poole must plead.
'T is time I get rid of this seedy bundle;
I hear, I hear the royal coach's trundle. [*Sound of wheels.*

[Cat *runs mewing about the stage, and wringing his paws in distress, crying out aloud,*

Help, help my lord! Oh, where's my master's drapery?
His coat, his bathing-sheet, and other napery?
Some thief has ta'en them, and here comes the King!
Thieves! Thieves! Fire! Fire! Murder!—everything!

Enter King *and* Princess.

Cat *(with great rapidity of speech)*. O gracious liege! my lord is in the river.
He can't get out except to shake and shiver
In *puris naturalibus*, and that
I know he won't, as I 'm a modest cat.

Some thief has stolen his suit of *cramoisie*,
And not a shirt or pantaloon has he—
Sad plight for nobleman of high degree!

KING *(astonished)*. A talking cat! the missing link, I vow!
Huxley and Darwin, triumph with me now!
De Chaillu's apes were never half so human:
This creature chatters like a pretty woman. [CAT *giggles.*
Remind me, love (*to Princess*)—Good heavens! the thing can laugh!—
When I go home, to write a monograph
To the Society of Anthropology
On this, my new discovery in zoology:
On one side genus *Felis*, on the other
(He's black) the negro type—a man and brother!

PRINCESS. He talks good English, not like Quashee's pranks.

KING. Has he a tail, child? Can his race be Manx?

PRINCESS. He has his tail on, like Mac Ivor's chief.

KING. A Celtish cat from Inverness or Crieff.

CAT *(kneeling down before the* KING*)*. Have pity on my master wet and chilly.

PRINCESS. Let's drive back to some shop in Piccadilly
For shirts with ballet girls or boatmen printed.

KING *(severely)*. Your taste lacks culture, as I oft have hinted;
Read Owen Jones, his "Decoration Grammar."

CAT *(aside)*. O King, you're dense as Civil Service crammer.
A flannel shirt will do; cheap tweeds from Hyam, [*Aloud.*
Pegtops and cutaway——

PRINCESS *(with energy)*. I'll go and buy 'em!

KING *(peevishly to* PRINCESS*)*. You wasteful girl! some old clothes we will lend;
Who runs up tailors' bills to serve a friend?
In my valise you'll find a robe to spare; [*To* CAT.
Take it and welcome. Is my valet there? [*Calls.*

CAT *(prostrating himself with gratitude)*. Good King! kind King! you've saved my master's life,
And helped him half-way to his future wife. [*Aside.*

[*Servant enters with a valise.* KING *examines the contents.*

KING. Not that—my best suit! anything that's seedy
Is quite sufficient guerdon for the needy.
That lace is rather tarnished; that will do;
Add vest and collar, and a glove or two.

[CAT *seizes the things, and rushes off the stage, crying,*

CAT. Come, Marquis Carabas, come from the water!
Present yourself before the King and daughter;
Reflected lights of royalty you show
From your cocked *chapeau* to your buckled toe,
Your velvet vest o'erlaid with golden laces,
And royal handiwork on those gay braces. [*Exeunt.*

SCENE III.

Enter KING *and* PRINCESS.

KING *writes notes in a memorandum-book;* PRINCES *fidgets about.*

OLD SCOTCH AIR.—*I wonder if I'll be married?*

PRINCESS *(sings).* Oh, I wonder if I 'll be married?
Married? Ay, married!
Oh, I wonder if I 'll be married—
Married before that I die?

KING *(still writing).* Grey whiskers; body, lean; fur, black; fore-paws,
Not over-clean; the usual share of claws;
Hind legs thrust into boots; the strangest feature
Of this remarkably abnormal creature—
Born booted—is a fact scarce known to hearsay.

PRINCESS *(aside).* His master is abnormal too, I dare say;
Another of those spectacled old fogies
Pa brings to Court, as ugly-faced as bogueys,
Professors of the ologies, red-nosed!
My only fun is when with slang I 've posed
Max Müller's worshippers, or bet Fitz-Lyell
At six-bar gates to have a racing trial,
Which makes a first-rate geologic "dip,"
As he heels over like a tacking ship. [*Laughs.*
Pa sent me up last Christmas to the Local;
Of course they plucked me, save in music vocal;
I sang them "Champagne Charlie:" it was stunning!
The president rebuked me—"Cease your funning."
Court is so dull! I wish I were of age,
And I 'd elope to-morrow with my page:
He 's a conceited ape, 'twixt you and me;
But anything is better than *ennui.*

AIR.—*Hey for one and twenty, Sam!*

(PRINCESS *sings.)* Hey for one and twenty, pa;
Ho! sweet one and twenty, pa;
I 'll take the bit between my teeth,
When I am one and twenty, pa.

Professors cannot flirt or jest;
Their lectures are too plenty, pa;
I want to have the talk myself,
When I am one and twenty, pa.

I 've ten Venezuela shares,
Were left me by my auntie, pa;
So I can boil my own kail-pot,
When I am one and twenty, pa.

You 'd have me wed some Dryasdust
As glum as gloomy Dante, pa;
But I 'll pick up a soldier lad,
When I am one and twenty, pa.

Enter CARABA *in the* KING'S *robes,* CAT *following, holding up his train.*

PRINCESS. Here comes my hero; well, he *is* a beauty!
To please the gentlemen's a lady's duty. [*Demurely.*
Good evening, Marquis; would you like a drive? [*To* CARABA.

CAT *(aside).* A fast young lady with her wits alive!

SCENE IV.

[CARABA *stares shyly at the* PRINCESS. PRINCESS *holds out her hand encouragingly.* CAT *impatiently pushes* CARABA *forward.*

CAT. Quick! seize it! faint heart ne'er fair lady gained.

[CARABA *takes the* PRINCESS'S *hand, and drops it again sheepishly.* KING *calls to the coachman, who is supposed to be outside.*

KING. Drive by the sewers that I may *see* they're drained
According to last sanitary laws.
Was your cat *born* with boots upon his paws? [*To* CARABA.
Why not with gloves? Discrepancy prolific
Of many a wise conjecture scientific!

CARABA *(to* PRINCESS, *stammering).* Ne'er saw I beauty till these eyes saw you.

PRINCESS *(jauntily.)* You flatter, sir; you flirt, I dare say, too?

CARABA. I don't know how.

PRINCESS *(laughing).* Oh, la! the boy's a booby!

CARABA *(taking courage).* What a small hand! and what a Balas ruby!

PRINCESS *(putting it on his finger).* I'm glad you like it; wear it for my sake.

CARABA *(putting his hand on his heart).* If e'er I part with it my heart will break.

PRINCESS *(aside).* 'T is only Palais Royal gem and gold.

KING *(pettishly).* Come, children, haste; the evening air grows cold.

[*Exeunt omnes.*

ACT III.

SCENE I.—A CORN-FIELD. Peasants *reaping, and singing ballad.*

*(*Peasants *sing.)* It was the mirk midnight,
And sharp the north wind blew;
The witch-wife rose from out her bed,
And saddled the sea-mew,
And over the sea and over the land
To the witches' tryst she flew.

JENKINS. Dost thee believe in witches, neighbour Hodge?

HODGE. Ay, that I du. I heerd one at my lodge
A-howling and a-howling all the night,
And off it scoured just at the morning light.

JENKINS *(doubtfully).* Mayhap it was a *h*owlet if it howled.

HODGE *(offended).* Can't thee believe a story when thou 'rt towld?
'T ain't no good manners to pick holes and doubt.

GILES. Sure, nobody tells lees till he's found out.

HODGE. I know for sartain old folks make a bargain
With the foul fiend by French or Latin jargon,
And then they turn black cats upon a broom,
Flying o'er hill and dale across the gloom.

JENKINS *(still sceptical).* Black cats don't fly.
HODGE *(with an air of superior wisdom).* Not common cats, I know;
But witch-cats have some magic way to go;
And then Old Nick is under pledge to aid.
JENKINS *(bragging).* I'd like to see them coming! Who's afraid?

SCENE II.

Enter LUKE, *pale and terrified.*

LUKE. Oh, neighbours, neighbours, here's an awful story!—
The world's come to an end. [*Wipes his brow, stares wildly.*
ALL. Luke, what's come o'er ye?
LUKE. A cat bewitched, that talks, and scolds, and swears,
And on its hind legs hobnailed bluchers wears;
A savage monster, to our field he came,
Rolled his green eyes, and called us each by name:
"Good people," quoth he, "you must boldly say,
When we and His Majesty do pass this way,
And asks, inquiring whose fair parks are these,
Whose fields, whose flocks, whose cattle, and whose trees,
'The High and Mighty Marquis Carabas,'
Or every one of you, ground down to glass,
Chopped in small bits, shall be to vultures flung."
Then, glaring fiercely, down the road he sprung;
Here comes he quickly—he'll tell you the same.
ALL. But Carabas is not our master's name;
Our lord's an ogre with Hungarian titles.
HODGE. This news comes very home to all our vitals.
GILES. Chopping and changing is an endless pother.
LUKE. Chopping *or* changing—choose ye one or other.
HODGE. First law of nature is self-preservation;
Truth's but a secondary consideration.
JENKINS *(stolidly).* If I must tell a lie, why, then I must.
HODGE. I call that logic.
LUKE *(angrily).* Don't kick up a dust!
GILES. In vain to-day brief safety should we borrow;
Our Ogre master would find out to-morrow.
HODGE. And then would come the chopping, I assure you;
Down in his donjon dark he would immure you,
Sending his cook to fatten up each pheasant—
No, I mean peasant.
GILES. Either is unpleasant.
I'm skin and bones, but you're like larded capon,
And in a pie would take a goodly shape on.
Here comes the monster, kicking up the dust!
ALL. Well, if we must tell lies, of course we must!

SCENE III.

Enter CAT, *booted and spurred, cracking a huge whip, and scowling fiercely on the* Peasants.

CAT. Good people, when the King drives here to-day,
If every one of you don't boldly say,

When asks His Majesty, "Whose farms are these?
Whose stacks, whose barns, whose orchards, and whose trees?"
"The High and Mighty Marquis Carabas!"
Then every one of you, ground down like glass,
Chopped in small bits shall be, to vultures flung,
And carrion crows make mincemeat of your tongue.
Now, let me hear you shout it ere I pass— [*With authority.*
The High and Mighty Marquis Carabas!

JENKINS *(humbly).* Please, Mr. Cat, an Ogre is our squire.

CAT. Villain! I 'll have you broiled upon the fire!

ALL *(trembling and stammering).* The High and Mighty Marquis Carabas!

CAT *(graciously).* Now to reward you for this small concession.
The Marquis comes to-night to take possession;
Munched up himself before to-morrow morning
Shall be your Ogre,—all of you take warning!
[*Exit* CAT. Peasants *breathe freely, and grow very bold.*

ALL. We might have floored him—such a mite to bounce!
Are we but mice for stranger cats to pounce?

HODGE *(to* JENKINS*).* You should have struck him; you 've a bullock's fist.

JENKINS *(to* HODGE*).* I did think of it; but suppose I missed!

GILES *(to* HODGE*).* I killed the last wolf; it is now *your* turn.

HODGE *(grandly).* Cats are but vermin, and such prey I spurn!

ALL. Cats are but vermin—set the dogs to worry 'em,
And when they 're dead we 'll not disdain to bury 'em.
[*Exeunt omnes.*

ACT IV.

SCENE I.—INTERIOR OF OGRE'S CASTLE. A LARGE HALL.

OGRE *seated at table, arranging Red Indian scalps.*

OGRE. I 'm very dull here; everybody 's quiet;
Europe 's forgetting how to make a riot;
Even a dissolution of the House
Can't raise abroad the spirit of a mouse.
If in the hustings bleed no broken pates,
I must cross over to the United States:
They know what 's what; with Colt's and Bowie knives
Folks get some small excitement in their lives.
But here we 've nothing but excursion trains
To mangle limbs, and blow out people's brains,
And strew with carcases the six-foot ways,
Recalling the dark ages. Happy days!
Too happy days! when one could roast a Jew,
And not a meddler write the "Times" unto;
When serfs *were* serfs, and sought not useful knowledge,
And no man lectured at a Ladies' College.
Too happy days! when Tyburn tree bore fruit,
And gibbets were a British institute;
Hanging the cure for thieving and for forging,
Our jails and prisons daily crammed to gorging.
Ah, happy days! when to the drop we sent all,
I 'm always hungry when I 'm sentimental!

I had my boy-soup at eleven o'clock,
And now I feel as *peckish* as game cock. [*Rings bell violently.*
Ho, there! my baby *fricassée!* my lunch!
Bring in the tray, oaf, or your bones I'll crunch.
[*Enter* Servant *with luncheon-tray, &c.*

SERVANT *(humbly).* My lord, a travelled cat your audience seeks,
A wizard cat—he wears boots, and he speaks!

OGRE *(fiercely).* I want my lunch, you rascal! Where's my lunch?
Put down the tray; your travelled cat I'll munch
In one small mouthful! [*Begins to eat greedily.*

CAT *enters unannounced, and coolly sits down opposite* OGRE.

CAT. Would you like to try?
Pray don't disturb yourself, 't is only I;
Passing your door, I thought I'd just drop in
And take pot luck.

OGRE *(roars out).* My castle's not an inn!

CAT *(blandly).* Just so. Your hospitality's renowned.
A Dorking capon! larded, I'll be bound. [*Examines the meat.*

OGRE *(with fiendish glee).* 'T is baby-arms, with curry-powder drest.

CAT *(shuddering).* Ah! then there's not too much for host and guest;
It's not a dish to which I'm very partial.
Ingenuus puer, as saith the poet Martial.
You're fond of poetry and tuneful tones?
You've a grand piano?

OGRE *(growls).* No, I play the bones.

CAT. Well, as for me, I sing sometimes by rote;
So, when I've washed the dust out of my throat,
I'll give you a new ditty, quite the rage,
The very spirit of our cynic age. [*Helps himself to wine.*
[*Drinks off his glass, leans back in his chair, and sings.*

AIR.—*Paddle your own Canoe.*

I have no wife
To scratch out my life,
No kittens to squeal and prowl;
So, till day is done,
I sit in the sun,
And blink like a barn-door owl.

Cheop's Pyramid
Holds my ancestors hid,
Each swaddled in mummified fold;
They were worshipped once
By both sage and dunce
Who lived in Egyptia old.

But I never would crave
An idol's grave,
Nor to sleep by the mummied Thoth;
So, till day is done,
I sit in the sun,
And doze like a drowsy sloth.

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Who lived in Egyptia old.

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An idol's grave,
Nor to sleep by the mummied Thoth;
So, till day is done,
I sit in the sun,
And doze like a drowsy sloth.

I can catch my mouse
In stable or house,
Nor care for one human scowl;
And, when work is done,
I sit in the sun,
And blink like a barn-door owl.

That 's nineteenth century philosophy:
De'il tak' the hindmost, if the first I be;
Live for yourself, and let the world go smash.

OGRE. It 's very good sense—no humbug or trash—
It 's quite our ogre creed.

CAT. And Stuart Mill's.
Let the strong spend; the weak must pay the bills.

OGRE *(crossly)*. When are you going off? I want my nap.

CAT. I 've heard at magic you 're the cleverest chap,—
Can change to lion great or tiny bee;
It is a sight I 've long desired to see,
Yet can I not believe it!

OGRE *(roars)*. Starveling brute!
D'ye think I 'd lie? I 'll brain you with your boot!
I 'd eat you up as soon as look at you!

CAT *(coolly)*. Don't look then; and don't eat me: if you do,
I 'll disagree so with your membrane mucous!
It 's only French restaurateurs can cook *us*.
But can you change, then, to a lion's shape? [*Coaxingly.*

OGRE. Tigers and lions I have yet a few
Railed in my park, a sort of model Zoo,
Also gorillas—that 's their proper place;
But lions here, 'mong tapestry and lace,
Tumbling upon my carpet's velvet pile!

CAT. Oh, please don't mention it, 't is not worth while;
[*With indifference.*
I dare say 't is a trumpery sorry sight,
Some juggling trick. He 'll do it out of spite. [*Aside.*

OGRE. You think so! I can see you dread the peril.

CAT. Ha, ha! he takes me for hysteric gir-r-r-r-l!

OGRE. You like to bluster, and then shun the test.

CAT. My dear friend, you 're a twaddler, I protest!
Excuse me for strong language; high faluting
Is not your line at all, and no way suiting. [*Sings.*

AIR.—*Believe me, if all those endearing young charms.*

Believe me, if all those old ogreish charms
That I gaze on astonished to-day,
Were to change in my presence to dreadful alarms
Of a lion that roars for its prey,
I would still be as calm as this moment I am,
Let thine ogreship change as it will;
I would finish my plateful of omelette and jam,
And enjoy my dry Sillery still.

[*While he is singing, the* OGRE *disappears behind the screen in the corner, a roar is heard, in rushes a lion.* CAT *seizes the wicker back of his chair, and holds it before him as a shield.*

An optical illusion! nought to boast
Like Stodare's sphynx or Polytechnic ghost:
I see the Ogre underneath your gape;
Your lion 's not so good as Blondin's ape.
But if you will play Flavian Circus games,
Have at you then! Lo, how the impostor tames!
[*Flings a hassock at lion, who ducks to avoid it.*
You 're only make-believe, like ass in fable.
I 'll ring and have you locked up in the stable;
Nobody now feels reverence or fear
For men or gods, for lions or small deer.
[*Lion skulks out with his tail between his legs.*
Ha, ha! he can't stand preachment, I perceive:
At my first sermon-head he took French leave.

OGRE *(reappears).* Art now convinced? My power dost humbly own?

CAT. Oh, anybody can be overgrown;
The test of genius is to shine in littles:
Radetzky beating corporals at skittles;
Lord Derby emulous of Tupper's diction;
Carlyle a copyist of Miss Braddon's fiction;
Napoleon scribbling half Burnand's libretto;
Or Gladstone drowning Mario in falsetto.
Let 's see you try *that* sort of thing, old codger!
[*Slaps him on the back.*
Don't mind the furniture,—I 'm but a lodger;
Or, if you fear to spoil your tasty house,
Your portly person squeeze into a mouse;
Or, smaller still, one of the industrious fleas,
Or mites that burrow in a Stilton cheese.

OGRE. I hate to personate such petty vermin;
But that my magic power you may determine,
Behold!

[OGRE *vanishes behind screen; a mouse runs out.* CAT *pounces on the mouse, shakes it, worries it, and carries it round the room dangling in his teeth. (The mouse can be one of those worked on wheels).*

CAT. Yes, now I know your power beyond a miss. [*Eats it.*
How very little of a meal it is!
Who would have thought an Ogre's mighty *corpus*
Would scarcely whet one's appetite for dinner?
I could as lief have eaten up a porpoise
As him, without this magic for beginner!
[*Rings the bell loudly.*

SCENE III.

Enter Servants, *who stare at the* CAT, *but keep silence.* CAT *sits in the* OGRE'S *chair twiddling his paws.*

CAT. Well! where 's your manners, fools?

SERVANTS *(scraping and bowing).* My lud, your grace?

CAT. Your master 's gone down to his proper place;
Vanished, my friends! He dabbled, as you knew,
In the black art. You need not look so blue.
His hour has struck. Long since he sold his soul;
'T was a bad bargain! Did you see the scroll,
Signed with his blood? To-day the debt fell due,
So I 've dispatched him home.

SERVANTS. He 's gone; is't true?

CAT. You never more will see your Ogre chief.

SERVANTS *cheer.* Hurrah! hurrah!

CAT. You don't seem choked with grief!
But don't you reckon on democracy,
For I am pledged to aristocracy;
I give you leave to vote, each man Jack there,
But only for my nominee,—that 's fair;
That 's universal suffrage! Vote, then, free [*Very grandly.*
For your new master, as proposed by me.
Speak up, then; vote for Marquis Carabas;
This very night you must receive him here.

SERVANTS. It 's all the same—Lord Cat or Carabas—
So we 've our perquisites and lots of beer.

CAT. Clean up the hall, then, for the King get ready,
Deck Monsieur Ogre's boudoir for the lady—
The lovely Princess—who, 't is said, will pass
Her life here as the Lady Carabas.

[Servants *hurry about,* CAT *leans back in the* OGRE'S *chair, humming sarcastically.*

AIR.—*Ban, ban, Ca-Caliban.*

Ban, ban, Catamaran,
Of your old master you 'll make a new man.

ACT V.

SCENE I.

INTERIOR OF OGRE'S CASTLE. *Table spread with a banquet in the background.* Servants *drawn up to receive the* KING. *Enter the royal party,* KING *and* PRINCESS *abreast;* CARABA *very much surprised and bewildered;* CAT *doing the honours.* Servants *cheer lustily; music strikes up—*

AIR.—*Hail to the Chief that in triumph advances.*

Hail to the Marquis that shyly advances!
Honoured and blest be the ever-wise Cat!
Long may the King and the maid with arch glances
Flourish and fidget, and laugh and grow fat.
Heaven send them plenty money,
Earth yield them bread and honey;
Gay may they glitter, and loved may they grow.
Shout, groom and vassal,
Through courtyard and castle,
Marquis of Carabas, ho! ieroe!

He is no Ogre, to pilfer and purloin,
Snapping up strangers to roast at his board;
When the butcher comes up with his saddle and sirloin,
Oh, then will Carabas joy in her lord.
Fed upon wholesome diet,
Wedded in peace and quiet,
Never a breeze on the couple shall blow.
Housemaids and servingmen,
Echo their praise again,
Marquis of Carabas, ho! ieroe!

[*During the song the* KING *goes peering about, examining the wainscotting, the chimneypiece, the hearth, and window-sashes.*

KING. Well built—good ventilators—patent, whose?
Arnott's or Moore's? 't is difficult to choose.
The vulgar have a prejudice 'gainst draughts—
Confuted in my book on chimney-shafts.
Is that a Ransome's filter? I 'm expectant
Of miracles in my new disinfectant,
Shown at the Social Congress.

PRINCESS. Stop that, Pappy!
He 's such a twaddler when he 's pleased and happy.
[*To* CARABAS.
And now we 're waiting, Marquis, for *your* speech.

CARABAS *(alarmed).* Oh, please! I can't!

PRINCESS *(scornfully to* CARABAS, *with a nudge).* He reddens like a peach!
Men nowadays are but half educated.
I fear me, in this case, I 'm matched, not mated.
Say something, like a well-drilled British lord;
Suppose yourself guest at the Lord Mayor's board,
Returning thanks for King and Constitution.
Come, fire away! don't splutter in confusion.

CARABAS *(desperate).* My lords and gentlemen; (*to* PRINCESS) but *are* they gents?

PRINCESS. They like the honour—'t is a poor pretence—
Don't hammer!

CARABAS *(stutters).* Pr-o-udest m-m-o-ment of my life—
Unused to public speaking—h-h-e-re 's my wife.

PRINCESS *(interrupts).* There, that will do! and as my name *is* in it,
I 'll polish off your speech in half a minute.
(To Servants*)* Good folks, you 're welcome! gardeners, horseboys, pages;
If you suit me, I 'll double all your wages.
[Servants *cheer loudly.*
But see my croquêt lawn you daily mow,
And my park ride keep soft as Rotten Row.
I 've set my heart upon a pony chaise,
Two piebald ponies—horses are my craze—
A hack I must have, and an Arab mare,
So see you keep my stable on the square;
For I 'll examine, when I 've had my supper,
Stable and harness-room, from bit to crupper.

KING. My dear! my dear! you strain the woman's tether.
PRINCESS. Oh, I'm a nobody to *you*, of course!
CAT *(aside)*. What fun it is to bring that pair together,
And watch the grey mare prove the better horse.
I've raised my younker to the highest ranks,
But, after all, I don't expect much thanks;
There must be drawbacks in this weary life,—
A throne might be a bore with *such* a clever wife!

SCENE II.—THE SAME.

Servant *enters and announces* ARABA, *who follows, dressed in blue coat and brass buttons, gaiters and top boots.*

SERVANT. Araba Miller, of Milltown, Esquire,
And Deputy-Lieutenant of the Shire.
ARABA *(advances to* KING*)*. My liege (*starts on perceiving* CARABA), my liege
—why, Caraba!—and there's the Cat!
Oh, gemini! they'll give me tit for tat. [*Ruefully.*
CARABA. Yes, brother, it is I, and I'm a lord:
This is my castle, comfortably stored.
You'll stay and sup, and taste my port, beeswing?
And, by-the-bye, this gentleman's the King.
[KING *eagerly takes* ARABA *by the coat, and begins to gabble.*
KING. The very man I've wanted long to see,
An agricultural Midland grandee!
CAT. So, majesty hath got him by the button,
And prattles on without regard to stops.
KING. Do you approve of Thorley's food for mutton?
And what is your rotation of green crops?
Will you assist me with some papers deep [*Gabbles very fast.*
On guano from the Kooria Mooria Isles?
Did you e'er speculate in Tartar sheep?
And what's the price of terra cotta tiles?
Have you extracted silica from stubble?
Is whisky swill thought wholesome for pig-wash?
ARABA *(haughtily)*. My liege! my money's made. I never trouble
My head with all that stupid stuff and trash.
CARABA *(wondering)*. How made you money? for the place was poor,
Trade was but slack, ungrateful was the soil.
ARABA. Nobody thrives now by the slow and sure!
I dug up my foundations, and—"struck oil!"
Then made a tidy business of the selling
To a cute Yankee, but retained the dwelling.
Our ancestors for ages owned that mill,
And so I'm Miller of the Milltown still.
It is a handle with the landed gentry,
Land is a pass-word to Belgravia's sentry;
As for the Scotch, you may be rich as Crœsus
And yet they say, "We will esteem you poor;
If you've no country-seat you cannot please us:
You must be of some rock, or bog, or moor."

CARABAS. Pussy and I congratulate you, brother!
CAT. I wonder what has happened to the other?

SCENE III.

Servant *announces* BARABA, *who enters, extravagantly dressed in a foreign style, bowing and smirking and dangling a gold eye-glass.*

SERVANT. Signor Baraba, Impresario.
PRINCESS *(ecstatic)*. The dear black man; he parts his hair like Mario!
BARABA *(with a foreign accent)*. Zis be delights *(starts)*. Per Bacco! what. old Araba!
And *che!* the Cat! and *che! che!* booby Caraba!
Sare, I muche frightened that I make one misses. [*To the* KING.
CAT. Come on, you need not fear this company's kisses.
CARABA. So, you've turned artist?
BARABA. Yes; ze opera's mine!
I bring great stars togezzer zere to shine;
I bring out my great card, my double bass,
Signor Somaro.
ARABA. Why, that's daddy's ass!
BARABA *(dignified)*. Sare, you have wrong! he singer from abroad;
He get muche clapping—vat you call applaud.
Gounod wrote for his part—compose for us
Ze Golden Legend of Apuleius;
Ze musik critics back us in a body.
CAT. Upon my word, this donkey-power beats Shoddy.
PRINCESS *(sentimentally)*. I like that black-haired signor best of all;
I wish he owned the Ogre's house and hall,
I'd be his *prima donna* if he chose;
My Marquis has not half so good a nose!
CAT *(to* PRINCESS*)*. Upon an opera-house your faith don't pin,
Theatrical lessees too seldom win;
At first you'd make a splinge and spout and splutter.
Then out you'd go! and where's your bread and butter?
PRINCESS *(to* CAT*)*. That's very true: a love-match never pays;
I'll stick to my new stable and my bays!
Cupid was never known to drive a team
  More sprightly than his mother's doves, they say;
So I'll give up my sentimental dream,
  And let the signor toddle on his way.
Signor, put me down for a box next season, [*To* BARABA.
I don't mind prices—anything in reason—
A good place, please, to see whatever passes,
On stage or off it, without aid of glasses;
And bring your star on my first concert night:
I'll put him in my programme (gold and white)
As "by desire!"—it always makes sensation.
BARABA *(bowing)*. Madame, your bounty gives me palpitation.
KING. Is it not supper-time? who else is coming?
Out in the lobby there's a fiddle strumming,—

Is *that* the supper gong? I'm here *incog.*
Hand round the sherry; Marquis, help the prog!
[*They turn towards the supper-table. Outside, in a very deep bass voice,* Signor SOMARO *sings,*

AIR.—*Sound an alarm!*

Solo. Sound an alarm! your silver trumpets sound!
And call the hungry and the thirsty round.
Who craveth, follow! To the joint again!
Roast beef and mustard for a thousand men!
Chorus. We hear! we hear the appetizing call,
And follow to the banquet one and all;
King, Marquis, guests, let's hope there's food for all!

CAT *(to* BARABA*).* I thought you said your signor was a bass;
But that's a tenor's ditty. What an ass!
BARABA. He can sing all ze gamut, top to toe,
Farzer zan any biped's troat can go.
Oh, he sing everysing,—he roar like Santley,
Bellow like Formes or ze Worm of Wantley.
[*Music again outside.*
Recitative. I rage, I melt, I burn, I hubble bubble!
The royal bride of Caraba's my trouble.
Thou trusty pannier, that I bore so long
With stumbling steps, 'neath many a lash and thong,.
I lay thee by. Bring me a pound of shag,
To fill a pipe for my capacious mouth;
A porter pewter, that at once I brag
The Princess' beauty, and appease my drouth.

AIR.—*Oh, ruddier than the cherry!*

Oh, strong as brandied cherry!
Spicy as elderberry!
Oh, Princess fast
As winter blast,
And sharp as Afric sherry!

Cool as a currant cluster!
She ne'er is in a fluster!
With all her fun
Minds Number One,
And lets the weak world bluster.

Enter Donkey as Signor SOMARO. *(Applause.)*
[*All come forward to the front of the stage;* CAT *in the centre addresses the audience.*
CAT. Now, gentle friends, my task is well-nigh done.
Royal and noble is the miller's son;
His wife may rule the roast, but then she's rich,
And well we know how money can bewitch!
In fact, there's nothing like it in our days
To win the bachelor from his lone club ways;

A Gorgon is a houri in his eyes
If in her hand she bring the yellow prize.
Nor failed the brothers in their fortune's quest,—
Each has attained the thing he likes the best,
Titles and fame and notoriety.
I hope you have not found satiety
From our brief rendering of an old-world story,
Which gladly we'll rehearse again before ye;
And wish you good luck of your humblest friends.
Cats, donkeys, fools, may bring about your ends.

[*Curtain falls.*

CONFLAGRATION.

In Four Acts.

Synopsis of Scenery.

ACT I. (THE WORD IS *CON.*)

SCENE I.—A LIBRARY.—Door to left of stage; writing-table, four Windsor chairs, horse-hair sofa.

SCENE II.—The same.

SCENE III.—The same.

ACT II. (THE WORD IS *FLAG.*)

SCENE I.—A SHIP'S DECK.—The rigging may be represented by the housemaid's steps. If a ladder be placed against the side wall, it would add to the scene. The Union Jack should be hoisted on the top of the steps or ladder. A large square box may represent the hatches, behind which the crew come up to the front.

ACT III. (THE WORD IS *RATION.*)

SCENE I.—A DESERT ISLAND.—Must be imagined if there be no good painter at hand. The furniture of the room must be cleared away, and some shrubs from the greenhouse set about as disorderly as possible, shells strewed about, and any pieces of stone or mineral that can be got

SCENE II.—A rude tent in the corner can be made of shawls and waterproofs hung over the umbrella-stand or a couple of screens. A barrel of flour, a keg of rum, and a heap of broken cups and plates furnish the tent. A fire with pot boiling—can be represented with red foil for fire.

SCENE III.—The same as before: a heap of shawls in a corner for the child EFFIE to lie upon.

ACT IV. (*CONFLAGRATION.*)

SCENE I.—A BED-ROOM.—Sofa can be arranged like a bed; a toilet-table and glass, and a big bath complete the accessories.

SCENE II.—The same.

SCENE III.—A BOUDOIR—which means the drawing-room restored to its usual condition of neatness and ornament.

SCENE IV.—A DINING-ROOM.—At the back a window which can open: if there is no balcony at the back of the room that is used for acting in, a false window must be made, with paper sash and panes, which can be smashed in by the fireman; if there is a balcony, the real window can be opened for the escape of the actors from the supposed fire. Flashes of flame might be thrown into the room by clever management of mirrors and candles in the passage, the mirrors being quckly moved at the proper angles of reflection, in the way that boys tease their opposite neighbours by flashing the sunlight into their eyes.

SCENE V.—ANOTHER DINING-ROOM.—A very slight alteration would do for this last scene.

ACT I.

SCENE I.—A LIBRARY.

Dramatis Personæ.

DR. RIGID *(a Schoolmaster).*
FRANK BUMPTIOUS *(a boy going up to pass for the Navy).*
HON. ADOLPHUS FITZJAMES *(a ditto).*
BROWN.
JOHNSON.
THOMSON.
MRS. RIGID *(the Schoolmaster's Wife).*
MISS RIGID *(her Daughter).*

MRS. RIGID *is working on a sofa in the corner;* MISS RIGID *is correcting the boys' sums at the writing-table;* HON. ADOLPHUS *is trimming his nails;* FRANK *is riding astride a Windsor chair.*

FRANK. Here, Dolly, lend a hand to pull this taut.
[FITZJAMES *pays no attention, but yawns.*
Miss RIGID *(over her slates)*. "If fourteen quarters of ten pigs be bought,
And sold for twelve-fifths of the cost price"—Oh!
[*Starts because* FRANK *has jogged her elbow.*
You rude boy! quickly to your grammar go;
You 'll never pass.
FRANK. I hate that vile exam.;
It 's all a humbug; cram is only sham,—
Isn't it, Dolly?
FITZJAMES *(yawning)*. Yaas, an awful bore;
I did three problems, and they 've asked for more!
FRANK. Besides, I know about the sea already,—
Port there, my hearties! luff her! steady, steady!
[*Acts steering a boat with the chair, which cracks at the bars.*
Mrs. RIGID. Another breakage! Master Bumptious, pay
Two half-crowns for the damage. [*Jumps up angrily.*
FRANK. Hoy! belay!
You 'll soon re-furnish this old room with fines.
Miss RIGID *(severely)*. Bring me your task on tangents and on sines.
FRANK. I 'll fly off at a tangent, if you tease. [*Takes out a pea-shooter.*
My gunnery practice first. What jolly peas!
[*Hits* Mrs. RIGID *on the cap.* Mrs. RIGID, *in a rage, boxes his ears.*
Oh, oh! I beg your pardon; do not worrit; [*Pretends to cry.*
Your cap was Captain Cole's revolving turret.
How well I aimed!—allowance made for wind,
Straight as a shaft the topmost bow I pinned!
'T would gain a thousand marks at Shoeburyness.
Mrs. RIGID *(angrily)*. I 'll teach you aiming, imp of wickedness!
Can't you behave like gentle, sweet Fitzjames?
[*Pushes him into a corner with a big book.*
There, learn that column of historic names!
I 'll tell the Doctor of your faults this minute. [*Exit.*
Miss RIGID *(coaxing)*. Adolphus, will you play upon my spinnet?
FRANK *(aside)*. Just like herself, as bony, hard, and yellow!
Here, Dolly, help *me*, like a right good fellow. [*Aloud.*
Miss RIGID *(sternly)*. Self-help should be your motto, *vide* Smilés.
FRANK. Your smiles, my Pallas! *(Aside.)* How the poor joke riles!
You should be proctor of a ladies' college; [*Aloud.*
You 're awfully got up in useful knowledge.
Pray tell me how the human chignon grows,
[*Slyly pulling her hair.*
And hangs behind in such a stunning pose.
Why, bless me! 't is a new sum in subtraction,
A curious case of capillar attraction. [*Pulls off her chignon.*
I only touched it with admiring fist——
[Miss RIGID *sobs and cries, and catches hold of* FRANK'S *hands.*

Enter Dr. RIGID, *reading aloud.*

Dr. RIGID. "The aqueous strata of micaceous schist,"—
Heydey! who 's crying?

Miss RIGID *(incoherently).* On my hair look!—bread and water!
Dr. RIGID. Young rascal! have you dared to hurt my daughter?
FRANK. No; only scalped her.
Dr. RIGID *(in a rage).* I'll skelp you—that's plain!
Come to my room, sir; Barbara, fetch the cane.
[*Exeunt* Doctor, Miss RIGID, *and* FRANK.
FITZJAMES *(yawning).* I am so bored, I scarce can keep awake;
Well, Bumptious *is* a fool, and no mistake. [*Exit.*

SCENE II.—A LIBRARY.

Dr. RIGID, FRANK, FITZJAMES, BROWN, JOHNSON, THOMSON, *all seated round the writing-table.*

Dr. RIGID *(to* FRANK*).* Here, take your book; you don't know half your dates.
And you, sir, are deficient in your weights. [*To* BROWN.
BROWN. Oh, dear no! I've gained half a stone in flesh.
FRANK. Dates come so far, they never can keep fresh
In any memory. With six hundred men [*Gabbling.*
William the Conqueror weighed twelve stone ten.
BROWN. Two choppins English make one mutchkin Scotch.
FRANK. Robert Curthose was poisoned with hotch-potch.
Dr. RIGID. Your ignorance is crass—from Latin, *crassus.*
BROWN. Bother the Latin! it will never pass us.
Dr. RIGID *(to* FITZJAMES*).* I'm sure *you*'ll break down in your hydrostatics.
And *you*'ll be plucked, sir, for your mathematics. [*To* JOHNSON.
FITZJAMES. I know sea-water wets my flannel jacket.
JOHNSON. If A. can't equal B., why, A. will catch it!
Dr. RIGID. On politics and history now begin,
With facts from "Mangnall's" and "Inquire Within."
BROWN *(gabbling).* The rotten boroughs through Welsh rabbits fell.
FRANK. Porson invented the artesian well,
When very thirsty after cheese and onions.
JOHNSON. Corn Laws have proved the cure of British bunions.
Dr. RIGID. Oh, muddle-headed crew! I'm all amaze!
Spout me a stanza from Macaulay's "Lays."
FRANK *(recites).* Now, glory to old Lillywhite, who makes the bats that win;
And glory to our first eleven, who keep their party in.
Now, let there be the pleasant sound of roller on the swards,
And cheers from carriage company, thou jolly land of Lord's!
And Harrow, thou, our Harrow, praised in Public Schools Commission,
Send all thy batters swinging forth in excellent condition;
As thou hast won thy fights of old, thy innings win to-day,
And lick the cheeky Eton lads once more in grassy fray.
Hurrah! hurrah! a hundred fields inspire our champions' souls;
Hurrah! hurrah! for Harrow, for her wickets, bats, and bowls!
[*All the party join in a loud chorus of* "Hurrah!"
Servant *puts in his head and says,*
SERVANT. Young gentlemen to pass up to the examiners.
[*Dead silence. All look ruefully at each other.*
Dr. RIGID. Delay not; take the plunge; it must be done.

FRANK. Here goes! exam. must be no end of fun.
BROWN. My memory 's gone off upon a holiday.
JOHNSON. My head seems reeling round in a strathspey.
THOMSON. I 've got a faint idea of triple X.
FRANK. Faint heart wins nought: here goes it. *Vivat rex!*
[*Exeunt omnes.*

SCENE III.—A LIBRARY.

Enter FRANK, FITZJAMES, JOHNSON, *and* THOMSON.

FRANK *(singing)*. A riddle-ma-ree, now solve it he who can—
Why is young Johnson just like Plato's man?
JOHNSON *(sulkily)*. You 're like a hen o'er addled nest-egg clucking.
BROWN. Ah! nobody likes roasting after plucking,
Though 't is the natural order of affairs.
JOHNSON. Mind your own business.
FRANK. Let 's all cry shares;
Plump all our marks into one common pot,
And deal them equally round, scot and lot.
D'ye think we 'd any of us come out winner?
JOHNSON *(to* FRANK*)*. I wonder how *you* passed, you lazy sinner!
I know you cribbed the little that you learned.
FRANK. Not I; by impudence success I earned.
THOMSON. And I too. Let 's have *your* story of defeat. [*To* FITZJAMES.
FITZJAMES *(grandly)*. Defeat! I passed.
BROWN. On all-fours, hands and feet!
I heard you give it as your fixed opinion
That Phineas, Aaron's grandson, was a Fenian!
FRANK. They tried to pose me with *pons asinorum*,
And whether Chatham was next door to Shoreham.
BROWN. I wish I 'd known the isles of Bass and May!
When Bass geology they bade me say,
I vowed its aqueous stratum was the same
As Allsopp's, and enjoyed as great a fame.
BROWN *(to* JOHNSON*)*. But what floored *you*, old fellow?
JOHNSON. Who can tell?
On chilled shot I could patter pretty well,
Cool as a cucumber, and Captain Coles
Describe as king and jolliest of souls.
I can't think why they spun me.
FRANK. Never mind;
A better trade to-morrow you will find.
You never could keep up your head in water.
Dolly, you 'll marry the First Lord's rich daughter,
And leap up commodore in double quick.
FITZJAMES. I don't mind board ship if one wasn't sick.
JOHNSON. Well, there, you 're all three middies fast and tight;
I 'm rather glad I have escaped the plight—
The weevily biscuit, and the hard salt junk,
And fighting—fighting always made me funk.
FITZJAMES. And me too, only I dared never show it;
The Earl would cut me off did he but know it—

There's always been Fitzjames in every battle.

FRANK. Cheer up, old boy! we middies are tough cattle;

[*Slaps* FITZJAMES *on the back.*

To knock us down would take a week of Sundays.
Let's have a spree, and quite forget Black Mondays.
Cheer up, I say!

FITZJAMES. You hurt me: you're too rough.

FRANK. Oh, how they'll bully you on board, you muff!
Put gunpowder within your waistcoat fobs;
Use up your 'broidered handkerchiefs for swabs;
Your scents——.

FITZJAMES (*ready to cry*). I'd write home to my lady mother;
She'd tell the Admiralty!

FRANK. Idle bother!
At sea they own no master but the skipper.

FITZJAMES. I'd rather have my own fireside and slipper,
My railway novel, and my old Bordeaux.

FRANK. For my own pleasure to the seas I go,
Because I want prize money, and I feel
Drowning than hanging is the more genteel.
One cheer together ere we part, my lads—
Hurrah for England and her ironclads!

[*They all join in lusty cheering, and depart, the sound dying away behind the scenes.*

ACT II.

SCENE III.—THE DECK OF A SHIP. *Rigging may be represented by the housemaid's steps, with a flag flying at the top.*

Dramatis Personæ.

FRANK.	MRS. LANE (*passenger*).
HON. ADOLPHUS FITZJAMES.	EFFIE LANE (*her child*).
JONES (*lieutenant*).	
MILES (*boatswain*).	Sailors.

Enter FRANK *and* MILES, *pacing the deck.*

FRANK. I think our captain trusts by far too much;
The luff's a cur whom I would treat as such.
His eyeballs white show like a vicious horse:
If he had murdered 't were a thing of course.

MILES. You don't pull well together, I can see;
But, howsomdever, 't is no odds to me.

FRANK. It would be odds if he should seize the ship,
Turn her head round and give our Queen the slip.

MILES. He's master here: the skipper's a mere babby

FRANK. A lump of gelatine, so soft and flabby!
Dolly and he are just a pair of ninnies.

MILES. In this world somehow ninnies have the guineas.
If so be that the skipper will be idle—

FRANK. And let old Jones ride rough-shod, bit and bridle—

MILES. It's no good grumbling.

FRANK. I'd desert, I swear,
Did not a woman need some friendly care:
She and her child would well-nigh starve neglected,
If I should leave them wholly unprotected.
MILES. 'T was a kind deed of skipper home to take her.
FRANK. Yes, if he did not quite so soon forsake her.
The luff looks out no dainties come *her* way;
The very water grudged her day by day.
If *I* were captain, 'stead of that poor flat——.
MILES. Hush, hush, young sir; you'll get pulled up for that.
FRANK. Truth must come out—see, there's the ruffian Jones.

Enter JONES, *the Lieutenant.*

JONES (*fiercely*). You're fudging work, sir. Dash! I'll break your bones!
Up to the mast-head! Dash! I'll stop your grog!
FRANK. If you mast-head me, please to cast my log.
JONES. Dash! do you dare me? I'll crack all your pates!
[FRANK *goes up the rigging.*
Turn up the hands there. [*To* MILES.
MILES (*whistles with a boatswain's whistle*). Tumble up, my mates.

SCENE II.

The Sailors *come from behind and stand in a row,* MILES *in front.* JONES *pulls down the Union Jack, and stands upon it.*

JONES. Now, listen, men: the captain's in his cot;
He gives me power to tell you what is what.
Yours is a shabby trade—all kicks, no pence;
You could get rich if you had common sense.
SAILORS. Ay, ay, sir; lead the way, point out the prize.
[JONES *shows a paper and holds out a pen.*
JONES (*tapping the paper*). You've only to sign this,—it tells no lies.
The Yankees want more money and more men,
You wan't more wages. (*To* First Sailor). Here, man, take the pen.
SAILOR (*drawing back*). But that's deserting!
JONES. Never mind the name,
The ship, the captain, and the crew's the same.
SAILORS. We can't desert our pennant, bless its flutter!
JONES. You fools, to quarrel with your bread and butter!
Who asks what pennant flies at the mast-head?
'T is but a coloured rag when all is said.
SAILORS. Ay, but we love Old England's Union Jack.
MILES. No stars! no stripes!
[JONES *is going to hoist the Yankee colours. He stops angrily.*
JONES. I'll lay them on your back!
Here, men, be wise now--pockets full of gold!
And you'd stick, idiots! to that canvas fold.
[*Flings away the Union Jack.*
By Heaven! I'll make you wear round for New York!

Enter FITZJAMES, *with a flask of liquor in his hand.*

FITZJAMES. Can anybody draw this Noyeau's cork?
Jones, you 've a pocket screw.
JONES *(surlily).* I think you 're screwed already.
FITZJAMES. Pardon, I think it 's you that stand unsteady;
You 're flushed—and why is all the ship's crew mustered?
Who threw this down? Why, man, you 're strangely flustered.
[*Picks up the Union Jack.*
JONES *(trying to hoist the Yankee pennant).* I 've done with Union Jacks and British crosses;
I 'm going to take a turn with Yankee bosses.
[FRANK *seizes the American colours, and prevents him from hoisting them.*
JONES. Ho, you there! ease her, lubber that you are!
FRANK. I 'll make you swallow every stripe and star!
[*Slides down the rigging, with the American colours in his grasp.*
Who is for England and her hearts of oak?
[Sailors *move forward.*
JONES. Who wants good wages and an easy yoke?
No cat! (Sailors *hesitate.*) No stopping rations, pay, nor grog.
SAILORS. We 're yours, sir, if you promise not to flog.
JONES. Ay, ay!
FRANK. Oh, blockheads! promises bind *him!*
JONES *(in a rage).* I promise *you*, sir, that I 'll dowse your glim!
[JONES *rushes upon* FRANK. *They struggle.* FITZJAMES *hovers about them, trying to part them, and whining.*
FITZJAMES. Oh, pray don't! pray be quiet! Goodness gracious!
Do, men, assist! [*To* Sailors.
SAILORS. We won't be so owdacious
As meddle in the squabbles of our betters.
FITZJAMES. Oh, Frank! he 'll have you punished, put in fetters.
He 's your superior officer. You are mad!
Oh, dear, he 's killed!
[FRANK *falls heavily.* JONES *rises, staggering.*
JONES *(savagely).* You 've got enough, my lad!
Dashed meddling idiot! never can be quiet!
I 'll stop him once for all from making riot.
Out with the cutter! lay him safe and sound, [*To* Sailors.
And he can please himself when homeward bound.
FITZJAMES *(crying).* I 'll not stay here to break my country's laws.
JONES. You 'll find, without the cat, I still have claws.
FITZJAMES *(crying).* You shouldn't treat my chum so.
JONES. No abuse!
You shall go with him, dash it! if I choose!
I 'll have no mutiny in my ship, I say!
And there 's that silly woman in the way.
Bumptious may steer her to the British Channel.
Fetch her and fetch the child. [*To* Sailor.
FITZJAMES *(to* Sailor). And lots of flannel,
For, oh! it 's freezing in an open boat;
Be sure you bring some shawls and pilot coat.

FRANK. I'd desert, I swear,
Did not a woman need some friendly care:
She and her child would well-nigh starve neglected,
If I should leave them wholly unprotected.
MILES. 'T was a kind deed of skipper home to take her.
FRANK. Yes, if he did not quite so soon forsake her.
The luff looks out no dainties come *her* way;
The very water grudged her day by day.
If *I* were captain, 'stead of that poor flat——.
MILES. Hush, hush, young sir; you'll get pulled up for that.
FRANK. Truth must come out—see, there's the ruffian Jones.

Enter JONES, *the Lieutenant.*

JONES *(fiercely).* You're fudging work, sir. Dash! I'll break your bones!
Up to the mast-head! Dash! I'll stop your grog!
FRANK. If you mast-head me, please to cast my log.
JONES. Dash! do you dare me? I'll crack all your pates!
[FRANK *goes up the rigging.*
Turn up the hands there. [*To* MILES.
MILES *(whistles with a boatswain's whistle).* Tumble up, my mates.

SCENE II.

The Sailors *come from behind and stand in a row,* MILES *in front.* JONES *pulls down the Union Jack, and stands upon it.*

JONES. Now, listen, men: the captain's in his cot;
He gives me power to tell you what is what.
Yours is a shabby trade—all kicks, no pence;
You could get rich if you had common sense.
SAILORS. Ay, ay, sir; lead the way, point out the prize.
[JONES *shows a paper and holds out a pen.*
JONES (*tapping the paper).* You've only to sign this,—it tells no lies.
The Yankees want more money and more men,
You wan't more wages. *(To* First Sailor*).* Here, man, take the pen.
SAILOR *(drawing back).* But that's deserting!
JONES. Never mind the name,
The ship, the captain, and the crew's the same.
SAILORS. We can't desert our pennant, bless its flutter!
JONES. You fools, to quarrel with your bread and butter!
Who asks what pennant flies at the mast-head?
'T is but a coloured rag when all is said.
SAILORS. Ay, but we love Old England's Union Jack.
MILES. No stars! no stripes!
[JONES *is going to hoist the Yankee colours. He stops angrily.*
JONES. I'll lay them on your back!
Here, men, be wise now--pockets full of gold!
And you'd stick, idiots! to that canvas fold.
[*Flings away the Union Jack.*
By Heaven! I'll make you wear round for New York!

Enter FITZJAMES, *with a flask of liquor in his hand.*

FITZJAMES. Can anybody draw this Noyeau's cork?
Jones, you 've a pocket screw.

JONES *(surlily).* I think you 're screwed already.

FITZJAMES. Pardon, I think it 's you that stand unsteady;
You 're flushed—and why is all the ship's crew mustered?
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FITZJAMES *(to* Sailor*).* And lots of flannel,
For, oh! it 's freezing in an open boat;
Be sure you bring some shawls and pilot coat.

SCENE III.

Enter Mrs. LANE, *leading little* EFFIE, *wrapped in shawls.*

EFFIE. Me seepy, seepy—mammy, what 's the matter?
Oh, Mitter Fank! oh, Mitter Fank! [*Sees* FRANK *lying.*
JONES *(roughly).* Don't chatter!
Hold mother's hands, and sit down on her knee.
[Sailors *fasten* Mrs. LANE *and child into a chair.*
EFFIE *(frightened).* Oh, mammy! will they put us in the sea?
Mrs. LANE *(to* JONES*).* Heaven will repay you by some sore distress
For wronging widowed ones and fatherless.
JONES. I 'll take my chance. *(To* Sailors.*)* Here, fling him in the boat.
He 'll soon recover when he 's once afloat.
[*Pushes* FRANK *off the scene.*
Mrs. LANE. Alas! alas! a wounded man for guard!
FITZJAMES *(to* Mrs. LANE*).* Don't cry, ma'am; I am going with you too.
Frank 's only stunned; his skull 's so precious hard.
MILES. And I 'll make one of that adventurous crew.
TWO SAILORS. And I—and I—we wont let women drown.
JONES. Go, and be hanged, then, with a woman's gown!
You lily-livered cowards!
[*Sailors carry off* FRANK, *and* Mrs. LANE *and* EFFIE *in the chair.*
JONES. Shove off there!
Haul up the studding-sails; the wind is fair,
Shake out all reefs, and let go sheets unfurled;
Steer north-north-west, and hey for the New World!

ACT III.

SCENE I.—A DESERT ISLAND.

Enter FRANK *and* MILES.

MILES. There 's not too much of it to call an isle;
From sea to sea I 've walked it—half a mile.
FRANK. At any rate, there 's water fresh and sweet.
MILES. And burning rocks to burn one's shoeless feet.
FRANK. We may be thankful, after such a night,
On *terra firma* safely to alight.
I wonder if the ship rode out the gale
That smashed our little vessel?
MILES. Sir, you 're pale—
Still weakly from your blows.
FRANK. Not I: yon cask
I rolled up from the beach; that 's no bad task.
'T is flour, and turtles in the shallows breed,
So we shall have the wherewithal to feed
On Lord Mayors' dainties every day we choose.
MILES. What 's turtle-soup when one has lost one's shoes?
FRANK. That can't be helped. Let 's rig a tented roof
Out of this canvas bag and waterproof;

We'll plait sea-bent for slippers—don't look glum!
See, here's a keg full of the Queen's own rum—
We'll serve it out in equal portions fair,
And all sleep soundly as an Arctic bear.

Enter little EFFIE, *crying.*

EFFIE. I've lost my mammy—lost her in the sea!
FRANK *(petting her).* I'll be your mammy; come along with me.
Isn't it fun to live quite out of doors?
EFFIE. Me like a ship best when it rains and pours.
FRANK. It won't rain here, not for a month to come.
Now, messmate, give a shove to that old rum. [*To* MILES.

Enter FITZJAMES, *disconsolate, without cap or jacket.*

FITZJAMES *(sighing).* I've searched in vain in every nook and cranny—
My ivory brushes and my Frangipanni! [*Groans.*
My dressing-case, inlaid and silver mounted! [*Groans.*
And the sweet trinkets that so oft I counted! [*Groans.*
Oh, if my lady saw me thus distressed—
One shirt alone, and that my second best!
FRANK. Dolly, you've got a waistcoat, I declare;
And trousers too, and not a holey pair.
Doff me that vest for this poor shivering brat;
'T will make a frock, tied on with your cravat.
FITZJAMES *(aghast).* My vest! my only vest! I'd die of cold!
And my cravat! Upon my word, you're bold.
FRANK *(angrily).* Not for myself, you churl! I want your gear,
But this poor orphan,—like us, shipwrecked here.
FITZJAMES. You must excuse me such a sacrifice.
FRANK. You selfish dog, I'll strip you in a trice!
[*Collars* FITZJAMES *and shakes him.*
FITZJAMES *(alarmed).* Oh, Bumptious! Bumptious! let me go! I'm choking!
Shipwrecked! garotted! ah, 't is too provoking!
[FRANK *tears off the waistcoat and wraps it round* EFFIE, *twisting the cravat round it like a sash.* EFFIE *dances for joy.*
EFFIE. Oh, putty, putty buttons! putty scarf!
FRANK. Leave off that blubbering, you insane mooncalf!
[*To* FITZJAMES, *who is lamenting his loss.*
D' ye think I'd hurt you, my old fellow-chum?
Cheer up, you goose, and drink my health in rum.
[*They all go off in the background.*

SCENE II.

A rude tent made of a waterproof wrapper and shawls; a barrel of flour in one corner, keg of rum in another, a heap of broken cups and plates in another; fire, with pot boiling; Mrs. LANE, Sailors.

Enter FRANK, HON. ADOLPHUS FITZJAMES, EFFIE, *and* MILES. EFFIE *runs into her mother's arms screaming for joy.*

EFFIE. Oh, mammy! mammy! Oh, my mammy's found!
MRS. LANE. My child! my darling! Oh, I thought you drowned!
EFFIE. And did you dump up, right up, from the sea?

MRS. LANE. Oh, sir! what blessings you've conferred on me!
[*To* FITZJAMES.
To save my child, and in your clothes to wrap her.
FITZJAMES *(smirking)*. You're very welcome.
FRANK *(slapping him on the back)*. Bravo, Dolly Dapper!
FITZJAMES *(aside)*. She's five foot nine, and has a blacksmith's arm;
There's quite too many here to cause alarm.
Somehow a desert isle makes folk look truculent:
It's the bad food, maybe!
MRS. LANE. Yes, succulent [*To* FRANK.
Is turtle-soup for men and babes.
FRANK. Of course!
A child like that would thrive on a cab horse!
See here! [*He lays out the dinner on the head of the flour-cask; broken cups, platters, &c.*
A picnic service from the wreck,
A footless jug our barrel board to deck.
First course, the turtle-soup; then turtle eggs;
Third, pudding flavoured from the keg of kegs.
Now share and share alike must be our rule;
Fall to, men, quickly, ere the turtle cool!
Whatever happens, equal shares divide,
Till some kind ship across yon water glide.
[*They all gather round, and eat with much show of appetite.* MILES *sings:*

Let London's May'r
Green fat prepare
With Mounseer's crack-jaw names,
On our desert isle
A feast we'll pile
That Guildhall's banquet shames.
Let peers their plate
Send for whitebait
At Lovegrove's by the Thames.
Then, hurrah, my boys
For turtle's joys,
Sound sleep, and pleasant dreams.

[*They wish each other good night, and disperse in different directions.*

SCENE III.—THE TENT.

EFFIE *asleep;* MRS. LANE *watching her.*

MRS. LANE *(anxiously)*. She's very feverish, and, I may assert, ill!
I fear, I fear she's had too much of turtle.
Sailors to mother's milk may liken rum,
But, oh! I wish a real cow could come
O'er these salt waters! Then, the flour runs low:
On half allowance we already go.
What can we eat when empty is the cask?
In vain, each day, that question sad I ask,
What *can* we eat?
[FRANK *enters softly, with an armful of seaweed.*

FRANK *(cheerily).* Why kelp, dear lady.
I found this seaweed in a corner shady:
It tastes like Iceland moss.

MRS. LANE *(shakes her head).* She will not take it!

FRANK. Oh, yes, you 'll see how tastily I 'll make it.
Don't vex yourself,—a ship must pass by soon,
'T is the best season of the trade monsoon.
The flag-staff can be seen for miles away,
And will attract some vessel to this bay;
My red shirt blazes like a beacon fire.
[*Voices outside.* MRS. LANE *looks sadly at* EFFIE.

MRS. LANE. She can't hold out long!

Voices outside. Run the red rag higher!

Voices outside in great excitement. Hurrah! she sees us! no, she don't! she veers!

MRS. LANE. Alas! these moments are as long as years.

Voices outside. She tacks—shifts sail—she wears—her helm 's a-port—
She 's making way!—was that a gun's report? [*Gun heard.*
I saw the flash! I heard the shot! ha, ha!
She lowers a boat! we 're saved! thank Heaven! Hurrah!
[*Loud shouts outside;* EFFIE *wakes and cries;* MRS. LANE *clasps her in her arms, weeping and exclaiming. Enter the rest, crying all at once.*

ALL. The boat 's at hand; let 's gather up our traps!

FRANK. The precious goods! bequeath our island scraps
To the next Robin Crusoe that here lands.
Come, Effie, let me lift you o'er the sands.

MRS. LANE. Oh, if there should be one milch cow on board!

FRANK. 'T is a large Indiaman, all fully stored;
Effie will revel like a queen to-night.

MRS. LANE. I hope some ladies will assist our plight!

SAILORS. And we 'll have grog now, and some Christian grub.

FITZJAMES. Shall I find scented soap, and means to rub?
I 've got a half-crown in my trousers pocket,
Beside my tooth-brush and my mother's locket;
I 'll buy wax candles, if I can, on board,
And have a silver fork.

ALL. Restored! restored!
To home, to country, and to friendly faces!
Here comes the boat--I hope we 'll all find places.

FRANK. Finis to desert island's brief adventures, [*Looks out.*
Of ups and downs, like railway Cos.' debentures;
But, luckier far than Chatham line and Dover,
We launch afresh, and henceforth live in clover.
[*Exeunt all, shouting and rejoicing.*

ACT IV.

Dramatis Personæ.

EARL. MARQUIS.
HON. ADOLPHUS FITZJAMES.
FRANK.
POMPEY.

COUNTESS.
MARCHIONESS.
Maid.

SCENE I.

A BED-ROOM IN A LONDON HOUSE. FRANK *brushing his hair with two ivory brushes before a cheval glass: he is very smartly dressed.*

FRANK. Now, this is jolly! When I reached the station,
And counted shillings in some trepidation,
Lest e'en a Hansom were beyond my figure,
Behold, a gorgeous, gold-laced, liveried nigger,
Who showed his teeth, and bobbed his woolly pate,
Saying, "By golly, but dis train be late! [*Mimics a negro.*
You Massa Middy, from ship *Clio* true?
Dis all your luggage? you hab berry few!
Poor massa lose um tings in desert isle."
Then he snapped up my valise from the pile,
And, as I did not quite know what to say,
I thought I might as well go on his way.
There's nobody expects me in this city,—
No friends have I in London, more 's the pity!
By Jove! he handed up my luggage shabby
To a wigged coachman, not a humble cabby;
Opening the door of such a splendid carriage,
It might have borne a princess to her marriage!
"Jump in, sar, quick,—de horses dey catch cold."
So I jumped in. I own t' was rather bold,
But such a lark! and after whacks and blows
I think one good turn Fortune to me owes.
So here am I, in this patrician mansion,
Received by all the plushes with expansion;
For such a seedy coat as I had on
Must have been nuts to Chawles and Jeames and John.
Well, here I am as cosy as a cricket
Under an oven; how I got the ticket
Of entry matters not a pin to me—
All ports are home, from Hong Kong to Dundee.
[*Rings bell violently.*

SCENE II.

Enter POMPEY *the black footman.*

POMPEY. What, massa? Here be all the smells he lub—
Millefleur and Jockey; de big sponge and tub;
Two, tree, new brush, and inlaid water-jug.
Ah, Massa Dolly, you like all tings snug! [*Chuckling.*
FRANK. You grinning monkey, tell me who I am.
POMPEY. Law bress us, Massa Dolly!
FRANK. What a cram!

POMPEY. You Massa Dolly, of de Queen's ship *Clio!*
FRANK. Then who are you?
POMPEY *(with great dignity).* Free nigger from Ohio!
Own footman to my lady your mamma.
[*Bell rings, exit* POMPEY.
FRANK. My lady mother? what a sell! ha, ha!
I 've got promotion faster than "Gazette;"
From orphan middy to an earl's cadet.
So I 'm old Dolly Dandy! Now for fun;
I 'll play his part, and then I 'll cut and run!
Re-enter POMPEY.
POMPEY *(grandly).* My lady ready to embrace her treasure!
[FRANK *flourishes his cambric handkerchief and pretends to be a great swell.*
FRANK. Ah, yaas! announce me! with the greatest pleashaw!
[*Exeunt.*

SCENE III.—COUNTESS'S BOUDOIR.

COUNTESS *and* Maid. COUNTESS *lying on a sofa, painted, bewigged, and much made up.* FRANK *enters.*

COUNTESS *(affectedly).* My son! my precious! rescued from the ocean!
[*Kisses him, then pretends to sink back fainting;* Maid *rushes to support her.*
Oh, my poor nerves! it kills me, such emotion!
Benson, my drops! my salts! support my head!
There, that will do. *(To* FRANK*).* We all supposed you dead,

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There, that will do. *(To* FRANK*).* We all supposed you dead,

And *what* I suffered nobody *can* tell! [*Languishingly.*
My heart 's *too* tender! Pompey, ring the bell: [*Sharply.*
My chocolate. (*To* FRANK). So there you are,—so tall!
Not like a Robinson Crusoe at all!
Do you still use that violet pomade?
Were you shipwrecked? Wasn't your captain mad?
Have you spent all your money?

FRANK. Every shilling!

Enter EARL; *he is short, fat, and fussy.*

EARL. Ha! back again? some folks take extra killing!
But—hey! the wrecking has worked wondrous well,—
You 're more a gentleman, and less a swell. [*Stares at* FRANK.
[COUNTESS *gets up languidly and draws* FRANK *to stand side by side with her before the mirror; she minces and ambles.*

COUNTESS (*to* EARL). Isn't he quite my image, eyes and all,
When you first met me at the county ball?

FRANK (*aside*). Like *her!* I hope not! skinny-armed and yellow!

MAID (*aside*). Like *her*, old hag! that bright-eyed bonnie fellow!

EARL (*bluffly*). I shouldn't have known you, that 's the truth, old Dolly—
Your mother made you such a precious Molly.
There 's nothing like the navy for a muff!
You don't mind dining now on junk or duff?

FRANK. Or shark, or porpoise, when nought else turns up!
When do *you* dine, ma'am? [*To* COUNTESS.

COUNTESS. Have a tiny cup
Of this Vanilla chocolate?

FRANK. Oh, ma'am!
My hunger 's such I could devour black Sam,
Your gorgeous nigger, to his last gilt button:
Were there no scraps left from the servant's mutton?

EARL. Bravo, old chap! you 're something like a sailor,
[*In high glee, takes him by the shoulder.*
Not a mere cross 'twixt hairdresser and tailor!
I owe the Service something for this service;
You 'll be a tar like Collingwood and Jervis,
Ready for squalls, cross-seas, and dirty weather:
Come, and we 'll have a glass of grog together.
[*Exeunt.*

SCENE IV.—THE EARL'S DRAWING-ROOM.

Guests at dinner: EARL, COUNTESS, MARQUIS, MARCHIONESS, FRANK. Servants *putting dessert on table.*

COUNTESS (*to* MARCHIONESS). Now, hasn't he the Montmorenci nose?
And family air, down to his very toes?

MARCHIONESS. Um—um!—they have hawk's beaks, and he 's a pug!

FRANK (*aside*). Horrid old harpies, jawing at my mug!
I must be off, and change these borrowed clothes,
Or, spite of all my Montmorenci nose,
There 'll be a row when Master Dolly shows.
He 's still a-bed at Portsmouth, I dare say,
While in his family I am making play.

MARQUIS *(to* EARL*)*. I compliment you, sir, upon your son;
The Admiralty knows what he has done
In that sad mutiny. [*A loud peal at the hall door.*
FRANK *(aside)*. There he is, by Gemini!
Could I but hide in that capacious chimney!
But 't is choked up with pasteboard wreaths and trash.
'T is Dolly's voice; oh, ain't I in a hash! [*Voice outside.*
I 'll just go on, and give them all fresh bother.
I wish him joy of that idiotic mother!

[*Servant announces* Mr. ADOLPHUS FITZJAMES. *Enter* FITZJAMES, *very mud-stained and disordered in dress; he stops and smiles awkwardly on seeing visitors; the company stare at him.*

FITZJAMES. Oh, dear! I 'm hardly dressed for ladies' presence.
POMPEY. *Two* Massa Dollys!
COUNTESS *(shrieks)*. Who 's that? Where 's my essence?
EARL. Bless me, what impudence, in here to push!
FITZJAMES. Oh, what a pleasure to see men in plush
At home! 'mong silver forks and finger-glasses.
EARL. He 's an impostor! turn him out, you asses!
COUNTESS. That muddy lout my son! Oh, no! no! no! [*Shrieks.*
MARCHIONESS. Two Dromios—a Shakspearian tableau!
Which is the Simon Pure? Decide, dear earl,
Which is the honourable and which the churl?
FITZJAMES. I know that I 'm Adolphus, and that 's Frank,—
As usual, after some outrageous prank.
But I 'm too tired to quarrel or abuse you, [*To* FRANK.
So in your own name let me introduce you
After I 've dined. Here, Wilson, bring the wine, [*To* Butler.
Some *entrées*, *vol-au-vent*—I want to dine;
And then, mamma, I 'll kiss you when I 'm dressed,
Meantime I 'm rather muddy for your guest.
You sent no carriage, so I had to foot it.
This pheasant 's stunning; father, did you shoot it?
The blessing of a napkin! [*Spreads napin on knees.*
EARL *(angrily)*. That 's old Dolly!
The same old cormorant and Molly!
And you, sir, staring like a stuck cockroach!—
What brought *you* here, sir? [*To* FRANK, *fiercely.*
FRANK *(coolly)*. 'T was your family coach—
You sent to meet me.
EARL *(in a rage)*. No, to meet my son.
FRANK *(rising)*. 'T was well intended, and I 've had my fun;
So here I wish the company good night. [*Bows and exit.*
COUNTESS. He 's very plain—in fact, an utter fright.
'T was only my emotion could deceive me. [*To* MARCHIONESS.
Now, *there* you see blue blood, *pur sang*, believe me.
[*Points to* FITZJAMES.
MARCHIONESS. But what about the Montmorenci nose?
He 's your own child for selfishness, no doubt. [*Aside.*
[*Sudden cries of "Fire! fire!" Every one starts up. Lights seen at back window.*

ALL. How? what? Break in the doors! Let's out! let's out!
[*The door is burst open, smoke fills the room.*
EARL. Good gracious! 't is the passage that's a-flame.
FITZJAMES. Oh! *(stammers)* now, I think, the moment when I came
A candle I upset upon the table:
Perhaps *that* caused it.
EARL. Idiot!—Who is able
To scramble out of window and get aid?
MARCHIONESS. I am too fat.
FITZJAMES. And I am too afraid.
I never could help when we beat fire-quarters.
[MARCHIONESS *screams;* COUNTESS *faints;* MARQUIS *and* EARL *bang at windows and doors.*
EARL. Help! help, outside! Oh, for some brawny porters!
The lobby's quite impassable for smoke
And fire. Oh, me! the only ladder's broke! [*At the window.*
Voices outside. We've sent for Shaw and all the fire brigade;
Wait till they come.
EARL. Wait till we're broiled and flayed!
[*The window is smashed in;* FRANK *appears, black with smoke. He seizes the* COUNTESS, *who is insensible.*
FRANK. You called me son to-night, and a son's part
I'll do to you. Here, Dolly, pluck up heart;
Help out your father, there.
FITZJAMES. I can't—I daren't!
It's worse than shipwreck. [*Cries in a corner.*
[FRANK *lifts* COUNTESS *out through the window to the people outside. Comes back and seizes* EARL.
FRANK. Though he's not my parent,
I owe him a good dinner; so here goes!
Come, Dolly, save your Montmorenci nose.
FITZJAMES. Oh, dear! oh, dear! I'm stupefied with terror.
The heat has split down all the sideboard mirror.
I think I'm dying, I do feel so queer!
Re-enter FRANK; *finds* FITZJAMES *stupefied, and carries him off.*
FRANK. Poor Dolly! muffs would only frizzle here.
I'll give him one more chance to be a man—
Here, you outside there, catch him if you can.
[*Scrambles out. A crash is heard. Scene changes.*

SCENE V.—AN ADJOINING HOUSE.

EARL, COUNTESS, MARQUIS, MARCHIONESS, FITZJAMES, FRANK, *in a chair, much bruised and burnt;* Doctor *examining him.*

EARL. Nothing of danger? He's a noble youth.
I wish he *were* my son, and that's the truth.
He saved our lives, while *you* could only blubber,
You good-for-nothing, gluttonous land-lubber! [*To* FITZJAMES.
You idle dandy!
FITZJAMES. Yes, I know I am!
I never tried on the heroic sham.

I 'm a philosopher with few desires;
And as for fishing people out of fires,
That 's not my line—I leave it all to Frank,
Whom in the public name I hereby thank.

COUNTESS. He must have good blood in him—some great-aunt
Must have been a Montmorenci.

MARCHIONESS. Silly cant!
He 's better as he is. I like his face.
Spite of pug-nose, he beats your nosey race. [*Aside.*

MARQUIS. I 'll write to the First Lord; on second thought,
I 'll get your name down for the Royal yacht.

EARL. In token of my gratitude—hum, hum!—
I 'll bid my bankers pay you the same sum
As quarterly to Dolly I allot.

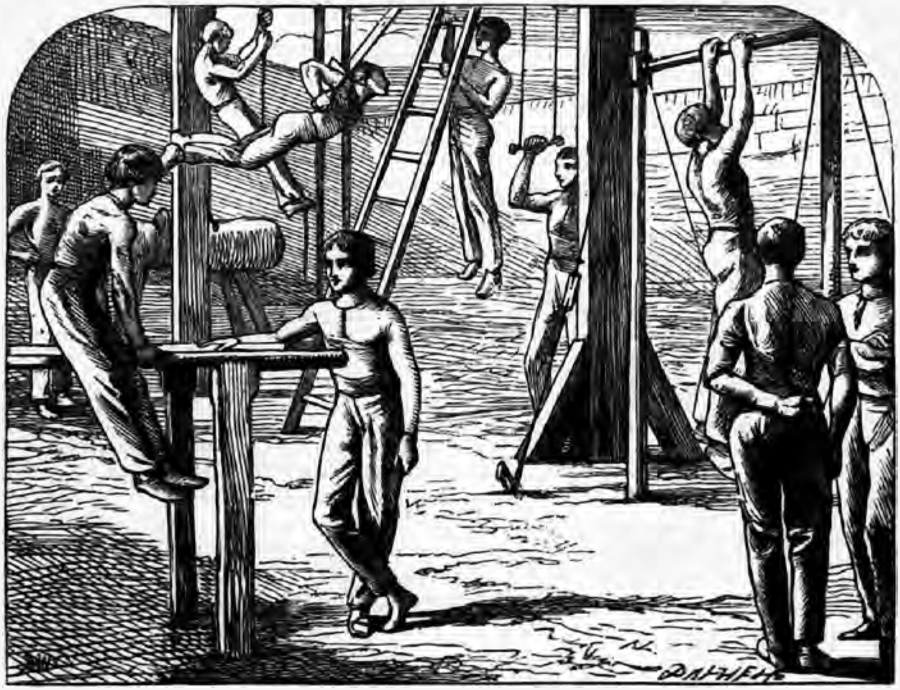
FRANK. Oh, sir!

FITZJAMES. Well, but for you we 'd gone to pot!
So that 's but fair, and make no bones about it.

FRANK. What luck is mine! I never more will doubt it:
Such glorious ending to my silly prank.

ALL *(drink and come forward).* Here 's health and happiness to gallant Frank!
Soon may he fly his Peter at the fore,
Fame crown his brows, and wealth increase his store.

[*Curtain.*



Athletic Sports, Accomplishments, &c.

GYMNASTICS.

With Apparatus.

IT is scarcely requisite, in these days of advanced physical education, to expend time and space in advocating the study of Gymnastics. These delightful and healthy exercises have now become so thoroughly an institution among us, their popularity is so firmly established, that very many years must elapse before it again becomes necessary to take up the cudgels in their defence.

"But," say some, "are they not dangerous for boys?" To this we may return answer, "Most assuredly *yes*," and with equal confidence, "Most assuredly *no*." It depends upon the sense in which the word "dangerous" is understood. If it is meant to signify that a boy *may* in his early essays at gymnastics damage himself more or less severely, break a bone perhaps, or otherwise come to grief, it would be vain to deny it; but unless a boy be tied up to his mother's apron-strings all his life, how is he to avoid *all* exposure to such accidents? He must not run, climb, or swim; and as to cricket, football, or riding, and similar more violent exercises, they must not even be thought of.

But if it be asked whether gymnastics are not exceptionally dangerous, we can answer unhesitatingly "*no.*" With proper apparatus, and a little supervision to prevent liberties being taken with it, we believe that the ordinary run of boys may enjoy almost perfect immunity from danger.

Where accidents do occur, they may almost invariably be set down to one of two causes, or perhaps more frequently to both combined: either, that is, to the foolhardiness of the boy or to the imperfection of the apparatus. The latter is a specially fertile source of accidents.

Now, a foolhardy boy *will*, as we all know, thrust himself into danger—indeed he is never quite happy out of it—and must, unless he be exceptionally lucky in his mishaps, expect a certain number of more or less severe casualties. All that can be said in his case is that a well-constructed gymnastic apparatus is far safer for him to exercise his climbing propensities upon than any tree or temptingly precipitous rock; and that at least he will thus almost daily acquire a control over his limbs that will save him from many an after fall.

Boys, and men too, if they take their share of ordinary British pastimes—and who would have them do otherwise?—*must* come in for a certain amount of risk: in some cases, such as hunting and the like, of life as well as limb. But amongst all these sports, with the before-mentioned reservation of trustworthy superintendence and apparatus, they can hardly anywhere be so safe as in the gymnasium.

The real foundation of this adverse prejudice is that, for want of habit, these exercises *look* dangerous. No one dreams of going into paroxysms of alarm at seeing a man disporting himself in ten fathom water; yet a momentary attack of cramp—quite as probable an eventuality, by the way, as that a gymnast should let go his hold of a rope—may drown him without hope of rescue.

Does any one take the trouble to cry out, "How dangerous!" when a man trots by at ten miles an hour in his dog-cart? And yet how many accidents, and fatal accidents too, do there not yearly occur from this cause? And as for gun accidents, or accidents in the hunting-field and the like, is not their name legion? is there a week that passes in the season without record of one or more of them in the newspapers? Yet who dreams of preaching a crusade against field-sports as too dangerous?

Three or four fatal accidents may occur every season, but they make no more than a passing impression upon those who are not immediately affected.

Let, however, a single accident occur in the pursuit of some new-fangled pastime, and the British public is up in arms; the novelty is ticketed "DANGEROUS," and thenceforth many a long year it must wait before it can hope to be re-established in public opinion.

Accidents of course do occur now and then, with the ropes and bars, as they will occur everywhere else,—some, as we have above observed, referable to the foolhardiness of the individual, and therefore not chargeable against the practice of gymnastics; for a foolhardy boy will be foolhardy, and get into dangerous positions, and meet with his destined share of accidents, wherever he is. The gymnastic apparatus is merely an outlet, and the safest he could have, for his exuberance of recklessness.

Some there are that are really and truly accidents, quite impossible to foresee or to provide against; but these are really surprisingly few, and mostly not of a very serious nature. But the real and most prolific cause of accidents in our gymnasia, the source of the most and most serious mishaps, is the imperfection of the apparatus.

A gymnasium is to be erected; the job is given to a country carpenter or builder, who knows as much about the matter as he does of making a steam engine: proportions, materials, construction, all equally important, are all taken equally at haphazard.

The carpenter sets up a pole with a spindle and hooks at the top, with pendent cords, and this he calls a circular swing or giant stride: whether the pole is sufficiently strong to bear the strain to be put upon it, or whether it be secure from the insidious attacks of the damp, or whether the hooks and ropes are so constructed as to be trustworthy, he has no means of knowing, and probably does not care.

Then some day the boys who use it sit astride, as they will do if not checked, of the cross-sticks, instead of holding on by their hands, and while they are thus urging on their mad career, an accident, as it is called, in due course occurs—something gives way, or the rope slips off the hook; the unfortunate victim comes heavily to the ground, and, being in an attitude which renders him perfectly helpless, comes also heavily to grief.

Or, as happened once in our own experience, the pole, weakened by damp-engendered rot at its point of junction with the ground, the part where the strain is always the heaviest, gives way suddenly under some more than usually severe jerk, topples over among the crowd of confiding youngsters, and does one of them to death, under circumstances of extreme and prolonged suffering.

Forthwith uprises a popular cry, "Away with such dangerous inventions!" the authorities are frightened, and, knowing little personally about the matter, or perhaps secretly prejudiced themselves in its disfavour, make a clean sweep of everything, not even troubling themselves to make out very distinctly the real cause of the mishap. "An accident has happened; the thing must be dangerous; we will none of it!" Such is their easy logic.

And yet these very same men shall, in the same year, see a score of accidents in the play-ground, in the field, on the river, some of them perhaps even more disastrous; but they never dream of therefore shutting up the play-ground, or *tabooing* the field or the river.

Yet the very same men, when they have to deal, not with new-fangled novelties, but with fine old crusted English sports, say, "An accident has happened; sufficient care has not been taken—more must be taken for the future."

This is the sensible way to look at the matter; and in all consistency, why should gymnastics be made an exception?

There is a prejudice against them to begin with: the apparatus is provided totally unsuited for its purposes: a circular swing such as we have described above; parallel bars, as we have ourselves seen, *two-and-a-half* feet apart, and solid as an ox-fence, three inches by four at least in thickness; a fixed horizontal bar to match; a hanging bar like the trunk of a young tree, fit for the hands of a giant, working loosely round in the loops of the sustaining ropes, and carefully contrived to throw off any performer at the shortest notice; and the rest in like proportion: an apparatus, in fact, that would be the death of half the gymnasts in Europe if they were weak-minded enough to trust themselves to it. The boys are allowed to fling themselves upon this without due guidance and instruction: they soon find they can make nothing of it in the ordinary way, and so, with their usual ingenuity, are not long in extracting fun out of it in other ways,—selecting, of course, by natural instinct, the most dangerous. Then come the usual results. Immediately there is a terrible outcry, and the exercises of the gymnasium get the discredit due to the mixed ignorance and stupidity of those who thus abuse them.

Let a set of apparatus be erected after the pattern we are about to give, and use be made of it as we shall recommend, and we will guarantee that there shall be fewer accidents in a whole year than may be looked for in any ordinary high field-day at football; nay, more than this,—that it shall prove not only a less perilous pastime than *any* of the regular outdoor sports, but actually a preservative against accidents from other causes.

This we are enabled to do, not relying upon ourselves, though we are not wholly unskilled in the use of the ropes and bars, but upon the long practical experience of a well-known gymnast, Mr. Chas. Spencer, of whose admirable little work, "The Modern Gymnast," we have largely availed ourselves in preparing this article.

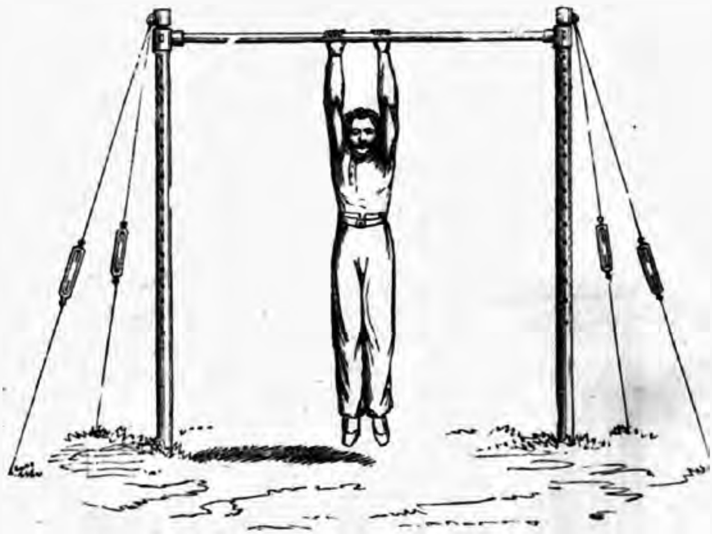


FIG. I

Our apparatus will consist of the following: horizontal bar, hanging bar, parallel bars, vaulting-horse, ladder, hanging ropes, and the usual *et ceteras.* Of these latter, however, we shall not take notice here; our attention will be entirely directed to the more advanced exercises.

THE HORIZONTAL BAR should be set up as follows: If intended as a permanency, two strong posts must be let into the ground or into iron sockets, standing seven feet apart and about eight feet in height; these are to support the bar, which must be made to shift up and down in grooves cut in the posts, so as to be easily adapted to the height of the performer. This bar should be of straight-grained ash, seven feet between the uprights, an inch and three-quarters in diameter, perfectly round, with a steel core an inch thick running through the centre. This latter is a very important point.

If there be no steel core, then the bar must be reduced at least one foot in length and increased to two inches diameter; both of which, especially the latter, as making it clumsy to the grasp of an ordinary hand, will detract much from its practical value.

The bar must be so fastened to the uprights that there shall be no unsteadiness or vibration. A wabbly bar is a terrible nuisance, and is apt to throw one out of all calculation just at the critical point of a feat.

If for private use, or it be thought desirable to make it portable, the method of construction figured in our cut (Fig. 1) will be found very convenient and serviceable, and, what is more, thoroughly trustworthy.

THE HANGING BAR must be very carefully constructed. The ropes should be attached securely to a good, firm, unyielding support, about fifteen or eighteen feet from the ground—this will be quite sufficient height—and the bar, which should be about twenty-six inches long by one-and-a-quarter in diameter, with a steel core as before, must be firmly attached to the ropes, so as to afford a safe hold. *Above all things, it must not revolve in the grasp.* The height from the ground must be regulated by the stature of the performer.

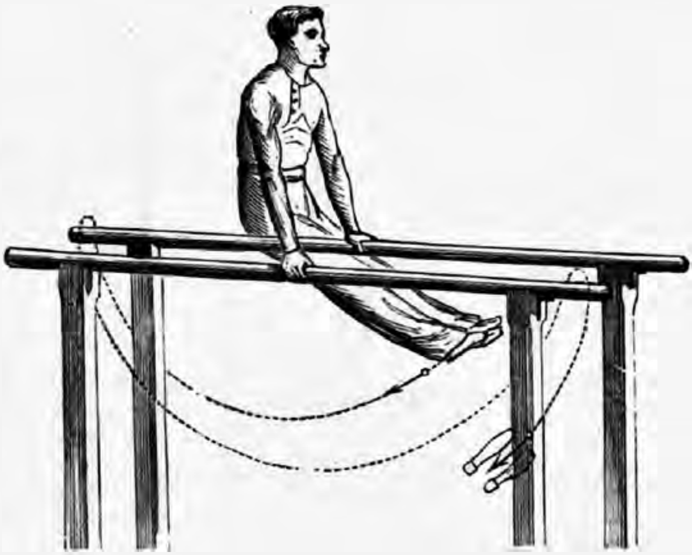


FIG. 2.

THE PARALLEL BARS are very seldom constructed with anything like correctness of shape or proportions. A couple of clumsy rails—one might almost say beams—laid across two pairs of posts at any height from the ground and at any distance apart, are set up, dubbed "parallel bars," and are supposed to be all that could be desired. But, as might be supposed if people only took the trouble to think, parallel bars, to be of any real service, require as nice an adaptation to their purposes as any other mechanical contrivance.

The bars or rails, being intended for the grasp of the hands, must be of such size and shape as will afford the best grasp, and their height and distance apart must be adapted to the stature of those for whose use they are intended.

The *size* of the bars is especially important: if they be too large for a fair grasp, not only is the hand likely to slip and a heavy fall to result, but there is great danger to the wrist and thumb of serious sprains or dislocation. The jar resulting from an ordinary vault over, with 3-inch rails, is something to remember. We can recollect once injuring one of our wrists seriously in this manner. Moreover, when a fair grasp is impossible, many of the exercises—most of them, indeed—are also *ipso facto* impossible, and thus many beginners are disgusted at the outset: they are told to begin with such and such exercises, as simple preliminaries to others more advanced; they find after repeated trials that they cannot even make a commencement, and naturally soon give up the whole thing in despair.

For ordinary purposes, that is, for people not of exceptional stature, the most useful dimensions are these: height from the ground, four feet eight inches; distance apart, eighteen inches, or nineteen at most; for boys, seventeen or even sixteen will be sufficient. The length should not be less than seven feet, and the bars should be *round*, and of a diameter of two-and-an-eighth inches.

Oval bars are sometimes used, but we prefer the round ones, as they feel more natural, most of the other apparatus being of similar form.

For the uprights no dimensions need be given: all that is needful is that they should be sufficiently strong. They should be fitted into a stout wooden frame, firmly morticed together. When in use, this frame must be fastened to the floor by screws. If required for a playground, or any place where it is necessary to have them fixed, they may readily be secured by wooden stakes or wedges driven into the ground.

A more convenient way is to sink the posts permanently into the ground; but then they are liable to decay from the damp, and thus to become unsafe.

FIG 3.

THE VAULTING-HORSE is of all gymnastic apparatus that which has been hitherto most neglected in this country, and even now in many parts the most rudimentary ideas as to its proper use and construction are extant. One of our writers on gymnastics describes it as being simply the trunk of a tree mounted on four legs. Now, this is most barbarous, and calls loudly upon us to "reform it altogether," as the use of it is much more likely to cause injury than benefit to any one attempting feats of agility upon it. The sketch will give an idea of a proper vaulting-horse.

There are various lengths for these horses, but the one you will find to be the most generally useful is six feet long and about sixteen inches across the back. It is covered with cow-hide all over and evenly padded, and is generally made with one end a little raised, with a slight bend corresponding to the neck of the animal which is its prototype; and this gives some form to it, and is useful as a mark where to place the hands.

There are two pommels placed about the centre, eighteen inches apart, and movable, so that the horse may be used without them if required; and in this case flush pommels, level with the back of the horse, are inserted into the grooves.

The legs must be made to slide up and down after the manner of a telescope, so that the horse may be used at heights varying from about three feet six inches to six feet.

It is also necessary to have a solid deal board, about three feet square, rising in thickness from a feather-edge to three inches, for taking what is technically termed a "beat" off, which is very useful in exercises which require to be performed lengthways on the horse. Of course it is not used as a spring-board, but only to give a firm foundation for the feet in jumping, and particularly to mark the place of starting when increasing or diminishing the distance from the horse.

FIG. 4.

The ladders, hanging ropes, and so on, we need not describe. There are, however, two more requisites to which we should wish to direct attention. One is the HAND-RINGS: two ropes, as if for a hanging bar, but terminating instead each in an iron ring covered with leather, and large enough for the hand to grasp comfortably. These rings are made of various shapes; but that which we recommend as the most practically useful is the *stirrup*.

One other requisite, indispensable for safety in first essays at many of the feats we shall describe, is the LUNGERS, so called. This is a strong broad leather belt to buckle round the waist, with on iron ring or eye at each side. To these eyes are strongly attached ropes, one on each side, of sufficient strength to support the weight of the wearer. The figure will indicate the method of using it. (Fig. 4.)

This is an invaluable safeguard for novices, and enables many to learn quickly—simply by the fearlessness it engenders—many a difficult feat which they would otherwise never dream of attempting.

We cannot help thinking that a similar appliance, only a little more above the centre of gravity, would prove of immense service in learning difficult figures in skating. Ladies, too, might profit by it in their first efforts, as all fear of unseemly falls would be quite dispelled.

So much for the construction of an apparatus; now for the use to be made of it. We will begin with

THE HORIZONTAL BAR.

But before we begin it must first be put into *good condition.* Most likely there will be a little grease on it from previous practice, which it is highly important should be removed before commencing. This is done in the following manner: Take a wet cloth (without soap or soda, as any kind of alkali will raise the grain of the wood and make it rough), and rub the bar with it; then get a few feet of rope—I find thick sash-line the best—give it one turn round the bar, and, taking hold of each end, rub it up and down, gradually moving it from one end to the other. The friction will dry the wood, remove the grease or dirt, and put on a good surface.

The bar being now in good condition, wash your hands perfectly clean, and you are ready to commence. You will find that there is no *resin* required, which every gymnast is compelled to use if the bar is not kept in good order. The use of resin is bad for various reasons: it will dirty your hands, and if you have not practised much it will cause blisters sooner than otherwise. I have sometimes seen the skin of hard hands torn, and wounds ensue, preventing further practice for some time. But if you are obliged to use resin, do it judiciously: powder a little, and rub only the *tips* of the fingers in it; avoid, above all things, getting it into the palm of the hands, as it will make them stick to the bar, and it is also very likely to cause jerks in swinging, and the grip will not be so certain as when the hands move smoothly round. These details may appear rather tedious, but you will find them useful, as they apply to all apparatus where the wood is handled.

Now, there is another thing you must bear in mind, and that is, the way in which you must take hold of the bar.

Some say that you should take hold of it as you would a handle, with the thumb underneath; but we think that there is no doubt that the proper way is the same as that in which a monkey holds the branch of a tree—the thumb on the same side as the fingers. If the thumb be underneath, in all ordinary swinging exercises it has a tendency to draw the fingers off: although in some few slow movements it may be under, yet, as a rule, it is better above.

Now, keeping what has been said in mind, let us try some actual exercises.

Jump up at the bar, and hang with the hands, the body, arms, and legs perfectly straight, and the feet close together.

Hardly anything looks worse than to see the legs swinging about in all directions when you are performing an exercise; be careful, therefore, to keep them quite quiet: every unnecessary movement, you must recollect, is so much wasted force, and so much, therefore, taken from your chance of performing the feat.

To perform all feats quietly and easily shows the finished gymnast; and so far from violent exertions being the test of difficulty, the reverse is generally the case, and the easiest-looking feats are very often the hardest, and *vice versâ*. And, besides, these irregular movements only tend to tire you.

FIG. 5.

Now, having hold of the bar with both hands, draw yourself up until the chin is above the bar; then lower the body until the arms are quite straight again.

Practise this exercise as often as you can without tiring, or until you can perform it six or eight times in succession, which you will not do until you have practised for some little time.

Beginners must now try a few gentle exercises, such as hanging by each hand alternately, the other close to the side.

Then begin to walk along the bar by the hands, taking alternate steps with them, making the steps as equal as possible, and keeping, as we said before, the legs hanging quietly down. Go in this manner from one end to the other, then reverse the hands, and back again.

Now draw yourself up, with your chin above the bar, as in Fig. 5, and repeat the walk in this position.

Next try a few good swings backward and forward at arms' length: you will find that you will swing farther each time, until you can swing your body almost into a horizontal position.

All these little exercises should be repeated as often as possible; they help to strengthen the muscles, and accustom the hands to the feel of the bar.

TO GET ON THE BAR.

Draw yourself up as in the last figure (Fig. 5), then suddenly drop the whole

FIG. 6.

FIG 7.

of the right side, raising at the same time the left leg and throwing it over the bar, as in Fig. 6. Now establish a good swing with the right leg, and you will bring your body well over the bar, when a sudden exertion of muscle will bring you sitting in the attitude of Fig. 7. This is by no means an easy thing to do at first; but persevere, and, after a few failures, you will suddenly find you have succeeded: once accomplished, it will come easy enough.

At first you will find it hard matter enough to get your legs up to the bar at all. Beginners mostly try to lift the toes without bending the knees, and, of course, find it beyond their powers. Bring your knees up to your chin, doubling your feet well into your body, and you will find it come easy enough.

There is another method of getting on to the bar, by bringing the leg up through the hands, and with one good swing bringing yourself roundly up.

You may try either of these methods, but nothing but continued practice will enable you to master either of them; but when you do, and can get on to the bar in a respectable manner, you may consider you are making some progress. We now proceed to

THE LEG-SWING.

Being in your original position, as in Fig. 7, throw your right leg as far behind you as possible, at the same time slipping the other leg backward, and catching by the bend of the knee, as in Fig. 8. Then throw the head back with a good swing (keeping the arms straight), and you will thus make one turn backward round the bar.

You will find at first you are apt to make a half-turn too much; but after a little practice you will be able to regulate the first swing so as to go round once, and come up into your first position with a good balance.

Next try two or three turns without stopping; but always endeavour to finish *above* the bar, as at starting. It is bad to stop as in Fig. 9, as you are disabled for the next exercise.


FIG. 8.


FIG. 9.


FIG. 10.

For the forward swing, reverse the hands, keeping the whole weight of the body on the arms, throw the head well to the front, and with one plunge forward—keeping tight hold with the hands, and the body erect, as in Fig. 10—you will make one forward revolution round the bar.

After some practice, you will be able to go round several times without stopping.

This exercise is actually easier than the former, but it requires more confidence, for the want of which you are apt to keep too close to the bar, and thus you do not get sufficient swing to bring you up again.

Practise both these exercises with right and left legs alternately.

SITTING ON THE BAR.

Having accomplished the backward and forward leg-swing, we will now proceed to something a little more difficult.

You will now get on to the bar as in Fig. 7, with leg over; now try to balance yourself in this position without holding by your hands; having succeeded, take hold of the bar with both hands behind you, and pass the hanging leg over the bar into a sitting position, as in Fig. 11.

FIG. 11.

Now practise a few different balances while sitting; that is, with the bar under different parts of the thigh.

Try to sit almost straight, and again with the bar just within the angle of the knee. This must be done without touching the bar with the hands.

We now come to

THE SIT-SWING.

This is so called from its being a swing performed while sitting on the bar, and we will commence with the backward swing.

FIG. 12.

FIG. 13.

The "sit-swing" is somewhat similar to the leg-swing, but, of course, more difficult, as in the latter the weight of the body is mostly on the leg; but in the present exercise the whole weight is thrown upon the arms, therefore requiring more strength.

While sitting on the bar, as in the last figure, but holding with the hands, straighten the arms, and let them support a great part of the weight of the body; now throw yourself backwards with a good swing, still keeping a firm hold of the bar with both hands.

Now, the object of this movement is to go quite round the bar in the swing and thus make one complete revolution, which is called the "sit-swing backward;" but of course no one can expect to accomplish this feat at once.

The first few times you attempt it, you will most likely find yourself hanging with the weight of the body beneath the bar, and with the momentum of the swing gone.

In this case, all you can do is to let your legs pass through your arms, and thus drop on to the ground; but you must repeat the movement until you are able to swing quite round.

The way to practise this is, to swing about three-quarters round, and then to come back into the sitting posture again. This will give you confidence, and after a time you will feel yourself able to go all the way round, and to come up into your original position.

For some time you will find that you will come up in rather an awkward manner, without having swing enough to balance yourself, and therefore you will fall forward again; in which case you must be prepared to let go with the hands, and to throw yourself off the bar on to your feet; or, what is much better, to have some one standing in front, in readiness to catch you as you come off.

But you may take comfort, for when you can get thus far the feat is nearly achieved, and after a few more trials you will be rewarded by feeling yourself able to accomplish the "sit-swing."

In the forward sit-swing, the first start is the principal thing, as the impetus gained will be sufficient to bring you up again. In order to get a good start, you must raise the body as far away from the bar as possible, supporting the whole weight on the arms, as in Fig. 13; now throw the chest out and the head

FIG. 14.

FIG. 15.

back, with the legs rather straight, then with a good plunge forward, keeping the arms straight as in Fig. 15, you will go quite round; that is to say, you will in time, for you must not think of succeeding at first in any of these feats, but perseverance will soon enable you to accomplish them.

You will find in practising this exercise, that some of your strength will be expended in getting on to the bar again after each failure. I will now show you a very good way of getting into the sitting position again, while hanging as in Fig. 9. Straighten the body as in Fig. 15, and draw your centre of gravity a little above the bar, then, bending the body again slightly, you will roll quite over so as to come into a sitting position again. This movement is called the "Plymouth."

HANGING BY THE LEGS.

Get on to the bar in a sitting position, and then throw yourself off backward, as for a sit-swing; but instead of going round, drop the body and bend your knees, and thus let them catch on the bar, getting a firm grip with them, at the same time letting go your hands as in Fig. 17.

A young beginner should practise this on a low bar, so that, when he hangs by the legs, his hands will touch the ground; and thus, when he is getting tired and cannot raise himself, he may let his legs drop, and come on to his

FIG. 17

FIG. 18.

hands on the floor safely. He may then get on to the bar again, hanging by the knees as before, and practise swinging backward and forward as high as he can. At first the friction will make the legs a little sore, but the muscles will soon harden with practice.

There are a few other leg exercises which may be practised with advantage, and which will afford variety, and also help to bring all the muscles into play.

One of these is shown in Fig. 18, where you hang on the bar with one leg, stretching the other straight out with the toe against the under side of the bar, and the exercise is to bend the body up and down. This should be done with right and left legs alternately.

A performance which is also very showy (although we should not advise any one to attempt it without very good nerve and also strength in the legs) is

THE STANDING BALANCE ON THE BAR.

This may be practised on a bar as low as you like, so that you can easily jump off; but of course it looks better on a bar of ordinary height.

While sitting on the bar, lift one foot and gradually bring it on to the bar, as in Fig. 19, and then raise yourself up standing, as in Fig. 20, a feat which,

FIG. 19.

FIG. 20.

of course, requires great strength in the legs, and a good command of balancing power. Now endeavour to walk forward and backward by shifting the feet; and if you lose your balance, jump off the bar altogether, without trying to recover it, and get up again.

HANGING BY THE TOES.

This will make a good finish after the standing balance on the bar. To do it artistically, stand first on one foot, then on the other, turn round, let yourself down, and drop quietly and smoothly beneath the bar, hook your toes on to it, and hang down quite straight with your arms folded across your chest. (See Fig. 12.)

FIG. 21.

This, if done without stopping, has a good effect; but of course you must not expect to accomplish anything in this style for some time, and therefore must be content simply to hang by your hands, and then bring your legs up, and hook your toes over the bar, taking care, the moment you let go with your hands, to straighten the body and stretch out your arms, so as to save your head if you should chance to slip.

VAULTING OVER THE BAR

is a very useful exercise, and quite as well performed on the horizontal bar as on the vaulting-horse if your choice of apparatus should be limited.

Try it first on a bar about three feet six inches from the ground, and gradually raise it; but take care not to overtask your powers by having it too high for you, as very often, when young gymnasts find that they are getting on respectably, they are very apt to be too ambitious, and to attempt heights far beyond their powers. About four feet six inches is a fair height for a person about five feet four or five, to begin with. Learn to clear this clean and in correct style, before you attempt anything higher.

As vaulting is by no means a difficult feat, to look well it should be done in good style. To make a clean vault, the body should be kept as straight and as far away from the bar as possible (see Fig. 22), and should be practised right and left alike.

FIG. 22.

No careful gymnast need ever be afraid of injury if he uses his brain as well as his body, and you will find that, if a mishap occurs, it is generally to some one who attempts exercises without taking into consideration in what different positions he may come off the apparatus; but all these exercises may be gone through safely if sufficient precautions are taken at first. Mr. Spencer says on this head,

"I am sure I can speak for myself, having often in former times made myself quite a laughingstock at the gymnasium from the careful way in which I have tried new exercises which had any risk attending them. But 'let those laugh who win.'

"I first put on the 'lungers' (which you will find represented and described on page 250), with a comrade on each side to hold the ropes, and something soft underneath (such as a mattress, tan bark, or any other suitable material), and having some one in front to prevent my pitching forward when I came down.

"This is as you might have seen me when trying my first 'fall-back,' or other difficult exercise; and what was the result? Why, I tried many times, and fell many times, and should have hurt myself many times had I not been caught.

"But I knew I was perfectly safe, from the precautions taken (I did not mind the *look*), and this gave me confidence, and left me at liberty to give my whole attention to the feat I was attempting; and since then I have done that, and many other more difficult feats, numerous times, without the slightest injury."

HANGING BAR.

The exercises on this will be much the same as those on the fixed bar. We shall not, therefore, with the limited space at our disposal, do more than recommend it as an agreeable change from the fixed bar. Its use as a flying trapeze is too dangerous for ordinary boys to attempt, and we shall therefore not introduce it here.

THE PARALLEL BARS.

You may commence with the parallel bars, as in the horizontal bar, with the simple movements which any one would naturally perform upon them; such as standing between them, and with a spring placing a hand upon each, and thus supporting the weight of the body.

When you have become somewhat used to them in this way, commence swinging forwards and backwards, with the legs straight down, trying to go higher each time.

Of course, if you have practised on the horizontal bar, the preliminary exercises will be mastered at once; but as it is possible that some may commence on the parallels, I give this short description of these simple movements.

The first exercise after you are on the bars should be

THE WALK.

This is very simple, being performed by jumping up and placing one hand on each bar, with the body hanging suspended between them as before.

Now walk along the bar by taking steps with the arms, making them as evenly and regularly as you can, keeping the head well up, and the body perfectly straight.

Walk in this way from one end to the other, and when you can do this easily, walk back in the same way, without turning round. Then let the body sink down as in Fig. 23, and hop from one end to the other backward and forward.

FIG. 23.

FIG. 24.

FIG. 25.

This you will find capital practice for the muscles of the arms, although rather tiring at first.

When this hopping movement is done with a good swing, so as to go forward or backward some considerable distance, it has a very good effect, and is called "The Grasshopper."

VAULTING MOVEMENTS

are performed by getting up between the bars as for the walk, placing yourself near the centre of the bars.

Now swing backwards and forwards until you are able to throw both legs over one side of the bars in front of you, as in Fig. 24.

Now with another swing bring them back again, and throw them over behind you on the same side as before. (Fig. 25.)

There are several of these movements which may be practised with great advantage to the muscles. Another is shown in Fig. 26.

This is one of many which may be gone through while in this position on the bars, the dotted line (as seen in the figure on page 248) showing the serpentine course of the movement.

All these exercises should be performed with the body as straight as possible, and when done neatly, with the legs close together, have a very pretty effect, and are very good practice.

There are several similar movements, such as those represented in Figs. 27 and 28, which are done by first swinging backwards and forwards, and then throwing the legs over the outside of the bars in front, one on each side; then bending back a little, and bringing the legs over back again between the bars, and then, without stopping, throwing them over again behind you, one on

FIG. 26.

FIG. 27.

FIG. 28.

each side as before. This you should practise until you can repeat it several times without stopping.

The next exercises are good practice. Stand between the bars, and place the hands on the under side of them, even with the shoulders, then gradually raise the legs until they turn over and bring the body into an inverted position, as in Fig. 29; then continue the movement right over, until you are hanging as in the position shown in Fig. 30.

FIG. 29.

FIG. 30.

You should practise this until you can do it several times without touching the ground with the feet, and you will find it very good practice for the front and back horizontal movements, previously shown on the horizontal bar.

FIG. 31.

FIG. 32.

THE PUMPING MOVEMENT

is one of the finest exercises for developing the muscles of the chest. You must first practise the swing until you can bring yourself up horizontally, as shown in Fig. 31; then, by bending the arms, drop the body into Fig. 32, and then swing round, your feet describing a semicircle, and come up again into Fig. 33, finishing the movement by swinging backwards again in the same manner into Fig. 31, as on commencing the movement.

FIG. 33.

THE VAULTING-HORSE.

There are no simple preliminary exercises on the horse but what may be just as well performed on the parallels; and, indeed, such is the similarity in some of them, that we have invariably noticed that any gymnast who is good on the one is not likely to be a novice on the other.

For this reason we shall endeavour to make as much variety as possible, and shall therefore not describe exercises which may be as well gone through upon the parallels, but only give those which have a distinctive character.

FIG. 34.

Commence by jumping on to the horse, with the hands one on each of the pommels, and supporting the whole weight of the body; the legs hanging straight down as in Fig. 3.

Now bring one leg over the body of the horse in between the pommels, as in Fig. 34; then bring it back again without touching the horse with the foot, and pass the other leg through in the same manner.

Now try and change the legs simultaneously; that is, while the one is being brought back, pass the other through forward; the body, of course, still supported by the arms.

THE LEG-SPRING

is the next exercise, and is performed in the following manner:

Get on to the horse as in Fig. 3, and then bring both legs up on to the back in a kneeling position, as in Fig. 35; then, while the body is thus gathered, give a good spring up, throwing up the arms as in Fig. 36, and you will come over to the other side on to your feet on the ground.

FIG. 35.

FIG. 36.

If you are nervous in attempting this at first, get the assistance of some one to hold your hand, and you will accomplish it without much difficulty.

The next exercise must be practised at first with the horse as low as possible, and the jumping-board placed about a foot from the horse.

JUMPING THROUGH THE HANDS.

Take a short run, and jump on to the board with both feet down at once, flat-footed. Place your hands one on each pommel, spring up, and pass the legs through the hands, as in Fig. 37, shooting them out in front of you over the horse, so as to come neatly down on the other side. Of course you must measure your distance, so that you may rise high enough while passing over for the back to clear the top of the horse.

FIG. 37.

Another form of this exercise is to jump over the horse with the legs *outside* the hands, and is performed in a similar manner to the last, but is rather more difficult, as you will need a much greater spring to raise yourself sufficiently high to pass clear over; and you must also take care to let go with the hands at the proper moment, when in the position shown in Fig. 38.

If you retain your hold of the pommels too long, you will lose command of yourself, and they will have a tendency to pull you back and cause you to pitch head first on to the ground; but when you commence to practise this movement, it is necessary to have some one standing in front, to catch you in case your feet do not quite clear the top of the horse, more especially if it should be at all too high for you.

SADDLE VAULTING.

Get on to the horse as in Fig. 39, sitting across as in a saddle, but *behind* the pommels; then, bearing the whole weight upon the arms, throw your legs right up, and giving yourself a kind of twist, describe a semicircle with them, and bring yourself round with the face the other way; your hands being one

FIG. 39.

FIG. 40.

FIG. 41.

upon each pommel, your course will naturally be towards the one which holds the aftermost.

THE LONG FLY

is a very fine exercise for the whole of the body, and more especially the lower extremities.

You commence practice for this movement by placing the jumping-board about three feet from the largest end of the horse, then with a run, pitch with your hands on to the end, as in Fig. 40.

Now move the board a little farther off, and repeat the movement; and thus continue the exercise, increasing the distance each time, until you can pitch on to the end from about five or six feet.

Now vary this movement by jumping from different distances, and pitching on the hands first, and then bringing up the feet on to the back of the horse, as in Fig. 41.

And when you are in this position, pitch with the hands on to the extreme end of the horse, and go over as at "leapfrog."

Having now sufficiently practised these preliminaries, place the board about a foot from the end of the horse (having first had the high pommels taken out, and the flush ones substituted).

Now take a run and jump, pitching with your hands on the first pommel, landing yourself astride, as near the middle of the horse as possible; repeat this exercise, gradually increasing the jump, until at last you clear the whole length, as in Fig. 42, coming down safely on the ground in front of the horse.

When you can get near the neck and are likely to come right over in a few more trials, have some one standing in front to catch you in case you do not quite clear the end, and come instead into a sitting position on the neck of the horse, as in this case the sudden stop is likely to throw you over head forwards in a rather ignominious manner; but if you practise assiduously, when you feel that you can do it, and make up your mind for it, you are almost certain to clear it.

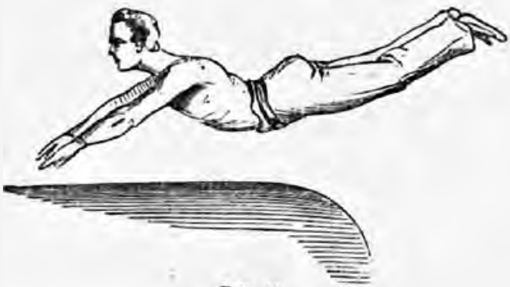


FIG. 42.

It will, of course, take some time to master this thoroughly; but it is a fine dashing feat, well worth the trouble of acquiring. Only don't think you are doing it if you are satisfied to pitch short and paddle along on your hands for the rest of the distance; you ought to pitch clear over at one movement. If horses of various lengths are available, they will prove of immense service in practising this exercise.

HANGING RINGS.

These are very useful for developing the muscles of the arms and shoulders. We have, therefore, found room for a few exercises upon them as a guide to

FIG. 43.

FIG. 44.

the young gymnast, who will find little difficulty in supplementing our instructions with exercises of his own.

Commence by drawing yourself up, as in Fig. 43, holding one ring at arm's length, and the other close to the body.

Draw in the outstretched arm and straighten the other, and repeat this as often as you like, as it is very good preliminary exercise for the trapeze.

Now, from this position gradually spread the arms wide apart, suspending the body between them, as in Fig. 44, and then let the body gradually sink down until you hang straight down by the arms again.

There are many other strength movements on the hand-rings, but you will soon find them out for yourself; we will, therefore, pass on to the swinging exercises.

Commence swinging simply backward and forward, increasing your momentum by drawing yourself up by contracting the arms as you ascend, and when at the highest, lowering your body with a drop, and by this means you will swing higher each time, until you are able to bring your arms and legs straight and nearly into a horizontal position, as in Fig. 45.

FIG. 45.

FIG. 46.

Also swing in different positions in order to get command of yourself while swinging. Practise by drawing the legs over the head when at the end of the swing, as in Fig. 46, passing back in this position to the other end, and then bringing the legs smartly over, and shooting them straight out (in order to preserve the momentum), and coming back all straight again to the starting-point.

Repeat this several times, and you will find it very good work for the muscles.

FIG. 47.

FIG. 48.

Also swing with the hands close to the groin, and the arms nearly straight by the side, and supporting the body, as in Fig. 47; keeping yourself from pitching your head and shoulders too much forward at the end of the swing by bending the arms and projecting the legs, as in Fig. 48, which represents the bent position which you assume when beginning to descend.

FIG. 49.

Another variety of this swing is shown in Fig. 49, where the body is kept horizontal throughout.

CLIMBING LADDERS, ROPES, POLES, &c., &c.

Climbing the rope is a very useful exercise, which should be practised by every one, as it may often be the means of saving life in cases of fire or shipwreck, &c.

FIG. 50.

FIG. 51.

FIG. 52.

FIG. 53.

We mean climbing by the use of both legs and arms. Fig. 50. shows the way of taking hold of the rope, and Fig. 51 the position when climbing.

At a gymnastic festival lately some of the competitors ascended on a rope in this way to the height of upwards of one hundred feet.

Another method is by holding on and raising yourself by using the hands only, but this is more difficult.

Another exercise is by climbing the knotted rope, and also one with short cross-bars fixed at frequent intervals.

Climbing the pole, either fixed or hanging, as in Fig. 52, only varies from the same exercise on the rope by its being rather more difficult to grasp, from being thicker and also rigid.

Climbing ladders, fixed both in vertical and horizontal positions, and at various angles, furnishes a good variety of exercise for the arms, and is very easy to commence with. Fig. 53 shows an exercise on the horizontal ladder, in which you hold by the outside, and progress by moving the hands forward alternately. Fig. 54 represents another movement, in which you walk along under the ladder, increasing the length of the step by holding the rounds at some distance apart, the intervening ones being passed. Fig. 55 shows one

FIG. 54.

FIG. 55.

FIG. 56.

of the movements upon the perpendicular ladder, in which the object is to keep the arms and legs as straight as possible while the steps are taken. Fig. 56 is the oblique ladder, which may be practised by moving both up and down by the hands.

The "giant's stride" is a very good exercise for beginners, and consists of a very strong and firmly-fixed upright, about fifteen feet in height, having an iron cap at the top which will revolve easily, and around which ropes are fixed, each having a short cross-bar at the bottom, so that several may exercise at once, each one holding a bar and running round, increasing the speed until the body takes the same angle as the rope. Various evolutions may be gone through in this manner, which will be found very amusing.

It is hardly necessary to say that there are some simple rules to be observed in practising.

One is, never over-tire yourself by practice, as that will do more harm than good. And be careful not to get into a heat without having a wrapper handy to put on when you leave off; and do not practise after a full meal.

Dress must also be suitable, as it is highly important to have all the limbs free and unfettered; and therefore light and loose garments, and gymnastic shoes, should be worn. A belt may be used by those who require it, but it is not indispensable.

GYMNASTICS WITHOUT SPECIAL APPARATUS.

THE THREE CHAIRS.

Even should the young gymnast be without any apparatus, he can train his body in various ways, so that, when he obtains apparatus, its work will be half done.

For example, he may practise the "Three Chairs" exercise, which will strengthen the loins immensely; that being just the portion of the body that is least exercised in the artificial life of the present day.

The young gymnast should take three chairs, and set them in a row, the

two endmost chairs facing each other, and the central one set sideways. They should be just so far apart that the back of the head and the heels rest on the two endmost chairs, and that the central chair supports the middle of the body.

Now curve the body a little upwards, so as to take its weight off the centre chair; take the chair with the right hand, draw it from under you, pass it over you to the other side, and with the left hand replace it under your body. This should be done several times, so as to pass the chair from side to side.

The easiest way of learning this really useful exercise is to begin by putting the head and nape of the neck on one chair, and allowing the feet to reach nearly to the middle of the other. This will greatly take off from the difficulty; and as you feel yourself getting stronger, move the chairs gradually apart, so that at last you lie exactly as shown in the illustration.

KICKING THE CORK.

This is a capital exercise, and has the advantage of being exceedingly amusing.

Draw two lines on the ground (like a ⊥ reversed), one at right angles to the other. Place your right foot with the heel just touching the cross-line of the ⊥, and the foot pointing along the upright line. Next, put your left foot in front of the right, with the heel just touching its toe, and then place the right foot in advance of the left in a similar manner. You will thus make three short steps, each the exact length of your foot.

Exactly in front of the advanced foot stand a common wine cork upright.

Now, go back to the cross-line, place your right heel against it as before, and with the left foot try to kick down the cork, as shown in the illustration, without losing the balance of the body or allowing the left foot to touch the ground. At first it will be found utterly impossible to do so, the toe not reaching within an inch of it; but a little practice will enable the young gymnast to perform the feat without very much difficulty. The best plan is to reach forward until you judge that your foot is close to the cork, and then, with a slight sideways kick, strike at the cork, and bring yourself again to the upright position.

This exercise is exceedingly valuable for strengthening the legs and giving pliability to the whole body.

THE STOOPING STRETCH.

This exercise does for the arms what the preceding does for the legs.

Take the same lines as before, and stand with both toes on the cross-line. Now throw yourself forward on your hands, and with the right hand make a chalk-mark on the floor as far as you can stretch. Having done this, spring up to the upright position by means of the left arm, taking care not to move the toes from the cross-line. Each competitor at this exercise tries to chalk his mark as far as possible.

When this exercise is first attempted, it seems utterly impossible to reach to any distance, the spring of the left arm being found insufficient to bring the body upright again. After a time, however, when the muscles of the arms become strengthened, the player finds that he can rapidly extend the length of stretch, until at last he can throw himself nearly flat on the ground, and yet spring up again.

In order to strengthen both arms equally, they should be used alternately.

One secret in performing this exercise is to chalk the mark and spring back as quickly as possible, as every second of time takes away the strength of the supporting arm.

STILTS.

There are various forms of stilts and modes of using them. Some, such as those which are employed by professionals, are strapped to the ankles and have no handles. These should not be tried until the young gymnast is skilled with the handle-stilts, as a fall is really dangerous.

Others have long handles, and the feet are received into leathern loops nailed on the stilt; but by far the best are those which, like the stilts represented in the illustration, are furnished merely with two wooden projections on which the feet can rest.

The easiest way of getting on the stilts is to stand with the back against a wall, and take the handles of the stilts under the arms, as shown in the illustration. Then place the right foot on the step of one stilt, raise yourself, with your back still leaning against the wall, and then place the left foot on the step of the other stilt.

Now try to walk, raising each stilt alternately with the hands, and lifting the foot with it. A very short time will get you into the way of doing this, and in a few days you ought to be able to walk with freedom.

Having obtained some degree of proficiency, you should race with other stilt-walkers, ascend and descend steps, planks, or stairs, pirouette on one stilt, holding the other above your head, and then replace the feet without coming to the ground, and perform similar feats. Accomplished stilt-walkers can even ascend and descend ladders laid at a considerable slope.

The height of the feet from the ground rather diminishes than adds to the difficulty of walking on stilts. If the stilt-walker should feel himself losing his balance, he should at once jump to the ground, and not run the risk of damaging himself by trying to recover his balance. After some little skill has been attained, the young athlete ought to be able to get on his stilts without needing the support of the wall, a short run and a spring being quite enough for the purpose.

THE WALL-SPRING.

A very good preliminary exercise is that which is called the "Wall-spring." The young gymnast stands at some little distance from a wall, places his left hand behind his back, and throws himself against the wall, supporting himself by the right hand. He then springs back to the upright position

without moving his toes from the spot on which they had been placed. This, like all similar exercises, should be done with both arms alternately, and the gymnast should learn to throw the strength of all his body, as well as of the arms, into the spring.

RIDING.

We remember well in our youthful days being told by a cautious, well-meaning old lady, that "we ought not to attempt to bathe until we could swim." This caution puzzled us extremely, as we did not quite comprehend how we were to learn swimming unless we did go into the water. If such a proceeding were possible as to acquire a knowledge of a practical subject by a theoretical course of study, we should undoubtedly urge on the reader the importance of never mounting a horse until he could ride.

The most neatly dressed, gentlemanly-looking man, who is a pattern of all that is correct, will, if he be a bad rider, look an awkward Guy if he be on horseback and cannot ride. The lovely girl whose every movement is elegant will make an exhibition of herself if she attempt an equestrian performance when she is unskilled in that branch of her education. Not only is it on account of the mere look, but also for safety and comfort, that one should be able to ride, to know what to do under ever-recurring conditions, and, in fact, not to be content to "stick on a horse without fear," but to be able to ride as a horseman should do. We shall, therefore, divide the subject of Riding into two parts: first, What to do; then, How to do it.

WHAT TO DO.

We will now suppose that a horse or pony has been procured for us to ride, that he is saddled and bridled, and held by a groom ready for us to mount.

In the following remarks we principally address those who know nothing about horses or riding; but we intend also to point out the defects in the performances of those who, from having lived entirely in the country, or from being self-taught, or untaught, have acquired habits which the sooner they are done away with the better.

When we have a groom or stableman whom we can entirely trust, we may run the risk of mounting a horse without even glancing at the manner in which the bridle or saddle is put on; but as no man is free from the possibility of making mistakes, we as a rule, previous to mounting, proceed as follows:

1st. Pass the finger under the throat-strap to ascertain whether it be too tight, many grooms thoughtlessly buckling this so as almost to choke the horse.

2nd. Glance at the curb-chain and buckles, to see that they are hooked and buckled firmly.

3rd. See that the saddle is neither too forward nor too backward on the horse.

4th. Look to the girths to see that they are not crossed nor wide apart: they should pass over each other, and thus occupy the breadth of one girth only, otherwise they are likely to gall the horse. By feeling the girths we can know if they are tightly buckled, as they ought to be; for, if loose, the saddle will slip backwards and forwards on the horse as he ascends and descends hills, the consequence being a sore back, from which the animal may not recover for weeks; or, if the rider be a bad one, the saddle may possibly slip round under the horse's belly, and the rider be deposited under his horse's hoofs.

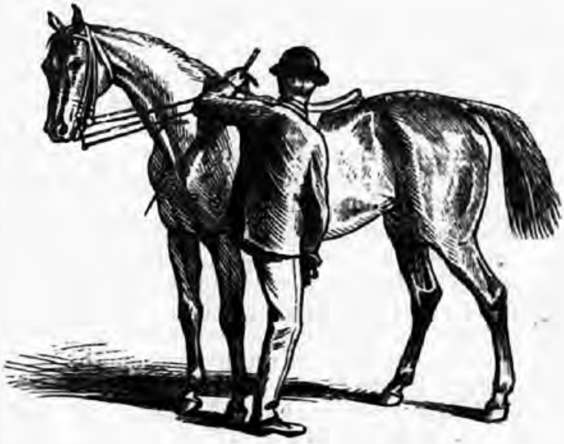
The manner in which a man with a momentary glance examines all these details, and then mounts his horse, reveals to the experienced eye whether he be a "horseman," or merely a person who "sits on the top of a horse."

Often have we smiled as we have observed the cautious wink given with a most serious face by the groom to his stable-companion, as he watched "the visitor" mount one of his master's horses. Not a word was uttered, but wonderfully expressive was that wink: it said in grooms' language, "That 'ere gent 's a muff with a 'oss, in spite of 'is pretence," as plainly as words could have said it; and yet the visitor had done nothing but mount the horse brought to him.

TO MOUNT.

When we are going to mount a horse which we have ridden on former occasions, we can learn whether the stirrups are of a proper length by measuring on our arm from the stirrup to the buckle. Usually the stirrup-iron should just pass under the arm when the extended fingers touch the buckle. If, however, a horse be very round in the barrel or very knife-like, a slight variation to this rule will occur. We will treat again of this subject after giving other details on mounting.

Having examined the details mentioned above, we should, on mounting, first stand on the left side of the horse, near to his fore-leg. Take the middle of the bridle in the right hand, and draw it through the left, letting the reins pass—one between the thumb and forefinger, the other between the first and second fingers. This should be done gently, and so as not to jerk the horse's mouth; but the reins should be just tight enough to "feel" the horse's mouth. Then quit the reins with the right hand, take a large lock of the mane and pass this round the thumb, so that, when the hand is closed, reins and mane are grasped firmly by it. Then place the foot in the stirrup, using the right hand to accomplish this if necessary. Then place the right hand as far over

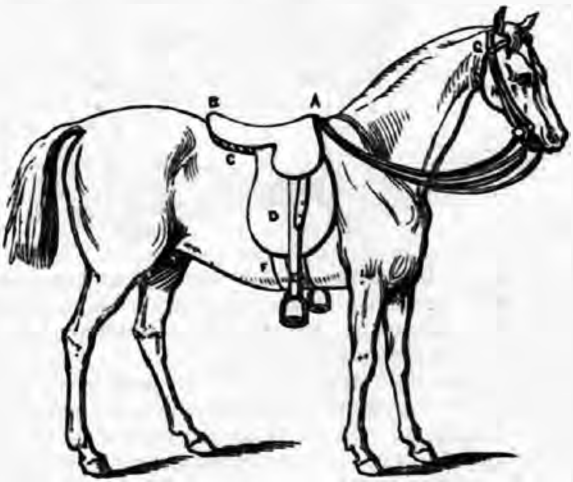


the saddle as possible, so as to bear on it on the right side, and thus counteract your weight borne by the stirrup in mounting. Rise with a good spring from the right foot, giving the weight on to the right hand. Take care that the right leg is swung well clear of the horse's back, and drop gently on to the saddle. Turn in the toes of the right foot, and the stirrup is found at once, even though the groom does not aid you. Quit the lock of mane, take the right rein in the right hand, and you are ready for your ride.

Now for some additional details on this mounting.

If you have a whip, it should be held in the left hand when mounting, and grasped firmly in the palm, which can easily be done even when the reins and mane-lock are held as directed.

A. Pommel.
B. Hind Arch.
C. D's on Saddle.



D. Saddle-flaps.
E. Stirrup leathers.
F. Girths.

Get into the habit of making your horse stand steady during and immediately after mounting. When an animal has been in careless hands, he not unfrequently tries to move off immediately he feels your weight on the stirrup.

This is not only an unpleasant but also a dangerous proceeding, especially when a lady is mounting. It may be checked by keeping the reins tight, and, if necessary, using the curb-rein. The horse is so docile an animal, though a creature of habit, that it can easily be taught what is required, or cured of its defects, provided only that its master is patient and intelligent. Thus, when mounted, instead of immediately starting off at a trot or walk, wait a few seconds, and thus teach your horse that he is not to rush away immediately he feels your weight in the saddle.

In order to discover the proper length for your stirrups, sit comfortably down on your saddle, keep the body upright, let the legs hang loosely at first, then clasp the horse slightly with them, turn the toe in and rather up; then the stirrup ought just to support the foot. Then stand up in the stirrups with the legs straight, and see whether the fork will clear the pommel of the saddle: it ought just to do so if the stirrups are the correct length. Having once ascertained what is the correct length for the stirrups, you should measure from the finger-tip to armpit the length from the buckle to the end of the stirrup, and thus you can always on future occasions tell whether any alterations are required before mounting.

Being now seated on the horse, which we will suppose is a quiet, well-trained animal, it would be advisable that a groom or some friend should lead the horse for a time, in order that we may get accustomed to the motion of the horse and to sitting in the saddle.

The seat in the saddle should be obtained by sitting *well down*, leaning rather backwards than forwards, and grasping the horse with a tolerably firm grip of both legs. There are two seats to be avoided, but which nearly all beginners at first practise: one is leaning forward as if in readiness to go over the horse's head; the other is sitting on the saddle as though it were red hot. The very best method of getting "shaken down in the saddle," as the term is, is to quit the stirrups—that is, take the feet out of them—and trot round and round a circle. This can be easily done by having a rope attached to a head-collar on the horse, and getting this rope held by an attendant. After a few days of this kind of bumping, we learn how to grasp with the legs so that we scarcely move from the saddle, and we do not then adopt the dangerous and unsightly practice of depending mainly on the stirrups for our equilibrium.

During the time that we are "jogging" in the trot the reins should be held one in each hand, and so that we "feel" gently the horse's mouth: at no time should the reins become slack, but an uniform "feel" should be maintained. A horse soon becomes accustomed to the hand of its rider, and learns to obey the slightest change. Many horses, especially those gifted with tender mouths, will become restive, or will rear, attempt to run away, &c., when their riders either suddenly slacken, then tighten the reins, or in other ways alter their hold upon them.

THE TROT.

Having passed through the process of being shaken down in the saddle, we may then take our stirrups and learn how to sit down in the saddle, keep our stirrups, and yet not to rise in them when the horse trots; after which we may practise rising to the trot. There is scarcely a more ridiculous exhibition than that of a rider working laboriously to rise to his horse's trot, using much

more exertion than the animal he bestrides, whilst he works his arms and body as though riding were a very painful matter. The very slightest movement of the instep and a spring from the knee is sufficient to prevent the bumping produced by a horse's trot; and the skill or awkwardness of a rider is never more prominent than when his horse is indulged in a long slashing trot.

THE CANTER.

To "raise a horse into a canter" from a trot, we should slightly pull the left rein, at the same time closing the legs. By a steady hand on the reins we may increase or decrease the speed of the horse, or again reduce his pace to a trot.

Nothing but practice and instruction will ever give a rider a good firm seat on a horse; but at the same time practice alone may produce a strong seat but a very awkward one, unless the defects of the seat are pointed out early.

Vices and their Treatment.

Having attained a certain amount of skill in sitting on a horse and in handling the reins, the horseman may devote his attention to certain matters which are not unlikely to happen to every equestrian performer. These may be classed under the head of the vices of the horse, and are principally as follows: running away, shying, rearing, bucking, and refusing to move; kicking, biting, and stumbling.

RUNNING AWAY.

A runaway horse is a most dangerous animal, and for an unskilled rider to keep such a creature is not advisable. Many so-called runaway horses, however, are merely high-spirited animals whose former riders were unable to manage them. As an example: we possessed for three years a horse which we regularly hunted, and on which we placed a lady, and which had been sold because he was a determined runaway. Only once did this horse run away with us, and that was in consequence of the reins breaking. That horses do run away, however, is a fact; and we will now consider the best means of dealing with this vice.

A runaway horse is usually one with a very hard mouth, which is unaffected by any amount of pulling applied merely as a dead pull. A horse is stronger than a man, and therefore to pull against him is useless.

A particular kind of "bit" is requisite for a runaway horse; the best that we have found being a powerful "Pelham." The reins should be very stout, so as to afford a firm grasp, with no fear of breaking. Stout strong reins also do not slip through the fingers as do those which are thin.

We will now suppose that a rider is seated on a horse, and starts for a canter on a nice bit of turf. His horse, probably fresh, bounds off, and the rider soon finds the animal pays no attention to his "Woa, woa!" or to the pull at the reins. A bad rider has at this point come to the end of his expedients, and usually does nothing more than give a dead pull at the reins until he gets cramp in his arms and fingers, and is unable to use them effectively, when he is at the mercy of his horse. Some riders vary the "dead pull" by sawing their horses' mouths by alternately pulling the right and left rein. This sometimes, but rarely, has the effect of stopping a horse; the common result being that the animal throws up its head, changes its feet in the gallop, but still goes on, probably with a temper not improved by the fact of its mouth bleeding in consequence of this ill treatment.

As an effectual method for pulling up a runaway horse we have never found any equal to the following:

The reins being very strong, and the bit a "Pelham," or one which will not slip through a horse's mouth, we gather the reins short up in the left hand, so short that the hand is pressed against the horse's mane; then pass the right hand down the right rein until it grasps this rein within a few inches of the bit; with a firm hold pull this round towards the right knee, taking care that the horse does not snatch the rein out of your hand, as he will try to do if he be an accomplished runaway. When the horse's head is thus pulled round he cannot gallop, nor can he do more than twist round. We have by this method the advantage of a lever pulling round the horse's head with enormous power.

Against this plan it has been urged that we are very likely to throw a horse down. Grant this; and it is perhaps the less of two evils that we throw a horse down where we like, selecting a soft piece of turf, than that we get dashed to pieces by coming in collision with a carriage or cart, a lamp-post or railing, or slip up on stone pavement, &c. But in answer to this objection we can say, that on an average once a week the horse we before mentioned *tried* to run

away with us, but we invariably stopped him by this plan, and never, during three years, did we ever throw him down. Two other horses that we rode also on one or two occasions tried to run away, and were instantly stopped by this method; thus we have practical proof of its efficacy, against the theoretical objection urged against it.

To a bad or timid rider, or even to one not capable of dealing with it, a runaway horse is a dangerous possession; unless, therefore, a rider is well skilled, well nerved, and strong armed, our advice is, never mount a known runaway horse. As, however, every horse may, some time or other, try to run away, the preceding advice should not be neglected, as it may save a fall, a broken arm, leg, or neck.

SHYING.

Shying is a very common practice of horses, particularly of young horses. It may arise from defective sight, or from mere frolic. To a good rider it is of no consequence, but to a bad horseman a fall may result. After a brief acquaintance with an animal we can tolerably well tell at what objects he usually shies. To overcome this practice we should never be off our guard, but should ever keep a watch on our horse's ears. When we notice that he suddenly raises his ears, and looks attentively at any object, it is probable that he may shy. To avoid such a result, we should endeavour to distract the animal's attention by patting his neck and speaking to him, a slight movement of the reins to rouse him, or by letting the whip rest on his neck, his attention may be withdrawn from the object that alarms him. A brutal and ignorant horseman usually commences thrashing his horse when it shies, and thus only adds to its fear, and causes it to repeat its vice with double effect.

The late Mr. Rarey used to say that a horse never could surprise him, because its ears always told him what it was thinking of doing. There is much truth in this remark, as every one accustomed to horses must know, and those unaccustomed to them may learn.

REARING.

Rearing is one of the most dangerous and incurable of vices; it may, however, arise from a harsh use of the curb; but a rearing horse may at any time cause his rider's death by falling back on him. When a horse rears we should sit quietly on him, and well forward. A rider without a firm seat may lean back,

holding on to the reins, and will thus pull the horse over on him. A sharp pair of spurs may be used with advantage on a rearing horse, but the reins must be very delicately handled—the cause of rearing being in many cases due to that abominable habit of bad riders of continually jerking their horse's mouth, for no other reason, apparently, than that they *are* themselves bad riders.

BUCK-JUMPING.

Bucking is a habit not so common amongst English as it is among colonial horses. Bucking is an endeavour to unseat a rider, and consists in a series of bucks in the air, or a sort of rocking motion produced by a succession of jumps. The horse tries to get its head down between its legs, arches its back, and springs several times from the ground. There is no other means left than to sit the horse through its performance, which generally takes place when first mounted, after which it not unusually will travel quietly all day.

REFUSING TO MOVE.

This is not a very common vice, except with a horse which has been cruelly ill used. We once found a horse belonging to a friend which possessed this vice, and we cured it by getting two leather straps, like handcuffs; by these we fastened the horse's fore-legs together so that it could not move, and then sat patiently on its back. In about ten minutes the animal got tired of standing still; but we determined on giving it a lesson, so we kept it hobbled for fully an hour, after which it at once moved on. On every occasion afterwards, either the exhibition of these handcuffs or the attempt to put them on, at once was received as a hint, and the horse was ready to start off.

KICKING.

A kicking horse is always dangerous; when, however, we are on his back, it is well to remember that he cannot kick with both hind-legs whilst his head is held up. We should, however, be very careful how we allow any one to approach him; also when in the stable great caution is requisite. The same remarks apply to a biting horse: it is better at once to get rid of such a brute, for we are never safe from his vicious habit.

STUMBLING.

Stumbling may arise from careless riding or from the imperfect form of a horse. An animal which in its walk or trot does not raise its feet much will usually be a stumbler; and if its fore-feet, when they come to the ground, are not placed in advance of the shoulder, the horse is likely to be a dangerous stumbler.

Those who wish to become adepts in regard to horses should, when the opportunity offers, study the form and action of a well-known good horse; the shape of his shoulders, set on of the head, and, in fact, every peculiarity should be noticed. Although horses differ very much in external appearance, those which are fast, enduring, good jumpers, &c., all possess somewhat similar characteristics; and we can tolerably well conclude that a strange horse is a good jumper when we find his hind quarters and general form similar to those of a well-known horse which possesses this qualification. A friend of our own, when at Goodwood races, selected the celebrated mare Blink Bonny as the winner of the Derby before he knew her name or performances, he merely knowing that she was to start for the next year's Derby. This he did from her action and style of going being very similar to that of a horse which he had owned, and whose speed and endurance were unequalled.

There is no indicator equal to the eyes and the ears for telling the character of a horse: the eye of a vicious horse never will look good-tempered, nor can he conceal its vicious look. The ears of a playful horse may to the inexperienced seem to indicate vice; for a horse that is playful, well bred, and fond of its master or groom, will often put back its ears and bite at its manger when its master approaches it; but this is not vice, and should not be misunderstood for such. Experience in this respect is needed to prevent mistakes.

Having now offered a few remarks to those unacquainted with horses and ignorant of riding, we must venture some suggestions to those who can ride a little, or who consider they can stick on a horse. Among those who regularly mount horses, and are carried a certain number of miles per day by their animals, there are probably not ten in a hundred who are "horsemen." When a man is really a horseman, almost all danger in riding ceases; when he is not a horseman, he is in perpetual danger as long as he is on horseback. Many men ride all their lives and never become horsemen, whilst others become so in a very few years.

Our reader may possibly ask himself the question whether he is a horseman or not; and he may answer his question himself. If he can ride an average hunter over about three miles of hunting country, taking all the leaps he meets without losing his seat or losing a stirrup; can sit a horse neatly over a hurdle when his stirrups have been crossed over the saddle; can remain tolerably firmly seated when his horse, from a trot, suddenly stops and twists round, alarmed at some trifle, he is in a fair way to become a horseman. If, however, he dare venture only to trot or canter his horse along the roads, is very particular as to riding strange horses, and always feels anxious when in the saddle, he certainly is not a horseman.

It is not unusual to term a rider "a man on the outside of a horse" when he is a bad rider, and this definition is very graphic, as it expresses the seat and appearance of such a person; he is not "down" in his saddle, but seems

on the top of it, and is very likely soon to be beneath it and beneath the horse's feet also. It is somewhat a curious fact that bad riders almost invariably adopt nearly the same practices, even in different parts of the country, and when they never could by any means have seen each other, and thus have imitated each other's vices. In order to indicate what to avoid in riding, we will give a brief description of the appearance and practices of that awkward creature, a bad horseman.

A bad horseman usually rides with very short stirrups,—so short that the leg from the hip to the knee is nearly horizontal; he thus loses all grip with the leg, and is already half out of the saddle. When the horse is in tolerably rapid motion his body is bent back, whilst his toes are projected even with, or in advance of, his horse's shoulders; his toes are turned out, whilst his calves press against the horse's sides, and nearly the whole of his weight rests on the stirrups. When the horse decreases its speed and changes from a trot to a walk, the bad horseman changes his position from leaning back to leaning forward, and he suddenly seems to be regarding attentively and closely his horse's ears. As soon as the animal he bestrides, puzzled by his strange proceedings, starts for a trot when a walk only was intended, or walks when a trot was desired, he makes sundry fierce snatches at the bridle, thus making his horse's mouth bleed, and then with his whip or stick strikes the animal over the head and ears, at the same time heaping on the quadruped terms of abuse justly attributable only to himself.

When riding along a road, not the slightest attention is paid to the newly deposited flints or gravel: these are rattled over as though a horse's legs and hoofs were of cast iron or steel: though at the road-side a soft piece of turf may extend for some distance, this is neglected, and the hard and dangerous flints preferred. Then this monster usually starts off at a canter, which almost reaches a gallop for about a mile or more, irrespective of hills or flints; then the horse is suddenly pulled up and walked, but is again thrashed onwards.

These are the main characteristics of the bad and ignorant horseman, besides several other items which may be noticed at various times.

When the horse, irritated or frightened by such brutal treatment, plunges or rears, the rider's hands are at once held high up, whilst he unconsciously jerks his horse's mouth in his vain endeavour to maintain his seat. The *finale* not unusually is, a man on his back in the mud, and a riderless horse galloping along a road pursued by boys.

Let every young horseman carefully avoid all these faults.

Remember how to ascertain whether your stirrups are of the correct length; also bear in mind that your legs should cover the girths, and should not project before your horse's shoulder; your seat should be in your saddle, not on your stirrups; the leg from the seat to the foot should remain as nearly fixed as possible, whilst the body should move in accordance with the horse's movements from the waist upwards. Whenever a horse is inclined to be restive, the hands should be held *low*, even below the withers—*never high*—whilst the body should be upright. It is an important thing to remember that a rider scarcely ever is *thrown over his horse's tail*, whilst scores are thrown over his head: thus, when a rider leans forward and gets his own head close to his horse's ears, he is already half-way over his horse's head, and requires but little more to send him over completely. It is the common proceeding of the bad rider to thrash his horse when he himself is unable to make his wants known to the animal he is riding. No man is a good rider who thrashes a willing horse. Therefore be sparing of the whip: one blow of the whip is in almost every case sufficient to inform a horse that he is in error or must increase his speed. In fact, a willing horse ridden by a horseman rarely if ever requires the whip, the hand of its rider indicating to it all that is required.

A good horseman, unless much pressed for time or when hunting, will never ride his horse so as to cause it to sweat much: by a judicious arrangement of speed a horse may be ridden far and fast without its turning a hair. Whenever a horse is found to sweat much in only moderately warm weather, this arises either from riding him too fast, from bad riding, from the horse being in bad condition, or from not regulating the speed properly. To canter or rapidly trot a horse over a piece of turf is much less distressing to the animal than to walk him over flints or gravel on the road; then, if a horse be gently trotted for a mile or so, and afterwards walked for a quarter of a mile, and so on, selecting good ground for him, he will journey far without much distress.

In order to feel comfortable as well as to look well on horseback, we should have trousers made on purpose for riding: they should be made of some stout material, and should be tighter round the knee than ordinary trousers. In order to get a good fit, it is not a bad plan to sit across a chair, and bend the knees as though in the saddle: the trousers, if unsuitable for riding, will then be baggy under the knee and tight in other places. A tailor can then be instructed to take out a portion from this part, which will render our seat much firmer and better looking. In muddy weather there is nothing better for riding than a pair of overall boots which come up to the knee: these protect the extremities, and are easily taken off and cleaned when the ride has been finished.

The coat for riding should be short: extensive skirts, such as appertain to frock coats, &c., are very bad; for if a horse sweat much the coat tails become soiled, so that the shorter the coat the better.

Gloves should be of stout leather or dog-skin. If a horse has a hard mouth or pulls very much, we have seen instances where the hands, unprotected by stout gloves, have had the skin taken off the fingers.

There are several items which are taught by good riding-masters, but which a self-taught horseman is rarely if ever acquainted with. One of these we will remind the reader of in the same manner as it was impressed upon our own memory. As we were riding round the school, the reins in our left hand and the whip in our right, the word was given,—

"Scratch your face, sir!"

To so unusual a request we complied, however, by raising our right hand to our face.

"That's awkward, sir!" said the riding-master. "You should never raise your whip in that hand. Transfer your whip to the left hand before you raise your right."

It certainly does look awkward to see a man raise his hand with a whip in it to adjust his necktie or to lift his hat; and what is far worse, if the horse be a high-spirited animal, the whip being raised in the hand may cause it to start, imagining that the whip is about to descend upon it.

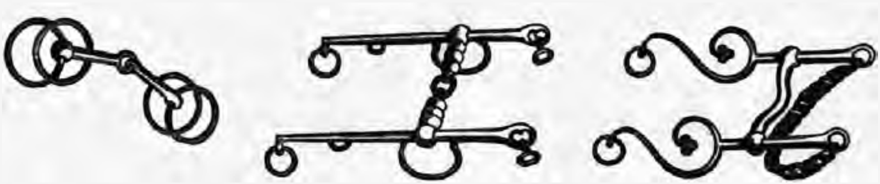
Every equestrian ought to practise mounting his horse from either the right or left side. It is sometimes considered that to mount from the left side is the only correct way; but this is a mistake, and, when mounting in a street, may oblige us to turn the horse about,—a proceeding fraught with inconvenience.

When riding on roads, every horse or vehicle that we meet we should pass on our right hand; but when we overtake anything, this should be passed on our left. The exception to this rule is when we meet two horses, one of which is led and the other ridden; the rule then is always to pass nearest to the ridden horse, so that, if a groom is leading a horse and is holding the reins of this horse with his right hand, we pass these horses on our left. The reason is that a led horse, either from viciousness or play, may lash out and kick a passer-by, whilst the groom is perfectly helpless to stop this proceeding; whereas, if a ridden horse be between us and the animal that is led, this cannot be done.

It is customary in England to entrust the saddling and bridling of our horses to our grooms; and to such an extent is this dependence carried that we have known many an instance where a gentleman did not know how to saddle or bridle his horse any more than he did how to cook a dinner. This is a condition which should not be allowed to prevail. Every gentleman ought to be able to put on a saddle and bridle; and as the process can be learned in a quarter of an hour, the knowledge should be acquired at the first opportunity.

The bits in most general use are the *Plain Snaffle*, the *Curb*, the *Pelham*, and the *Hanoverian Bit.*

The Snaffle is used for horses with good mouths, and may, in the hands of a skilful rider, be used even for hard-mouthed, pulling animals.



THE SNAFFLE. THE PELHAM. THE HANOVERIAN.

The Curb is often used with the snaffle. It is more powerful, and will pull up most horses; it also makes a horse carry his head well, and is a favourite bit with military riders.

The Pelham bit is very powerful, and is that which we recommend for a runaway horse. It can be used either as a snaffle or curb, and is a very serviceable bit.

The Hanoverian bit is more powerful even than the Pelham, but cannot be used as freely or like a snaffle. It is very similar to the curb, the mouthpiece being bigger.

When a rider has become sufficiently skilled to sit a horse well during its trot and canter, it is not improbable that he will wish to try a leap with it, or he may be desirous of hunting. Should this be the case, the first precaution is to find whether your horse *can* leap. One of the worst falls we ever had was from a mare whose appearance was that of a hunter, but who had not the slightest idea of hunting. We rode this mare over a ploughed field and at a small fence about two feet high. The animal went on as though meaning to rise at the leap; but, instead of doing so, she never lifted her legs; consequently she came down on her head, sending us with our face ploughing along the ruts. To cure the animal of this practice, we obtained two small wattle hurdles about two feet high; these we fixed firmly into the ground at about a foot apart at the base and touching at the top; the space between we filled with earth rammed tightly in. With a stout head-collar and a dumb jockey on the mare, we lunged her round a circle for a few minutes, and at a short distance from the hurdles. Suddenly changing our position, we allowed the mare to come upon the hurdles in her circle: she made a kind of lazy, careless leap at them, and, as we hoped, came down upon her head. She quickly got up, and looked as foolish as a horse can look. We again sent her round at the hurdles, which she now tried to avoid; but a judicious threatening of the whip made her take the leap, though in a clumsy manner; but again and again she was sent round to it, until at length she leapt very easily over it. Day by day we increased the height of this leap by adding strong bars covered with furze,—so strong that to touch them was to ensure a fall, and several falls did take place, to the shaking of the mare, not of our own bones; until after a week she would clear five feet without difficulty. At the end of each day we placed a saddle on her back and rode her over the same leap which she had previously jumped with merely the cross-bars on her. She was thus taught how to jump,

and when we once more took her into the hunting-field it merely required determination and quiet riding to make her behave very properly.

It is not to be expected that a horse is to know how to do anything which he has not been taught any more than that a man should. Some horses may have reached the age of four or five years and have never taken a leap; they don't know how to do it, and should be taught. If we ride a strange horse at a stile or stout fence, we may very probably find that the animal has been called upon to perform a feat as difficult to him as for a boy to leap with a pole when he has never before attempted to do so.

Remarking upon the number of accidents that annually occur in consequence of foolhardy conduct with firearms, when some boy points a gun at his friend, and says, "I 'll shoot you!" and straightway does so, whilst the boy shrieks, "Oh dear! I didn't know it was loaded!" a veteran sportsman once recommended us "*Always to treat a gun as if it were loaded and on full cock*, then we shall never have an accident;" so we would recommend a young horseman always to treat a horse as though he were likely to run away, likely to shy, and were unable to leap a stile safely, until we *have personally proved the contrary*. We can easily test our horse's leaping power by trying him at small safe fences; but we must bear in mind that many good horses will often refuse a leap at which they are not ridden in a determined manner. A horse is very quick at finding out whether his rider really means to ride at a leap or is "just a little nervous" about it; and as few animals care to exert themselves unnecessarily, the horse is not likely to take a leap unless he believes his rider means it.

Some right good hunters will not take a leap in cold blood, or if turned from a road at a fence, whilst nothing will stop them when excited by the presence of other horses or of hounds.

We once owned a horse that we bought at auction, having been taken with his form. He was described as "a bay gelding," and was not warranted to do anything. During the first day or two we tried him on the road, and found him a very high-spirited horse. We next tried him at a small fence, but he refused, and commenced rearing in the most dangerous manner. We therefore concluded that he would not do for a hunter at present. The next day, however, we went to the meet of the old Surrey hounds on the same animal, though we never expected a run, or never hoped to take part in it. As soon as the hounds found a fox, they ran under a very stiff line of rails which extended a quarter of a mile on each side, then over a stiff fence, and along a fair hunting country. One of the huntsmen, mounted on a splendid hunter, rode at the rails, and cleared it like a buck. "Neck or nothing," we said, as we cantered our horse at the same leap. The animal pulled like a steam engine, and we felt he meant to try the rails whatever the result might be. We felt a bound, like as if seated on an India-rubber ball, and we were over the rails; a few strides more, and we had cleared the quickset hedge in the same manner, whilst not above a dozen of the field had chosen to take the same line. For an hour and ten minutes, and round a semicircle the fox led us, the last leap being a drop into a lane, up the opposite bank, and over a hedge at the top—a very difficult and dangerous leap—without apparently the slightest idea of refusing, the horse that on the previous day, in cold blood, had refused a small fence, went willingly at this leap, got safely over, and landed us within one hundred yards of the pack which were killing their fox. As we trotted home with our "brush" we possessed a very different opinion of our new purchase's leaping power to that which we had formed on the preceding day.

Many horses which have been badly ridden, or bullied by bad riders, have bad tempers, which show themselves by refusing leaps, or refusing other things. A good rider, or even an observant person, will soon discover what irritates his horse, and will avoid any acts which produce this effect. A stupid child beats its hoop when it cannot trundle it, and a stupid rider not unfrequently thrashes his horse because of his own bad riding or ignorance of good horsemanship.

We once owned a horse which invariably showed temper when we raised a whip near its head, and this, we found after some time, was because a groom formerly beat the horse about the head with a whip. We therefore discarded a whip and rode with spurs only.

Horses that are usually ridden, vary in age from about four years to seven or eight. Whenever your horse commits any fault, bear in mind that he is not so old as you are, and in fact is a mere child in years; treat him accordingly, try to assist his weaker mental powers by your skill, and you will always find him a good and faithful servant; bully and ill treat him, and he is partially your enemy. When once, by ill treatment, you have produced any particular vice in a horse, it is almost impossible to eradicate it.

The age of a horse may be known by his teeth, and the following will aid the tyro in learning how to discover a horse's age.

When a colt is two years old its teeth are called "milch teeth," the centre of which is whitish.

At three years old the two centre milch teeth are displaced by two which are called "permanent teeth," and are distinguished by being broader, larger, and in the centre upper surface having dark cavities.

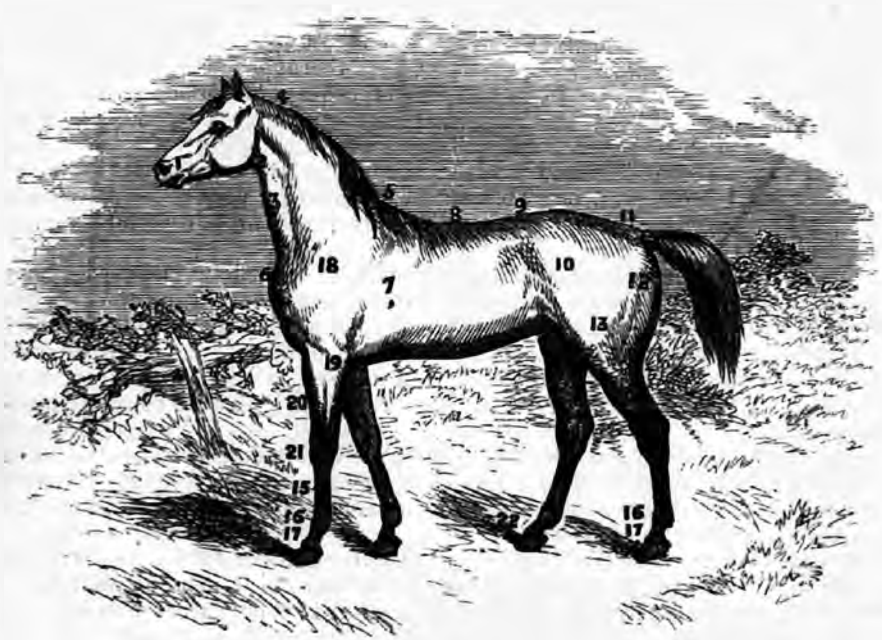
When a horse is four years old there will be four instead of two permanent teeth in the lower jaw, and between four and five years old the tusks begin to appear in males. Up to four years old a male is called "a colt," after this age "a horse."

At five years of age the horse's permanent teeth are complete, and the age after this is known by the wearing down of the cavities of the permanent teeth.

At six years old the dark oval mark on the centre teeth is worn down, whilst the cavities in the other teeth are more filled up. The tusks of the horse are longer than when five years old, but are still sharp, and not much worn.

At seven years old the cavities of the second pair of nippers are filled up; the tusks are blunted by wear, and are longer than formerly.

At eight years the horse is sometimes said "not to have a good tooth in its head," that is, the corner nippers are filled up, and the age teeth are nearly all alike, the tusks exhibit greater signs of wear and tear, and are very blunt.



1. Muzzle and parts about the muzzle.
2. Gullet.
3. Windpipe.
4. Crest.
5. Withers.
6. Chest.
7. Girth.
8. Back.
9. Loins.
10. Ilium or Hip.
11. Croup.
12. Haunch or Quarters.
13. Thigh.
14. Hock.
15. Shank or Cannon.
16. Fetlock.
17. Pastern.
18. Shoulder-bone or Scapula
19. Elbow.
20. Fore-arm.
21. Knee.
22. Coronet.

Beyond eight years old it is difficult to decide upon the exact age of a horse. The length of his tusks, however, and the appearance of the teeth will indicate to the experienced about the age of the horse. Just above the horse's eye there is a projecting bone, and above this a hollow. This in old horses is almost invariably a deeper hollow than it is in young animals, and at a glance this may be noticed, and an estimate formed of the animal's age.

It is usually considered that a horse that has not been overworked in its young days is in its prime from about six to nine years of age. A horse, however, is rarely known to die of old age; and many old and seasoned horses make good and useful hacks or hunters. We once knew an experienced veterinary surgeon who regularly hunted a horse which was certainly not less than eighteen years of age; his remark invariably was, "I look at a horse's legs to judge of his age." Many horses not more than five or six years of age have been ruined in consequence of overwork before they had gained strength, or from having been galloped or continually trotted on hard roads; whilst others, of twelve or fifteen years of age, having been carefully ridden and well fed, are sound and strong where the others are cripples.

In so limited a space as that at our disposal here, we can do little more than give a few brief hints to young equestrians. These few which we have given are the results of personal experience. From childhood we have been accustomed to look upon a horse as a friend and companion, and as long as we did so we ever found him a true and honest one: whether it was under the burning sun of Africa, when our horse's speed enabled us to ride down the lordly eland or escape the charge of the infuriated elephant, or in our more tame hunting-fields, where sport is more artificial, we have ever found the horse a really noble animal. Let it, then, ever be remembered that a horse is a friend who serves us well, and not a mere beast that is to be ill used and worked without any consideration, and too often neglected by a master who thus wilfully sacrifices his own property.

For more full particulars connected with horses and horsemanship we recommend our young readers to some of the many large works written thereon, among which "Rarey's Horse-taming," "The Horse and its Rider," "Youatt on the Horse," and others, will be found good books on the subject.

DRIVING.

Compared to riding, driving is usually considered an old gentleman's performance—the requisite skill for the latter being less than for the former.

In riding, it is necessary to have a good hand, seat, and head; in driving, hand and head alone are needed, the requisite seat being easily acquired.

We will briefly refer to the various kinds of driving which we may be called upon to practice.

1st, a single horse; 2nd, a pair; 3rd, Tandem; 4th, a Four-in-hand.

Driving a single horse is the most simple of the four named. We will suppose we have a tolerably fresh horse in some vehicle, and are going for a drive, and we can then point out the various items to which attention should be particularly directed.

It may be assumed that the groom or coachman has placed the harness on correctly, and is standing at the horse's head. The driver should see that the reins are placed handy, so that they may be grasped the instant he is seated in the carriage. Although not likely, yet it is still possible, that the

horse's head may be quitted by the groom sooner than it ought—and if the reins are out of reach, an accident is sure to happen if the horse start off suddenly, as he is tolerably sure to do.

A well-trained, high-spirited horse, on finding his head released, will usually move forward at once; but he should always be restrained from that very bad habit of starting off immediately he hears any one enter the vehicle or feels his weight on the shafts. This habit is commonly engendered by striking the horse with a whip immediately on entering a vehicle, and the animal endeavours to avoid this unnecessary punishment by starting off at once.

In driving, the reins should be firmly held in the left hand; the knuckles and back of the hands turned to the left. The left, or near-rein, should be grasped between the first and second, or second and third fingers, whilst the right, or off-rein, should be grasped between the first finger and thumb.

By practice and judgment the driver can soon find the correct length at which to hold the reins. They should be held short enough to enable the driver to pull up his horses instantly without shortening the reins, and not so short as to give an awkward appearance by an extended hand and arm.

For turning the horse to the right or left, the right hand may be employed, it being by the *pull* of the rein alone that a horse can be turned when driving.

The driver's seat should be high, so that the legs are nearly straight; thus a firm purchase is obtained, and a steady pull against the horse.

In driving, all sudden stoppages or starts-off should be avoided. A horse should be gradually checked in his pace when he is about to be stopped; otherwise those in the vehicle are unpleasantly jerked from or in their seats.

The same rule of the road holds good in driving as in riding: all vehicles that face us are passed on our right-hand side; but when we overtake vehicles going the same way as ourselves, we pass them so that they are on our left hand. The only exception to this rule is when two horses are met—one of which is ridden, the other led.

Accidents happen in driving most commonly from horses running away, from collisions, or from some part of the harness or carriage giving way.

Horses which are too fresh and high-spirited *may* run away; but with a powerful bit, strong reins, and a strong arm or steady hand, it is not likely to occur. Should such an event happen, it is not only the safest proceeding, but the one which every man should adopt—to sit in his place, and use the utmost endeavour to stop the horses. This may often be accomplished by a succession of steady pulls at them; or, if this fail, they may be kept from collision with other vehicles, and probably tired out, by being breasted at some steep hill. To throw oneself out of a carriage or a vehicle usually results in death or a broken limb, and is, after all, only the worst that is likely to happen.

As an example of this, we may relate an incident that happened to two lady friends some years ago.

They were returning from a ball in a brougham drawn by a pair of horses. The horses took fright and ran away down a hill, and were quite ungovernable. A gentleman in the carriage let down the windows to avoid splintered glass, and begged the ladies to sit quiet. At the bottom of the hill, the off-horse came into collision with a lamp-post, and was killed on the spot; but the occupants of the carriage received only a sudden jerk, and were unhurt. The door being opened, they stepped out without having even the skin scratched.

Timid people sometimes cast themselves over a precipice to avoid danger; and those similiarly constituted not unfrequently throw themselves out of a carriage with a similar result.

Most of the remarks relative to driving a single horse are applicable to driving a pair. There is, however, the necessity when driving a pair to be watchful that each horse fairly does its work. Unless this is done, we should soon find that one horse was sweating and fatigued, whilst the other had scarcely turned a hair. Thus each horse ought to be kept well up to the collar, and should keep his traces taut. By watching the traces, we can soon tell when a horse is shirking his work, and he should then be reminded by the whip of his laziness.

In turning corners or passing a road, care must be taken that other vehicles are not suddenly encountered; it is in such places that accidents happen.

Driving Tandem is not so fashionable now as it was some years ago; it is, however, one of the most difficult performances that a whip can be called upon to attempt.

Very few horses are good leaders in a Tandem. they require to be specially trained for this work, and when trained, must be driven with a steady hand. Nothing is more absurd than to see a tyro in a dog-cart with a tandem, the leader of which has turned himself round and is looking complacently at his driver, or has succeeded in getting the traces over his back or his legs over the traces.

Never attempt to drive tandem unless you are quite certain that your leader is up to his work.

There are two simple expedients in case of accidents, which should always be remembered at the proper time and acted on at once. First, if a horse is kicking, or has his leg over a trace, or is otherwise mutinous, either lift one of his fore legs off the ground yourself or get some one else to do it. A horse cannot kick on three legs.

During the summer of 1868 we saw a horse allowed by a careless rider to become entangled among some tent-ropes. In half a minute, horse, rider, and tent would have been on the ground had not a person close by seized the horse's fore leg and lifted it up, whilst another let go a couple of tent-ropes and freed him.

Secondly, if a horse fall, get a strong heavy man to at once keep its head down, until the horse is sufficiently freed from shafts or harness to arise without breaking anything; for as long as a horse's head is kept close to the ground, he cannot get up. It does not require much strength to keep a horse down: it is more dependent on determination and weight.

Driving a Four-in-hand is more difficult than driving a pair, as there is more to do. The leaders must be kept well forward, the traces all straight, and the leaders should be abreast, as should the wheelers. In keeping the team in their proper places, and in making each horse fairly do his work, consists the skill of driving four-in-hand—practice in this, as in all else, being the only road to proficiency.

The few remarks which we have here offered on driving are merely sufficient to point out to what items attention should be directed in actual practice.

ARCHERY.

It is scarcely needful to say anything in praise of Archery. Though it has declined from its position as the first of English sports into a mere accomplishment, it takes a very high rank in its modern capacity. It trains the eye, imparts a good and graceful carriage, expands the chest, and gives plenty of walking exercise without fatigue; moreover, it is equally adapted for both sexes.

The Equipment of the Archer.

The first thing we have to consider is what constitutes the necessary outfit for an archer—how it should be chosen, and how taken care of. Before choosing his outfit, the archer should find out a good maker, and obtain from him a list of prices; having done so, he will be able to determine what expense he is willing to go to, and then to apply the following hints in choosing his apparatus. Let us, however, entreat him not to sacrifice all his hopes of future success to a desire to get cheap things; let him rely upon it that things obtained at a fair cost from a good maker are twice as cheap as those whose only recommendation is their low price.

The following list will show *about* what is a fair price, and may be a guide to our readers in future selections.

Gentlemen's

		£	s.	d.
Backed Bows	£1 10*s.* to	5	5	0
Self Yew	£3 to	10	0	0
Practising Arrows	per doz.	0	12	0
Best footed Arrows	per doz.	1	4	0
Bow-strings (best)	each	0	2	0
Belt and Pouch		0	7	0
Grease-box		0	1	6
Tassel		0	1	0
Bracer	2s. to	0	3	6
Shooting-Glove	1*s.* 6*d.* to	0	2	6
Tips	per set	0	3	0
Targets	per pair	1	5	0
Stands		0	15	0

Ladies'

		£	s.	d.
Backed Bows	£1 1*s.* to	2	10	0
Self Yew	£1 5*s.* to	3	10	0
Practising Arrows	per doz., 10*s.* to	0	12	0
Best footed Arrows	per doz., £1 1*s.* to	1	4	0
Bow-strings (best)	each	0	2	0
Belt and Pouch		0	5	0
Grease-box		0	1	6
Tassel		0	1	0
Bracer	2*s.* 6*d.* to	0	3	6
Shooting-Glove	2*s.* to	0	2	6
Tips	per set, 3*s.* to	0	3	6
Targets	per pair	1	0	0
Stands		0	15	0

The Bow.

Bows are of two kinds. The *self* bow consists either of one piece of wood, or of two dovetailed together at the handle, in which latter case it is called a *grafted* bow; by far the best material for a self bow is yew, although a variety of other woods, such as lancewood, hickory, &c., are used. As it is but very rarely that we are able to obtain a piece of yew long enough for a bow of equal quality throughout, the grafted bow was invented, in order that the two limbs, being formed by splitting one piece of wood into two strips, may be of exactly the same nature.

The *backed* bow consists of two or more strips of wood glued together longitudinally and compressed so as to ensure perfect union. The strips may be of the same or of different woods—for instance, of yew backed with yew, yew with hickory, lancewood, &c.; but of all backed bows the yew-backed yew is far the best. It has been a great subject of controversy whether the self or the backed bow be the best for shooting purposes; we most unhesitatingly decide in favour of the self, although many good authorities prefer the backed.

HOW TO CHOOSE IT.

In purchasing a bow, it is always better to go to a good maker; the inferior makers, although they may sell their goods a trifle cheaper, are still not to be depended upon, and as a good deal concerning a bow has to be taken upon trust—*e.g.*, whether the wood is properly seasoned, horns firmly fastened, &c. —a maker who has a reputation to lose always proves the cheapest in the end. Having selected a maker and determined on the price you are willing to give, you will proceed to see that the bow tapers gradually from the handle to the horns; that the wood is of straight, even grain, running longitudinally and free from knots and pins, or that, if there are any pins, they are rendered innocuous by having the wood left raised around them. The bow should be quite straight, or even follow the string (bend in the direction it will take when strung) a little. Beware of a bow which bends away from the string: it will jar your arms out of their sockets, and should the string break, there will be an end of it. See that both limbs are of equal strength, in which case they will describe equal curves. The handle should not be quite in the middle of the bow, but the upper edge of it should be about an inch above the centre, and above the handle a small piece of ivory or mother-of-pearl should be let in on the left side of the bow, in order to prevent the friction of the arrow wearing away the wood. See that there are no sharp edges to the nocks on the horns of the bow, for if they are not properly rounded off they will be continually cutting your string. Lastly, make sure that your bow is not beyond your strength—in other words, that you are not overbowed. It is a very common thing for persons to choose very strong bows under the idea that it gives them the appearance of being perfect Samsons; but their ungainly struggles to bend their weapon, and the utterly futile results of their endeavours, are, we think, anything but dignified. The weight of the bow should be such that it can be bent without straining, and held steadily during the time of taking aim. The strength of bows is calculated by their *weight*, which is stamped in pounds upon them, and which denotes the power which it takes to bend the bow until the centre of the string is a certain distance (twenty-eight inches for a gentleman's, twenty-five inches for a lady's bow) from the handle. It is ascertained by suspending the bow by the handle from a steelyard whilst the string is drawn the required distance. Gentlemen's bows generally range from 48 lbs. to 56 lbs., and ladies' from 20 lbs. to 32 lbs.

HOW TO PRESERVE IT.

Many things will spoil a bow which a little care and attention would prevent. Amongst the most fatal enemies to the bow are chrysals (see Glossary), which, unless noticed in time, will surely end in a fracture. A chrysal should at once be tightly lapped with fine string saturated with glue; this, if neatly done and then varnished, will interfere but little with the appearance of the bow. Care should be taken not to scratch or bruise the bow. When shooting in damp weather, the bow, especially if a backed one, should be kept well wiped, and perfectly dried with a waxed cloth before putting away. A backed bow is always the better for a little lapping round each end just by the horn, which prevents the bow from breaking if by any chance the glue is softened by damp. A bow should always be kept as dry as possible; when going to shoot at a distance, a waterproof cover is advisable. Do not unstring the bow too often while shooting; once in every six double ends is quite enough, unless there are many shooters.

THE ARROW.

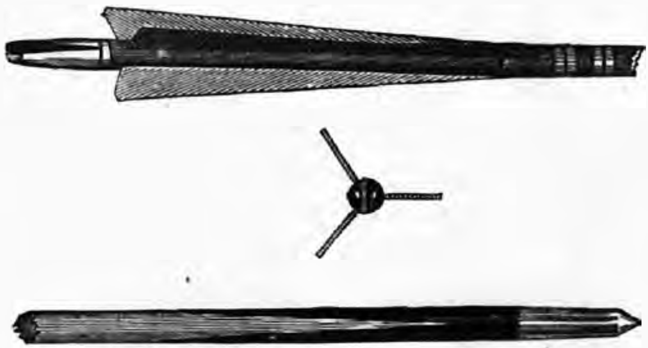
Arrows are distinguished by weight in the same manner as bows, only in the former it is calculated as weighed against silver money, and arrows are known as of so many shillings' weight, &c. The lengths and weights recommended by the best authorities are as follows:

		Length.	Weight.
For ladies		25 in.	2*s*. 3*d*. to 3*s*. 3*d*.
For gentlemen	Bows of 50 lbs. and upwards, and 6 feet long	28 "	4 6 " 5 6
	Bows under 50 lbs. and not exceeding 5 ft. 10 in. long	28 "	3 6 " 4 6

There are two kinds of arrows—*self*, made of one piece of wood, and *footed*, having a piece of hard wood at the pile end. The latter are the best for several reasons, one being that they are not so likely to break if they strike anything hard. The best material for arrows is red deal footed with lancewood.

HOW TO CHOOSE IT.

The first thing to ascertain is whether it is quite straight, which is done by bringing the tips of the thumb and two first fingers of the left hand together and laying the arrow thereon, while it is turned round by the right hand. If it goes smoothly, it is straight; but if it jerks at all it is crooked. Then make sure that it is stiff enough to stand the force of the bow without bend-

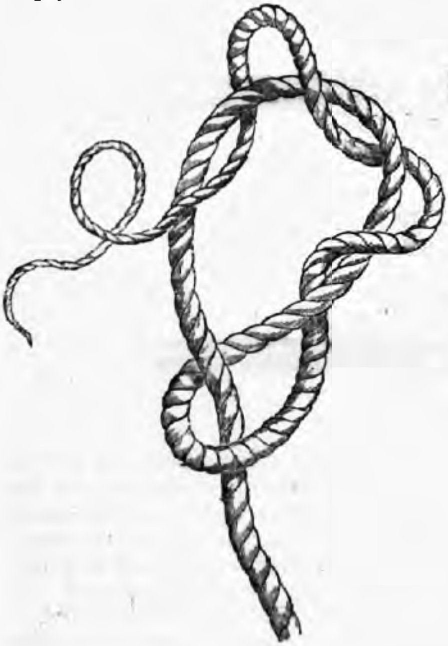


THE FOOTED ARROW.

ing, as, if too weak, it will never fly straight. The pile or point should be what is called the square-shouldered pile; some prefer the sharp pile, but the other answers best for all purposes. The nock should be full and the notch pretty deep; a piece of horn should be let in at the notch to prevent the string splitting the arrow. The feathers should be full sized, evenly and well cut, and inserted at equal distances from each other, as shown in the plate. It has been much disputed whether the Bobtailed, the Chested, the Barrelled, or the Straight arrow is the best to shoot with (see Glossary). Horace Ford, the champion shot, decides in favour of the straight arrow, and our readers cannot do better than take his advice. The arrow should be carefully wiped each time it is picked up, and this not only to preserve it, but also because the least particle of dirt clinging to the pile will effectually spoil the flight of the arrow. Every care should be taken to keep the feathers smooth and stiff; if attention be not paid to this point everything else will be in vain. Should they by chance become ruffled, a little warming in front of a fire (not too close) will generally restore them.

The Bow-String.

The best bow-strings are of foreign manufacture, and are generally sold complete; but in case any of our readers wish to fit their own, we will say a few words about them. The string should be not too thin, or it will not last long; in the selection of it, it is best to be guided by the size of the notch of your arrows. At one end of it a strong loop should be worked to go over the upper horn, the other end should be left free in order to be fixed on to the lower horn; this is done with a peculiar loop, as depicted in our cut. When the lower end is fastened, the distance between it and the loop at the other end should be such, that when the loop is in its place (*i.e.*, the bow strung) the string is, in a gentleman's bow, six inches, in a lady's, five inches, from the centre of the bow. The string shouid be lapped for an inch above the nocking point, and five inches below it, with waxed thread, and this again with floss silk—to such a thickness that it completely fills the notch of the arrow, but without being too tight, or it may split it. Never trust a worn string; take it off and put on a new one—should it break, it will most probably snap your bow.



BOW-STRING LOOP.

LADY'S BELT AND POUCH.

THE BELT AND POUCH.

This is used for carrying the supply of arrows required in a match (three for use and one spare one), as also for hanging the tassel, &c., to. We would, however, recommend our gentlemen friends to do without it—it is always in the way, and the arrows can be carried far better in a pocket made diagonally in the right rear of the coat, so as to come conveniently to the hand, and yet be far enough back to escape the risk of the feathers being spoilt by the elbow rubbing against them. In our cut we have depicted a lady's belt, complete with pouch, tassel, grease-box, scoring-card, and pricker.

GREASE-BOX.

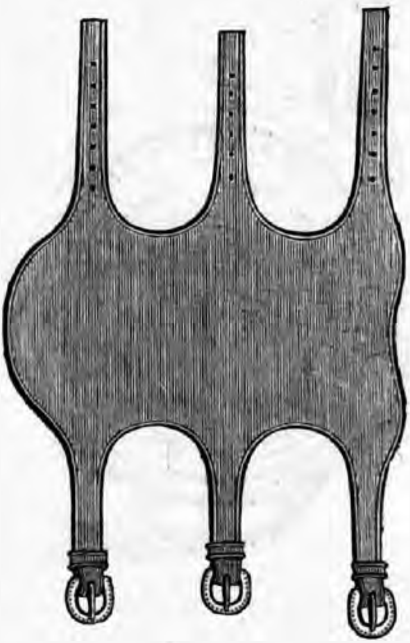
This is a little box, generally made of ivory, of such a shape as to hang from the belt. It is used for the purpose of holding the grease, which some archers use to anoint the string and their shooting-glove with, so as to get a better loose. The advantage of it is a matter of opinion, and so it may remain; if used too freely, however, it causes the bow-string to unravel.

TASSEL.

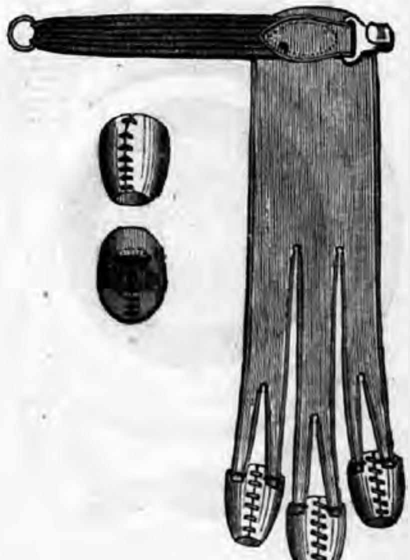
This is merely a large tassel of green worsted, and is used for wiping the arrows when they have stuck in the ground. If a belt is not used, it should be hung from a button-hole of the coat: it is an absolutely necessary part of the archer's outfit.

The Bracer.

This is a guard for the left arm, to prevent its being abraded by the string when loosed; it also has another object, viz., to confine the sleeve and keep it out of the way. It consists of an oblong piece of smooth leather, and is fastened to the arm by straps. In fitting it on, care should be taken that the ends of the straps are not left loose, and that the buckles come well round to the back of the arm, so as not to be in the way of the string; for if there be the least projection on which it can catch, your best aim will be of none effect.



THE BRACER.



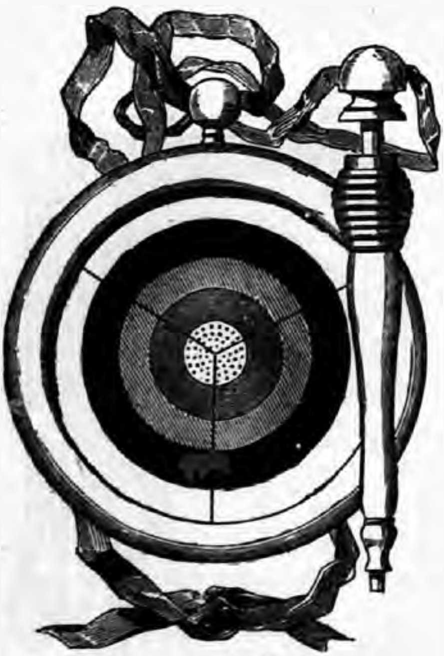
GLOVE AND TIPS.

The Shooting-Glove

Is used to protect the fingers of the right hand from abrasion by the string when loosing, and consists of three finger-guards, attached by strips of leather, passing down the back of the hand to a strap fastening round the wrist. This form of glove has, however, rather gone out of use of late years, most archers preferring independent guards, called tips, for each finger, generally fastening by means of an India-rubber ring round the finger, about the best of this kind being those invented by Mr. Buchanan of Piccadilly. In the matter of the shooting-glove, however, it is best to leave the archer to choose for himself, merely cautioning him to make sure that, whether gloves or tips, they fit him well, or he will never be able to make a good loose. The cut represents a glove and set of tips.

Scoring-Cards.

These are made of various shapes and sizes, to accommodate a single archer or to serve for a match. About the best for private use consists of a circular piece of cardboard coloured like a target, divided into three segments for three distances, and having the other side printed to receive the score when reckoned. These are carried in little ivory frames made for the purpose,



SCORING-CARD AND PRICKER

SCORING-CARD (REVERSE).

the whole being about the size of a watch. A small ivory pricker for marking is carried with it; the accompanying cuts represent one of these cards. Perhaps, however, for ordinary practice, nothing is better than a common metallic memorandum-book, ruled for the day of the month, and vertically for the rings.

The Quiver.

The quiver is a tin case somewhat in the shape of the quiver usually represented as forming part of the equipment of Robin Hood and his band; it is not now, however, used as part of the personal equipment of the archer, but is employed simply for the purpose of protecting the spare arrows. It is made of all sizes, to hold from six to three dozen arrows, and is provided with a cover and lock to make all secure. The best receptacle for arrows, however, is the box which is now almost universally used; in it each arrow has a place to itself, and by this means overcrowding is prevented and the feathers preserved unrumpled.

Targets.

A target is made of straw, bound with string into an even rope, which is twisted upon itself until it forms a flat disc, and then covered on one side with canvas painted in five concentric rings, viz., gold or centre, red, blue or inner white, black, and white. These rings should be all of exactly the same width, the target itself being four feet in diameter. In scoring the following value is given to the rings:

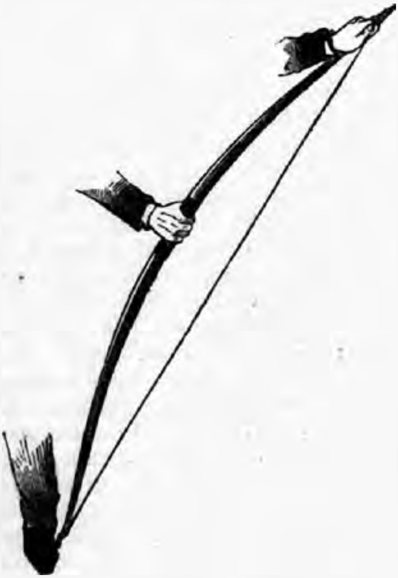
Gold	9
Red	7
Blue	5
Black	3
White	1

When an arrow strikes on the edge of two rings, the higher is counted, unless it is otherwise agreed upon. It is necessary to have two targets, one at each extremity of the distance fixed upon—as it is not usual to shoot more than *three* arrows at each "end," as it is called—walking over between each three to reclaim your arrows, and then shooting them back at the target you have just left. By this means a different set of muscles are called into play, those used in shooting are relaxed, and in addition, a great deal is added to the exercise which renders archery so healthy a pastime; for example, in shooting the national round the archer walks 3,920 yards, or nearly two miles and a quarter, between the ends. The stands for the targets are usually made of iron or wood, and somewhat resemble in shape an artist's easel. The legs should be padded or wrapped round with straw, otherwise arrows striking them will be apt to break. Mr. Aldred, of Oxford Street, has, however, invented an iron stand for targets, so constructed that the legs present a very thin edge to the shooter, thus reducing the chance of their being struck by an arrow to the minimum. In some places butts are erected, instead of stands, for the targets: they are built of sods piled together, the target being hung to a peg in the front of them. The target used differs from the ordinary one, and consists of a circular piece of white pasteboard, the size differing according to the length of range: *e.g.*, at thirty yards it is four inches; sixty yards, eight inches; ninety yards, twelve inches in diameter, and so on according to distance. Butts certainly abolish the trouble of stooping, as they catch all the arrows (except the very wide or high ones) which miss the target. The chief disadvantage of them is that after shooting at a butt it takes some time to get used to the target on a stand, so that it spoils an archer for matches, &c. Another advantage of butts is this, that as the targets are merely made of cardboard, they can be easily manufactured at home. In all cases, whether butts or stands are employed, the centre of the gold should be four feet from the ground.

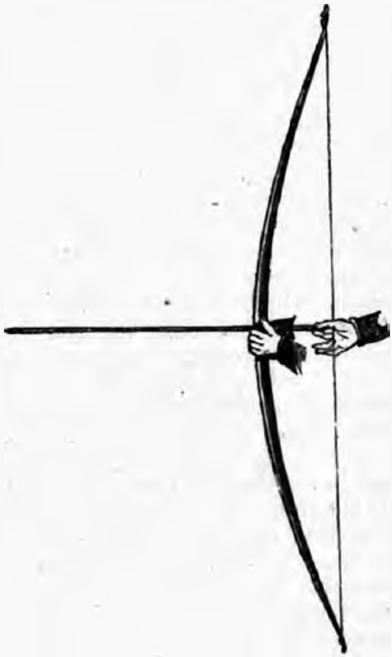
Instructions for the Field.

Having procured his outfit, the archer will doubtless be anxious to make a trial of it in the field, and we will now endeavour to give him the clearest instructions for the management of his weapon, by attention to which, and constant practice, we hope he will succeed to his utmost satisfaction. It will be useless for him to overburden himself with accessories more than are absolutely necessary—they will only be in the way; an archer who wishes to shoot well will find that the less he has about him the better. Besides his bow, he will take four arrows (three for use and one spare one in case of accident), which he will put into his pouch or pocket, bracer, glove or tips, tassel, and scoring-card. A spare string also it will be prudent to have in the pocket. Anything more than these is unnecessary in the field.

STRINGING THE BOW.—In stringing the bow it is held by the handle in the right hand (flat part towards the body) with the lower horn resting on the ground against the hollow of the right foot. The left hand is then placed upon the upper part of the bow in such a manner that the base of the thumb



STRINGING THE BOW.



NOCKING.

rests upon the flat side of it, the thumb pointing upwards. The bow is then bent by the combined action of the two hands, the right pulling, the left pressing it; at the same time the loop of the string is slipped into its place by the left thumb and forefinger. Our readers will better understand the operation by reference to the plate, which has been very carefully drawn. However, actual experiment under the guidance of a proficient will teach them sooner and better than we can possibly hope to do by mere precept. When the bow is braced, the string should be exactly six inches from the centre of the bow in a gentleman's, and five inches and a half in a lady's bow. Care must be taken that the string lies evenly along the exact centre of the bow, that it is not turned on one side at either horn. If this be the case, it will, by pulling the bow unevenly, in all probability break it.

POSITION.—It is difficut to determine exactly what is the *best* position for the archer. Every one naturally subsides into that which is most easy to him; still there are certain fundamental rules, which are given in almost every book on archery, by attention to which in the first place the shooter ultimately falls into the best position for himself. The left foot should point rather to the right of the mark, the right foot being nearly at right angles to it, the heels six or eight inches apart, in a straight line from target to target, both feet flat on the ground, knees straight, body erect but not too stiff, face turned towards

THE ARCHER—HIS POSITION.

the mark. The body must be carried as easily as possible on the hips, not too stiffly upright nor yet bending forward. Nothing looks worse than a stiff, constrained attitude, except a loose, slouching one. Our woodcut represents an archer taking aim.

NOCKING.—Having mastered the position, the next thing to be looked to is the *nocking*, and we cannot do better than give Ford's rule for so doing, which is decidedly the best published. "The bow being held by the handle in the left hand, let the arrow be placed with the right (*over* the string, not *under*) on that part of the bow upon which it is to lie; the thumb of the left hand, being then gently placed over it, will serve to hold it perfectly under command, and the forefinger and thumb of the right hand can then take hold of the nock end of the arrow and manipulate it with the most perfect ease in any manner that may be required." (See cut.) When the arrow is nocked it should be at right angles with the string. Some archers are accustomed to try to alter the range of the arrow by heightening or lowering the nocking point, but this is a great mistake. Care must be taken that the whipped portion of the string exactly fits the notch of the arrow. If too large or too small, it will probably split it.

DRAWING.—Having nocked the arrow according to the foregoing direction, the next thing to proceed with is the drawing, which is managed as follows: Extend the left arm downwards until it is perfectly straight, the hand grasping the handle of the bow, the arrow being held by the nocking end by the two first fingers of the right hand passed over the string and on each side of the arrow, as in the cut, care being taken not to pass the fingers too far over the string, or the sharpness of the loose will be interfered with. This done, the left arm should be smoothly raised, *still extended*, until at right angles, or nearly so, with the body, the string being drawn at the same time with the right hand until the arrow is drawn about three-fourths of its length, when the right wrist and elbow should be at about the level of the shoulder. Having got it thus far a slight pause may be made before drawing the arrow to its full length (although we think it better to make it all one motion), which done, the archer must take his aim before loosing. By the old fashion of drawing the bow to the ear, aiming was rendered impossible; in fact, there seemed to be a sort of idea that no aim whatever was required for archery. This, however, is far from being the case; it is most essential to take an aim, ay, and a good one too, if you wish to meet with success. By drawing the arrow below the level of the eye, the archer is enabled to look along it as he would along the barrel of a rifle. As regards the direction, the archer will find that it is but seldom he will be able to aim directly at the gold. He will almost always have to aim to one side or the other, to make allowance for wind, &c. This cannot be taught. The archer will soon learn by experience whereabouts on the target his proper point of sight lies, and will aim accordingly. He will also learn the degree of elevation required by his bow at the various distances, which elevation he will always give by raising or lowering his *left* hand, and in no other way if he values success.

Remember! the arrow must always be drawn to exactly the same spot. If possible, let the spot where the pile and stele join just reach the bow.

LOOSING.—Having drawn the arrow to its full extent, the next thing is to loose it properly, and this, although apparently a very simple thing, is by no means so easy as it looks. The great object to be attained in loosing is to remove the obstruction of the fingers from the string suddenly, and yet in such a manner that no jerk is given to the string (which would be fatal to the aim), and that the fingers do not at all *follow* the string, which would weaken the force of the shot. The string should lie across the fingers at an equal distance from the tip of each—not too near the joint nor too near the tip; about midway between the tip and joint of the first finger, and on the others in proportion, will be found about the most convenient position for a good loose. The fingers must all be withdrawn at once, for should one be an instant behind the others, it would be fatal to the aim.

It must be understood that, although we have described separately the actions of drawing, aiming, and loosing, no perceptible pause should be made between them: they should all appear to form part of the same movement; for, as Ascham says, "Holding must not be long, for it puts a bow in danger of breaking, and also spoils the shot; it must occupy so little time that it may be better perceived in the mind when it is done than seen with the eye when doing."

We have now concluded this portion of our subject, and hope that we have succeeded in making ourselves sufficiently intelligible to be of service to our readers. Let them always recollect that "practice makes perfect," and that we cannot make them good archers without great exertion on their part, although we hope we have succeeded in making plain to them those first principles, without which all efforts would be but labour in vain.

Clout Shooting.

This kind of sport is so called from the mark being a clout, or small white pasteboard target, about twelve inches in diameter. This is placed into a cleft stick, and then fixed in the ground in such a manner that the lower edge of the target touches the ground. The distances in this kind of shooting are generally 180 and 200 yards, and those shots alone count which hit the clout; or in default of any in the clout, the nearest arrow to it will count; so that, supposing you got thirty-six arrows within a foot of the clout and your adversary managed to get one in, even though his others may not have have been anywhere near, he will nevertheless be the victor.

Roving.

In this kind of shooting there is no fixed mark, anything being aimed at, such as trees, gate-posts, &c. The winner at one mark chooses the next, and so on. The distances are usually from 100 to 200 yards, and no shots count which are not within five bows' lengths of the mark.

This kind of shooting is only useful as a lesson in judging distance, and was very necessary when the bow was used in warfare, but has never been much in repute since archery has been merely practised as a pastime. It is rather an expensive amusement, as the arrows are so liable to be broken or lost.

Flight Shooting.

This is merely practised as a trial of distance, the winner being he who shoots farthest. Mr. Ford states that the farthest he has shot is 308 yards with a 68 lb. bow. Mr. Froward is reported in 1801 to have easily reached 340 yards with a self yew bow of 63 lb.

Dress.

The dress of the archer varies in different clubs, but the quieter it is the better. For gentlemen nothing is better than a green cloth coat, with gilt buttons having the club device upon them, and a *cap* of the same coloured cloth, with a covered peak. For ladies, a green jacket over a white skirt, with hat (with narrow brim) and green and white feather; or the following is a very pretty style for a lady's archery costume: a white clear muslin skirt with a deep hem, worn over either a white silk or cambric muslin slip; Russian bodice of white alpaca, trimmed with black lace insertion or braided with black; sleeves tight to the wrist, as that prevents any awkward catching by the string; a pointed black velvet band and sash, trimmed with black lace. Over the left shoulder, and fastened in a knot under the right arm at the level of the waist, a broad green sash, made of silk hemmed at the ends. This sash is gathered into folds and fastened on the left shoulder by a brooch of gold or silver, according to the taste of the wearer, bearing the badge of the club. Hat of white straw, bound with black velvet and trimmed with green and white feathers. This is a very pretty costume, and is worn, with modifications, by a great many societies.

We hope that the foregoing hints may prove of service to our readers. If in any part we have not succeeded in making ourselves as intelligible as we wish, we must plead in extenuation the difficulty of explaining by mere precept that which is not easily learnt even by example.

Glossary of Terms employed in Archery.

Ascham	A cupboard especially constructed to hold bow and arrow.
Back	The flat side of the bow.
Backed Bow	One made of two or more strips of wood glued together longitudinally.
Barrelled Arrow	One made largest in the centre.
Belly	The round side of the bow.
Bobtailed Arrow	One made larger at the point than at the feather.
Bracing	The act of stringing the bow.
Chested Arrow	One made larger at the feather than at the point.
Chrysal	A small crack, which, gradually enlarging, ultimately breaks the bow.
End	Each discharge of three arrows is termed an "end," as three is the number to be shot from each end of the range in turn.
Grafted Bow	One made of two pieces of wood joined at the handle.
Handle	The wrapping of plush by which the bow is held.
Horn	The tip of each end of the bow.
Limbs	The parts of the bow above and below the handle.
Nock	The groove in the horn of the bow into which the string fits; also the notch in the arrow for the reception of the string.
Nocking Point	The point in the bow-string which, when the bow is strung, is opposite the top of the handle.
Pile	The point of the arrow.
Self Bow	One made of a single piece of wood, or grafted.
Stele	The shaft of the arrow.
Straight Arrow	One of even thickness throughout.

FENCING;

With the most recent means of attack and defence when engaged with an adversary.

Fencing, though considered a gentlemanly accomplishment, does not receive the attention it deserves as an art, chiefly owing to the difficulty of learning, or the disadvantage of not having a master at hand to teach it, more especially in provincial towns and schools. With a view of overcoming some of these difficulties, the writer (having had twenty years' experience as an instructor of fencing, &c.), hopes he may not be considered presumptuous in submitting to the public some of the principal positions of the body, with foil in hand,—the object of which is self-instruction on a new system—by plates. By reducing the art to simple movements, we avoid all the complications which fencing usually embraces for the skilful fencer. By the practice of this noble art we bring all the muscles of the body into action; it gives quickness to the eye, lightness to the hand, firmness to the foot, and increases and confirms health—that most desirable of all blessings. A sufficient knowledge of the foil may be gained from these plates to enable two persons to practise together, by studying the paper carefully for a short time before beginning. Elaborate works have been written on fencing, therefore it is not necessary to enter here into a long detailed account of all the various movements, as that would only tend to perplex the mind. The writer's aim has been to convey a practical knowledge of fencing in the simplest manner possible, and in the shortest time.

INTRODUCTORY.—The writer would impress upon beginners the necessity of strictly attending to the instructions laid down in the first seven positions, as it is only by so doing that they will arrive at a true knowledge of all the other guards and parries. Most people are apt to read a book through too quickly: thus by the time they get to the end they forget the beginning. But whoever wishes to gain a knowledge of fencing must study one movement before he begins another; by this means only can he accustom himself to the

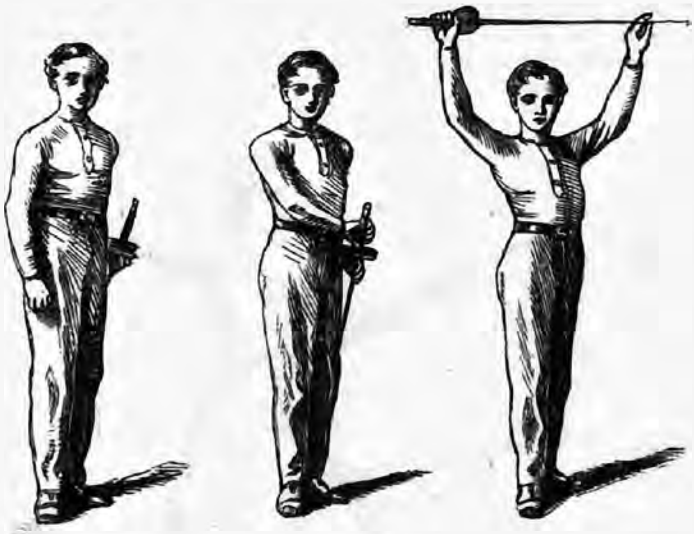


FIG. 1. FIG. 2. FIG. 3.

PLATE I.

various thrusts and guards. The fundamental principle of fencing consists in the execution of the right arm, the longe, the recovery, advancing, and retreating quickly; and lastly, not least, a good opposition, which is one of the most essential things in fencing, as you are guarded at least on one side. This will also give you the advantage of knowing what your adversary intends doing, which you must endeavour to discover by the feel of his foil.

FIRST POSITION OF THE BODY.

Place the right heel against the left ankle, so as to form a right angle with both heels, the foil to be held in the left hand under the hilt with the thumb and fingers, the right hand straight on the outside of the right thigh, shoulders square and pressed rather backwards, eyes turned towards the adversary, showing the right breast to the front, without constraint. (Plate I., Fig. 1.)

SECOND POSITION.

Bend the right arm as high as the elbow, and at the same time bring it across the body; take hold of the foil, thumb stretched along the convex. In this movement the body must be kept quite steady, shoulders square, eyes front, head up without appearing stiff, knees perfectly straight, waist in. (Plate I., Fig. 2.)

THIRD POSITION.

Raise both hands above the head, holding the button of the foil with the thumb and first finger of the left hand, turn your eyes to the right, so as to see your opponent full in the face. (Plate I., Fig. 3.)

MANNER OF HOLDING THE FOIL IN HAND.

Let the concave of the handle rest in the palm of the hand, the thumb stretched along the convex, the first finger about half an inch in advance of the thumb; the foil should only be held firm in the hand when parrying or thrusting, otherwise the fingers and thumb will get stiff from grasping it too long.

PLATE II.

ON GUARD IN CARTE.

Bend both knees together until they are in a perpendicular line with the toes; step out with the right foot in a direct line from the left ankle, about twenty-two inches or more, according to the length of the legs; keep the left arm up and bent, so as to form a half-circle, as high as the head, palm of the hand turned towards the left face; keep the body upright, the weight to be kept equally on both legs; bring the point of the foil down to the height of your adversary's left eye; this is the engage of carte; arm bent and the elbow drawn inwards, the hand as high as the centre of the chest. (Plate II.)

THE HALF-LONGE.

1. Straighten the right arm without moving the body, point of the foil as high as the chest of an opponent, hand as high as your face.

2. Throw the left hand backwards, at the same time press the shoulder well back, palm of the left hand to the front, about four inches from the thigh.

3. Straighten the left knee and incline the weight of the body forward on the right, without moving the foot from the ground.

TO RECOVER.

1. Bend the left knee.

2. Throw the left arm upwards to the position of the guard, bear the weight of the body again equally on both knees, right arm bent, elbow turned inwards; stand firm on guard without appearing stiff; head held easy and upright.

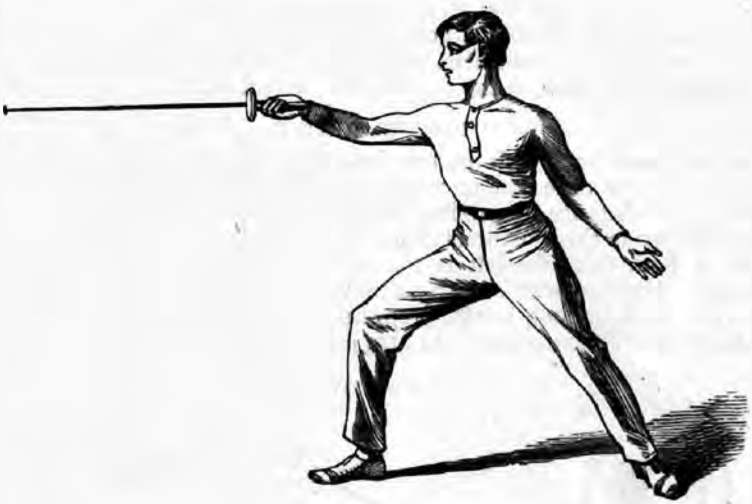


PLATE III.

THE LONGE.

1. Extend the right arm, direct the point of your foil to the height of your chest, longe in carte, looking over the right arm, the hand as high as your face.

2. Throw the left hand backwards to within four inches of the left thigh, palm of the hand to the front; press the shoulders well back.

3. Straighten the left knee and keep the foot flat on the ground.

4. Longe forward in a direct line from the left ankle, about forty inches or more, according to the length of the limbs, until the right knee is in a vertical line with the instep, toes turned out.

These four motions should be repeated often, so as to give freedom of action to all the joints.

HOW TO RECOVER GUARD.

1. Bend the left knee back.

2. Throw the left hand upwards to the position of the guard, palm of the hand turned inwards towards the left face, arm bent.

3. Bring the right foot up to the guard, supporting the weight of the body equally on both knees.

4. Bend the right arm, nails upwards, point opposite the face, hand as high as the chest, elbow rather inwards, head kept up. The groundwork of fencing depends on the attention given to all those preceding movements of the body.

THE ASSEMBLE OR FINISH.

This is done by beating twice with the flat of the right foot on the ground, without moving the body; secondly, bring the left foot up to the right heel; thirdly, bring the right hand under the chin, dropping the left hand to the side at the same time; fourthly, straighten the right arm to the right side as low as the knees, knuckles downwards.

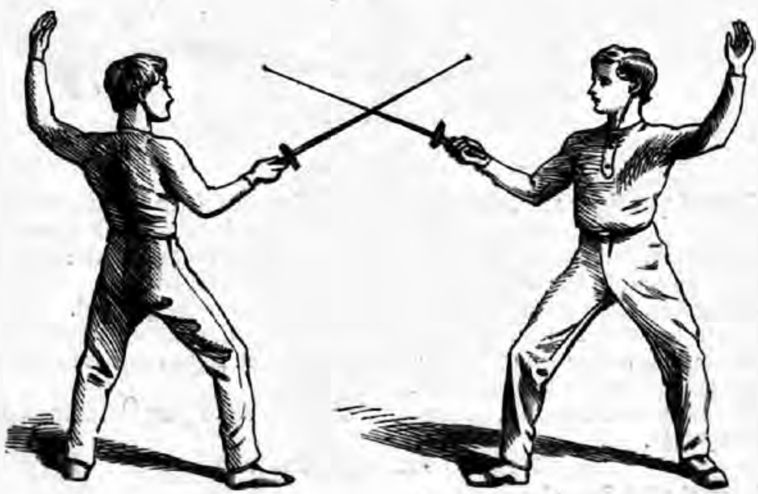
HOW TO ADVANCE.

Being on guard, take one step forward with the right foot, about twelve inches, bring up the left foot directly, keeping the same distance between both feet, as if making one movement with both; the knees equally bent, the body held upright, eyes fixed on the opponent or object in front.

HOW TO RETIRE.

Take one pace back with the left foot, bringing the right foot up immediately, at the same time beat once with the flat of the right foot firmly on the ground. The distance in walking backwards should be longer than the advancing by two or three inches, taking care that the weight of the body is kept equally on both feet; the left breast should be turned slightly towards the adversary. Having practised these movements frequently, finish by beating twice with the right foot, bringing up the left foot, and right hand under the chin, lastly straightening the right arm on the right side.

PLATE IV.



THE ENGAGE OF CARTE.

Inside guard high.—Being engaged in carte with an adversary, turn the nails upwards, cross foils about nine inches from the button: this half of the foil is called the foible, from being the next part to the end; the other half is termed the forte or part next the hilt: oppose the opponent's foil sufficiently to prevent him from touching you in the engage, keep the right arm bent inwards, point of your foil opposite your adversary's face, right arm as high as your chest.

The straight thrust.—If your opponent does not cover himself in the engage, straighten your arm, lower the point to his chest, longe in carte, looking over the right arm, hand as high as the face, recover, and engage in carte, crossing foils as before.

THE ENGAGE OF TIERCE.

Outside guard high.—This being the opposite guard to carte, it only differs from it in the position of the hand, nails of which are turned downwards. Engaged in tierce, join foils as in carte; if your adversary is not well covered

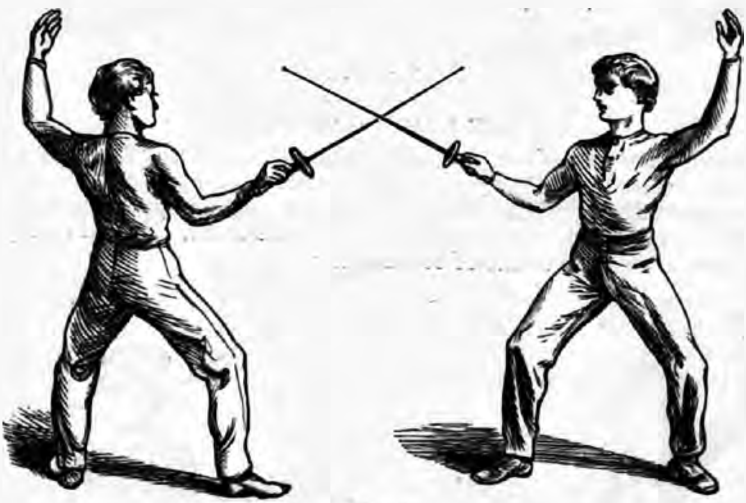


PLATE V.

in the engage, straighten your right arm by lowering the point to his chest, longe in tierce, looking inside the arm, shoulders pressed well back, left foot firm on the ground, left knee straight, the body not thrown forward but rather upright; recover in tierce.

THE GUARD OF HALF-CIRCLE.

Inside guard low.—The half-circle guard is generally used against the thrust of second and low carte. The guard is generally taken in the following manner: raise the hand as high as the left shoulder, nails upwards, the elbow turned well in towards the body, the foil to be held firm in hand, and opposed to your adversary, the point as low as your opponent's waist. If an opening should occur, raise the point and return carte.

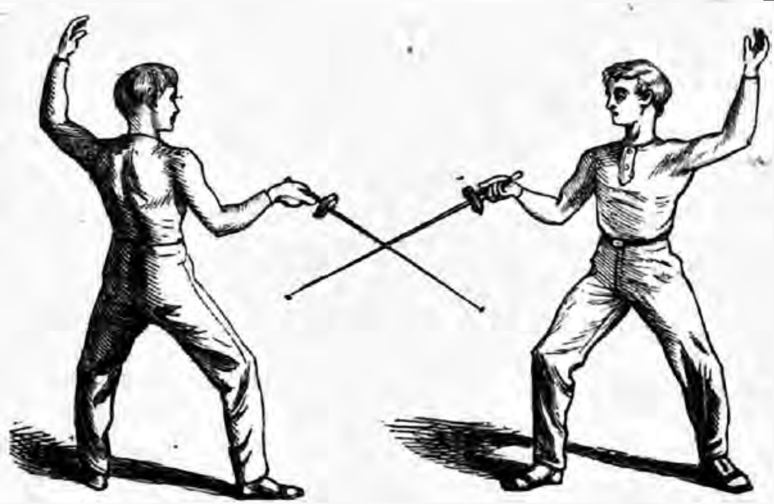


PLATE VI.

THE GUARD OF OCTAVE.

Outside guard low.—The guard of octave is the opposite guard to the half-circle, and is used against the thrust of octave; it also prevents the adversary from counter disengaging. Raise the hand as high as your chest, keep the point as high as the lower part of the opponent's chest. This is a very useful parry in returning the thrust of low carte.

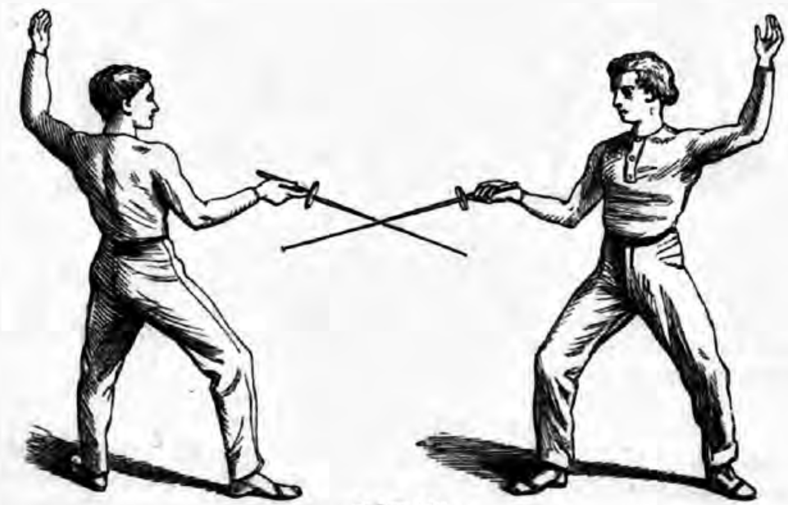


PLATE VII.

THE DISENGAGE FROM CARTE.

If your adversary presses your foil, lower your point to within about two or three inches of his hilt, at the same time passing it to tierce, straighten the right arm, and longe; recover in carte.

The feint of one, two.—Being engaged in carte, if your opponent takes the guard of tierce when you disengage on him, return back to carte and longe, making the movement quickly from the fingers, not from the shoulder; right arm quite straight, nails upwards, look over the right arm; recover in carte.

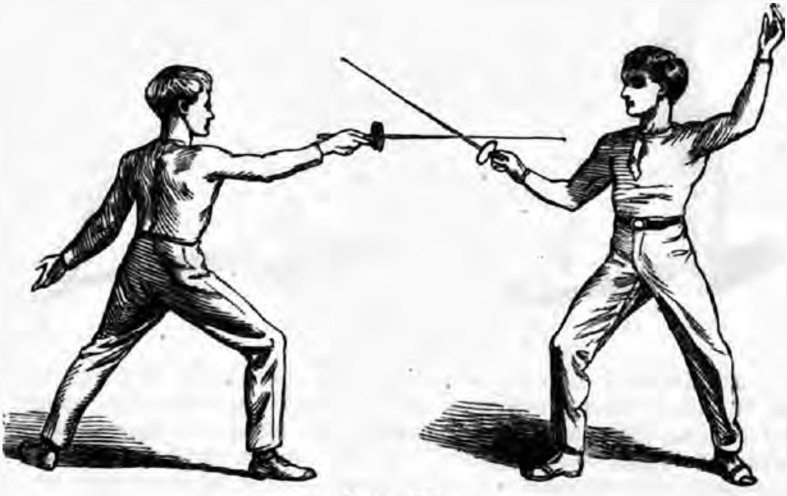


PLATE VIII.

The feint of one, two, three.—Engage in carte, as before, disengage to tierce, again in carte. In both cases raise the point of your foil as high as your opponent's face, arm kept straight, return again to tierce, point to the chest of your adversary, and longe in tierce, looking inside your arm, shoulders pressed well back, body upright; recover in carte.

THE DISENGAGE FROM TIERCE.

Engage in tierce. As soon as your opponent presses your foil, lower your point, straightening the arm, at the same time pass your foil to carte, longe with the knuckles turned upwards, taking care that the left foot does not quit the ground; recover in tierce.

The feint of one, two.—Engage in tierce. Disengage to carte, pointing to the face of your adversary, arm straight, the body kept steady; the moment your opponent takes the simple guard of carte, return to tierce, longe, looking inside the right arm; recover in tierce.

The feint of one, two, three.—Being engaged in tierce. Disengage to carte, again to tierce, extending the arm in the first disengage; finding that he takes the simple guards each time, return to carte, longe, looking over the arm, left knee always being kept straight in the longe; recover in carte.

WRIST PRACTICE.

An excellent practice for the wrist is for two persons to practise the counters of carte and tierce. This is done in the following manner: being engaged in

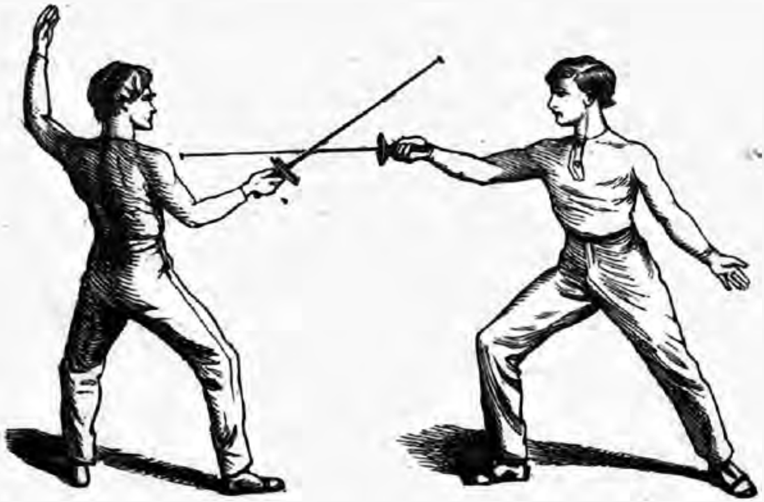


PLATE IX.

carte, your adversary disengages on you, take the counter of carte, and disengage on him without touching, unless by mutual agreement, he taking the counter of your disengage; keep repeating this for some time; then engage in tierce, the opponent disengages, take the counter of tierce, disengage on him; continue this also for some time and change again to counter carte. These practices will soon make the wrist supple and strong—two essential things for fencing.

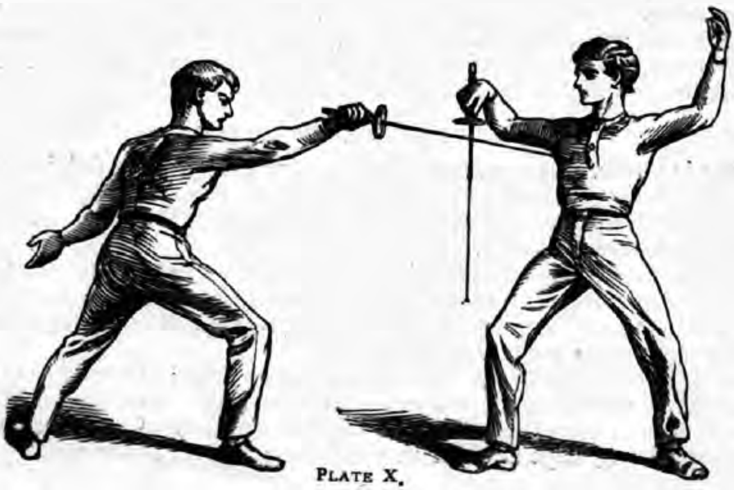


PLATE X.

HOW TO THRUST AT ALL FEINTS.

To thrust to all feints is to put all the thrusts of fencing into practice: for this purpose, begin by endeavouring to confuse your adversary by beating with the foot on the ground, disengaging without longeing, extending the arm; by this means you will discover what parries he intends taking and what thrust you can make safely.

THE PARADE OF PRIME.

Being engaged in tierce, your adversary tries to get in by main force; bend your arm and wrist, turning the nails downwards at the same time, raise the hand as high as your chin, drawing the arm inwards as you raise the hand, the point of your foil directed towards the lower part of the chest of your adversary, parry and longe in seconde, recover quickly in tierce.

THRUST OF SIXTE.

After having parried prime. Should your opponent keep his hand low in trying to get in by force in tierce, turn the knuckles upwards quickly, bring the point over his arm, thrust sixte over the arm by binding his foible with your forte: this must be done by a quick turn of the wrist.

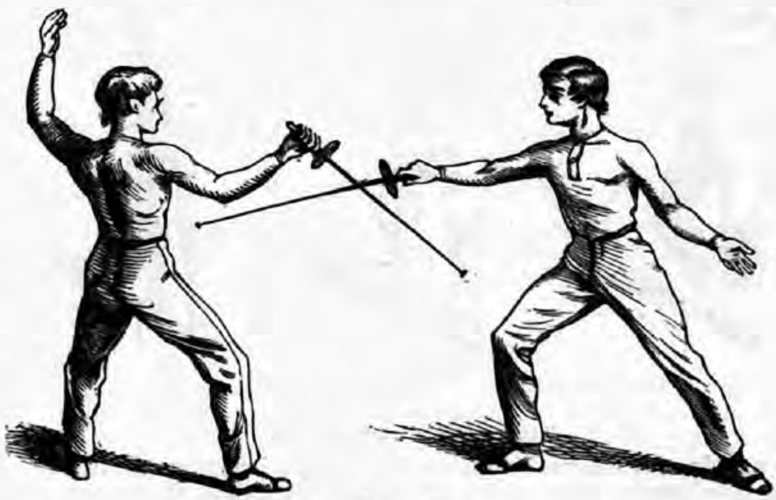


PLATE XI.

THE PARADE OF SECONDE.

Engaged in tierce, if your adversary should drop his point, parry seconde by giving a dry beat on the foible of his foil with the forte of yours, nails downwards, hand opposed, so as to prevent him touching you in the longe, point to the lower part of his waist, holding the head well up, the body not to be thrown too much forward, otherwise you cannot recover quickly; recover in sixte.

THE FEINT OF SECONDE.

Being engaged in tierce, drop your point under the hilt of your opponent, principally with the fingers, nails downwards, but without lowering the hand, return directly back again, longe by turning the nails upwards in sixte, over the arm, or return back to seconde again, longe, and recover in tierce. This is called the feint of seconde and tierce.

THE PARADE OF QUINTE.

This parade is used in the same side as carte inside guard, and taken in the following manner: the hand as high as the breast, nails turned downwards, parry and longe in seconde or carte over the arm: the parry is mostly taken when the adversary thrusts low.

It is also a very quick return thrust when your adversary keeps his hand too low, or drops the point to feint for the lower part of your body.

PLATE XII.

THE PARADE OF SIXTE.

This parade only differs from tierce in the nails being turned upwards instead of downwards. The hand must be kept as high as the shoulder, point as high as your adversary's face if your opponent is not well covered, straighten the arm, longe with the nails upwards, recover; if he presses, disengage in carte. The feint of one, two, and one, two, three, is generally made from this position.

BINDING THE FOIL FROM SIXTE.

Engage in sixte; if your opponent endeavours to get in under your wrist, drop your point opposite his waist, binding his foible with your forte, longe in octave, recover in tierce or sixte.

THE PARADE OF COUNTER CARTE.

Having joined foils in carte, nails upwards, as soon as your adversary disengages, follow his foil by making a small circle until you meet it again in carte; if he disengages a second time, take the simple guard of tierce. This is one of the best and safest parries in fencing, as it stops most of the feints. Being engaged in tierce, if the opponent feints one, two, take the counter of carte in the same manner as before; should he disengage a third time, take the guard of tierce; if he lowers the point, take the half-circle, returning again to carte.

HOW TO PARRY CARTE.

When your adversary stretches his arm to thrust, give a beat on the foible of his foil with the forte of yours, so as to make an opening for your thrust. This may also be done in the counter of carte, when your opponent is not too close.

THE PARADE OF COUNTER TIERCE.

This parade is performed similar to the counter of carte, but the nails must be downwards. Being engaged in tierce, if your adversary disengages, follow his foil in a circular manner until you meet it again in tierce; if he disengages a second time, take the simple guard of carte. Should he make the feint of one, two, without stopping, take the counter of tierce, as before, but be careful not to be too near, as the guard is only safely taken when out of distance. If he disengages after having feinted one, two, take the simple guard of carte.

How to parry tierce.—Turn the nails downwards, keeping the foil firm in hand, to prevent being disarmed. When your opponent stretches his arm to thrust, give a dry beat on the foible of his foil with your forte, so as to throw it out of the line. Direct your point to his chest, longe either in tierce or seconde.

HALF-CIRCLE PARADE.

The half-circle is generally used after having parried tierce against the thrust of seconde or low carte. For this purpose raise the hand as high as the shoulder, bend the arm, nails turned well upwards, elbow drawn inwards, parry and point rather low, longe in carte.

THE COUNTER OF HALF-CIRCLE.

Having crossed foils in half-circle, which is only done in making an assault, your opponent passes his foil over yours; follow by making a circle till you meet him again in half-circle; if he disengages again, take the guard of octave or seconde, longe and recover in tierce.

Sometimes the circle may be made twice with success by keeping the hand well up, holding the foil firmly. (Plate XII.)

THE PARADE OF OCTAVE.

The octave parade is the opposite guard to half-circle, and is taken to prevent the opponent from getting in by force in the lower part of the body in octave or seconde.

Keep the hand as high as the centre of your body, straighten the arm slightly so as to oppose your adversary, point of the foil rather low, parry and longe in tierce or octave.

THE COUNTER OF OCTAVE.

Having opposed your adversary in octave, he may disengage over your foil, therefore follow his foil, immediately describing a circle until you meet his foil again in octave, taking care to keep the hand well up. If he passes over a second time, take the guard of half-circle or quinte, longe in low carte, keeping the head up.

THE CUT OVER THE POINT FROM CARTE TO TIERCE.

Engage in carte. If the opponent holds his hand low with the point high, raise your wrist sufficiently to clear the foil of your adversary without exposing your body. Cut with the foil over his point until it hits the centre of

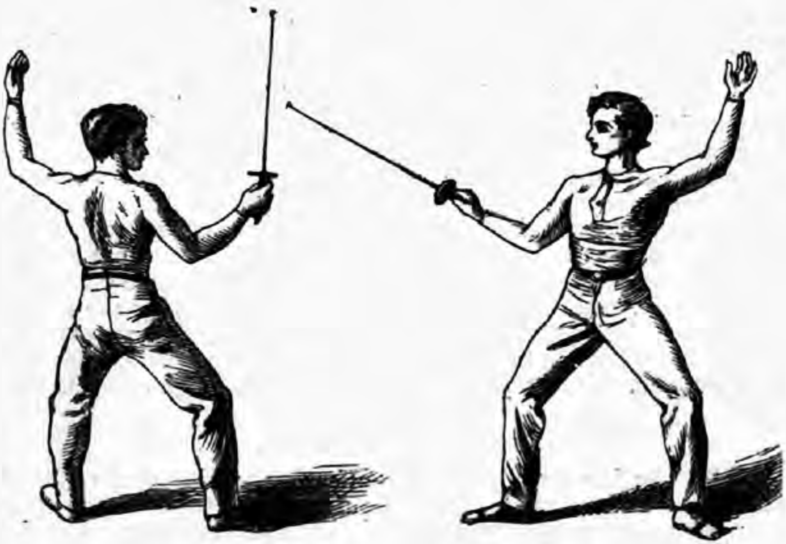


PLATE XIII.

his chest. If your adversary parries tierce, as soon as you see him take the guard, disengage under his arm by passing your point under the wrist. Longe in carte. The cut and longe should be made simultaneously.

THE CUT FROM TIERCE TO CARTE.

This cut is made in the same manner as carte, but the longe must be in carte inside the arm; be careful that the body is well covered, and not run the risk of being hit at the same time; keep the body a little backwards. If the adversary takes the guard of carte when you cut, disengage to tierce by passing your foil quickly over his wrist, arm quite straight, longe in tierce.

ON THE DISENGAGES.

The disengages are made when an adversary takes the simple guards, or leaves himself uncovered on either side; however, care must be taken that he does not thrust at the same time as you disengage, thereby both hitting at the same time. This can be avoided by keeping the hand opposed to the adversary, either in carte or tierce, whichever you may be engaged in at the time of making the disengage, the one, two, or one, two, three.

The disengage is also advantageously taken when the adversary advances or retreats. Allow him to take one pace backwards, opposing his foil on either side; lower the point of your foil; longe, covering your body in carte or tierce, whichever you may be engaged in at the time. Should your opponent advance, retreat one pace, keeping a good opposition; disengage as before, longe, and recover quickly on guard. The feint of one, two, and one, two, three, can be made in the same manner.

THE SALUTE.

The salute, previous to making an assault or loose play, as it is termed, is an established form of politeness before fencing for hits; it is also an excellent practice, as it prepares the body to undergo the more energetic movements in the assault. Begin in this manner:

1. Stand, as in Plate I., Fig. 1, with the foil in the left hand. Salute by presenting the right hand to your adversary as high as the chin, palm of the hand upwards.

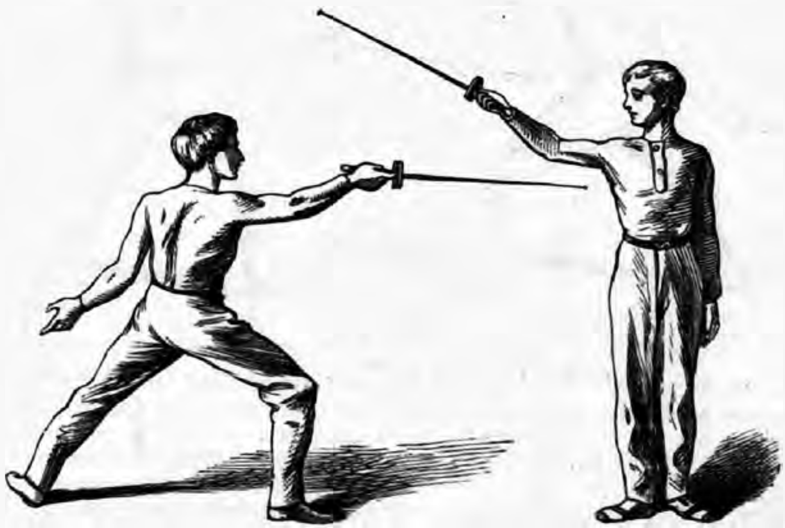


PLATE XIV.

2. Bring the hand across the body, as in Plate I., Fig. 2.
3. Raise both hands above the head. See Plate I., Fig. 3.
4. Step out on guard, in tierce, with your foil out of the line of your adversary's body, your opponent doing the same; now both beat twice with the right foot, leaving the body exposed; ask the adversary to thrust first, upon which he brings his point in front of your body, and longes in carte, but without touching your body. The distance of his point should be at least one inch from your breast. This is called measuring distance.

Your adversary having recovered, do the same by bringing the right foot up to the left ankle, dropping the left hand, the right hand brought under the chin. From this position salute, first in carte, by turning the eyes to the left simultaneously with the foil; bring the foil under the chin again; salute in tierce, bringing the foil back once more; salute your opponent by presenting your point in front of his face; then by a circular movement made inwards with both hands get on guard in carte.

THRUSTING CARTE AND TIERCE.

Engaged in carte, being the adversary's turn to thrust first, he disengages in tierce, you parry tierce, and turn the hand to seconde, nails down, by dropping the point; your opponent's foil is now over the left shoulder, holding with the fingers and thumb very slightly. Six disengages are to be made, that is to say, three on each side, finishing in carte. When your adversary gets on guard

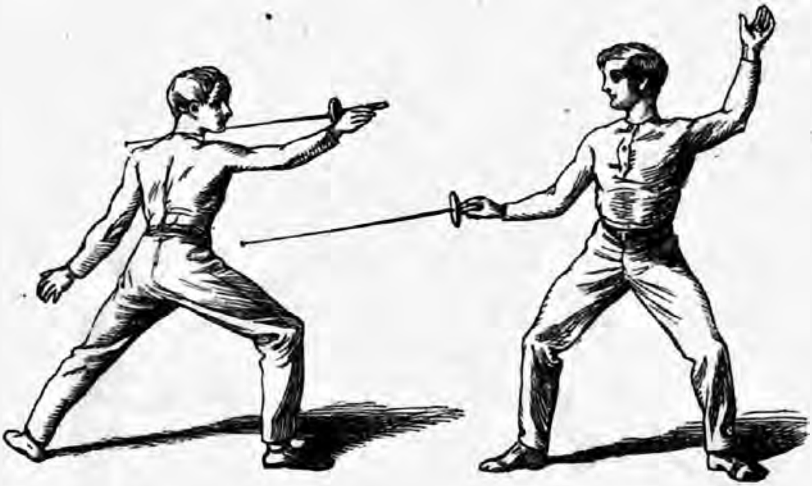


PLATE XV.

in tierce, engage with the foil, at the same time beating once with the right foot; now he disengages to carte, parry carte, and turn your foil in half-circle, nails up; his foil is now over the right shoulder. When he gets on guard, engage again in carte, beating once with right foot. When he has completed the six disengages, he finishes by feinting one, two, without longeing, recovers in tierce, leaving his body exposed, bringing the right foot up to the left ankle, left hand down to the side.

DISENGAGING CARTE AND TIERCE.

Being your own turn to thrust, your opponent asks you to do so. Begin by bringing the foil in front of your adversary's body, arm quite straight, longe in carte within one inch of his chest, recover, and both go through the salute as before; engage in carte. Make three disengages on each side as before, finishing in carte, each beat twice with the right foot, bring the right foot up directly to the left ankle, take one pace backwards with the left foot, resting the pummel of the foil on the right knee, the foil perpendicular, body upright; beat twice again, bring the left foot up to the right heel, right hand under the chin, go through the salute again, finish by describing a circle with both hands, resting the right hand on the knee, beat twice with the right foot, bring the right foot up to the left ankle, hand under the chin, and drop it to the right side over the knee, left hand down, after which put the mask on.

Beginners should wear the mask while going through the salute, to avoid the possibility of receiving a thrust in the face.

THE TIME-THRUST.

The time-thrust is to be made when your adversary comes upon you holding his hand rather low, and without being well covered. Make sure that you are covered yourself, stretch the arm, longe quickly; if he forces the foil, disengage. Never take the time-thrust unless you are pretty certain that you will not get hit at the same time.

THE MEASURE WHEN ENGAGED WITH AN ADVERSARY.

The measure being one of the most difficult things in fencing, it must be determined by the length of the foil and the height of your opponent. Keep out of distance until you know how far he can longe out. In fencing with a tall man, do not make many movements with the body, keep well on guard, make false attacks; as soon as he answers them, longe rapidly; if he parries, recover as quickly as possible.

HOW TO PARRY ALL FEINTS.

To parry all feints is to make use of all the various guards and parries learned in the lesson, varying them every moment; by this means your adversary will not be able to discover which of his feints you will answer. The counter parades, with the circle, octave, and seconde, are the best, as they baffle the designs of the adversary.

ANOTHER WAY TO DECEIVE.

Disengage in carte with a straight arm; if the opponent parries with the counter, double disengage; if he parries with the simple, feint one, two; parry sometimes when engaged in carte on the foible of his foil with your forte; changing to tierce, parry tierce; in fact, make as many movements as possible to deceive him in parrying, but never deviating from the opposition on which-ever side you are engaged, otherwise you run the risk of being hit while making your feints.

THE ASSAULT.

An assault with foils resembles an encounter with small-swords. All the thrusts and parries learned in the lesson should be brought into play, the object of each fencer being to discover the intentions of his adversary and conceal his own.

I would impress upon parents and those who have the charge of youth never to allow them to fence together without having a mask on, also a jacket of leather or some strong material, to prevent accident; also, to see that the foils are properly buttoned. When you put yourself on guard, endeavour to discover whether your opponent has a mind to attack or defend; for this purpose, take one step backwards, showing your point opposite his chest; if he thrusts, parry carte by giving a beat on his foil; if engaged in tierce, parry tierce; should he make the feint of one, two, take the counter of carte; and so on. Try not to let your adversary know your intention by your eye; keep changing to avoid this advantage which you may give him. Never throw the head forward in longeing: by so doing you cannot recover quickly. Always take care to be covered in whatever side you are engaged: if in carte, cover the body to the inside; if in tierce, cover the body outside; observe the same rule in the low guards.

HOW A FOIL IS TO BE MOUNTED.

The length of the blade is thirty-three to thirty-four inches from the shoulder to the button. First put the blade in the vice about one inch from the shoulder, bend the flat of the blade slightly towards you, so as to be in line with the concave of the handle. Then put the foil perpendicularly in the vice, about two inches of the bright part to be seen. Make the two shoulders quite square by cleansing them with a file. Next put on a piece of strong leather to make the guard and handle fit more firmly; put on the guard next; now the handle is put on by beating it down with a mallet. Should the handle be too loose, put some pieces of thin wood down the sides. The length of the pummel must be taken next: if the end of the foil projecting above the handle is too long, cut it down to an eighth of an inch, put on the pummel and rivet it on.

HOW TO BUTTON THE FOIL.

The foil is generally buttoned with gutta percha. Heat the end of the foil a little, press the gutta percha on the top, and heat the substance until it is warm, then dip your fingers in water, and make the button quite round. The best foils are those marked "Solingen," with a crown stamped on them. Should a foil break, dismount it and remount it in the following manner: file the riveting down to the surface of the pummel, then with a small punch beat out the iend of the foil, and mount your foil as before.

NECESSARY APPARATUS FOR FENCING.

To begin lessons, a pupil requires a foil gauntlet and shoes; the shoes ought to be made of buckskin tops, the soles of strong leather. After acquiring some knowledge of fencing, the pupil will require a leather jacket, which should be made of strong brown leather, in case a foil may break while making an assault; also a mask made of strong wire—the French pattern will be found the best, as they are light and yet strong.

THE REPOST OR RETURN THRUST.

The return is given, after having parried successfully, by returning a longe in the most rapid manner possible, taking care that your adversary's foil is out of the line of your body, and that you are well covered in whatever line you are engaged in, either high or low.

ON LEFT-HANDED FENCING.

When fencing with a left-handed fencer, you must adhere to the same rules as in right-hand fencing, only your carte will be his tierce, your tierce his carte. If possible, engage on the outside, so that you may be able to take the counter of carte easier, this being the stronger guard against a left-handed fencer; also use the half-circle parade against his low thrusts.

THE DOUBLE COUNTERS.

Engaged in carte, disengage to tierce, straightening the arm without longeing. If your adversary takes the guard of counter carte, disengage again; should he take the counter a second time, double, following his foil, longe in tierce; for instance, by doubling counter tierce, you deceive with a circle your opponent's counter carte.

Engaged in tierce, disengage to carte; straightening your arm, point to your opponent's chest, but be careful not to expose your body by inclining it forward; this should always be avoided. As soon as he takes the counter of tierce, double, and longe in carte; the same rule is to be observed in the lower guards; that is, if you are engaged in half-circle, disengage to octave; if your adversary takes the counter of half-circle, double and longe in octave, engage in octave, disengage to half-circle; if he takes the counter of octave or seconde, double circle, and longe in half-circle or carte.

HOW TO GUARD THE DOUBLE COUNTERS.

After having taken the counter guard twice, not meeting with the foil of your adversary, take the simple guard on the opposite side; for example, being deceived in your double guard of counter carte, take the simple guard of tierce or half-circle; being deceived in your double guard of counter tierce, take the simple guard of carte; the same for the low guards. Being deceived in your double circle, take the guard of octave; being deceived in your double of octave or seconde, take the guard of half-circle or tierce, always continuing the guard until you meet with the adversary's foil.

Another way of stopping the double movements is to take the guards of counter carte and counter tierce, or counter tierce and counter carte, without stopping; for the lower part of the body, take the guards of counter circle and counter octave, or counter octave and counter circle. This is an excellent practice to strengthen the wrist and make it supple.

OBSERVATIONS ON FENCING.

1. Never put yourself on guard within reach of your adversary's thrust, more especially at the time of drawing your sword.
2. Be not affected, negligent, nor stiff.
3. Be not angry at receiving a touch, but take care to avoid it.
4. Do not think yourself expert, but hope you may become so.
5. Be not vain of the hits you give, nor show contempt to those you receive.
6. Do not endeavour to give many thrusts on the longe, running the risk of receiving one in the interim; and it is wrong to deliver a second hit on the longe if you are certain you made a hit the first time.
7. When you present the foils to a stranger, give the choice without pressing.
8. If you are much inferior, make no long assaults.
9. Do nothing that is useless; every movement should tend to your advantage.
10. Judge of a thrust rather by reason than by its success.
11. Let your play be made as much as possible within the line of your adversary's body.
12. It is not enough that the parts of your body agree, *i.e.*, that you are supple, firm, and vigorous; they must also answer to your adversary's movements.
13. Endeavour to discover your adversary's designs and conceal your own.
14. Two skilful men fencing together act more with their heads than their hands.
15. The smaller you make your feints the quicker will your point arrive at your adversary's body.
16. Do not take the time-thrust too frequently, unless your adversary is much your inferior, and that you are not likely to be hit at the same time.
17. If one hit the body, and the other the face or elsewhere, at the same time, the hit on the body only is counted.
18. If in binding, parrying, or by any means, your adversary's foil falls, the

hit that is made in the interval is good, because you are not obliged to know that he will lose the grasp of it; but if the hit is made after you see the foil is out of his hand, you cannot reckon it, but in politeness you should pick up his foil and present it to him.

19. Never attempt to hit your adversary while thrusting carte and tierce in the salute, unless by mutual agreement; and it is a proper civility in saluting, to ask the adversary to thrust first.

20. Be sure, at no time while fencing with a skilful man, to attempt to volte, disarm, &c.; these are ridiculous things, only taught by the ignorant, and often attended with danger.

21. Never deny a hit.

22. Do not laugh nor ridicule another's manner of taking his lessons.

23. Never make use of the left arm, nor turn your back to avoid being hit on the chest.

24. Always join foils (if possible) after a hit is made, previous to another attack.

N.B.—Never use the foils without having the mask on.

A Dialogue on Fencing.

Q. When I parry your thrust over the arm, with the simple parade of tierce, what are you to do to avoid my parade?

Ans. I make the feint, une-deux, in carte, within the arm.

Q. If I make use of the counter in carte?

Ans. I should avoid your counter in carte, by doubling over the arm.

Q. Which parade must I take to prevent your doubling?

Ans. You must parry with the counter in carte, miss my blade, and take the parade of tierce, or semi-circle.

Q. If I parry your feint, une-deux, over the arm, with the counter in carte, what should you do to avoid my parade?

Ans. I make the feint, une-deux, and take advantage of your round parade, to push double carte over the arm.

Q. When I parry the feint, une-deux, in carte, with the parade of semi-circle, how would you deceive that parade?

Ans. I make the feint, une-deux, and as soon as you form the parade of semi-circle, I go over your blade, and thrust low carte.

Q. If I had parried with the circle?

Ans. I should pass twice over your blade, and thrust double carte, within the arm.

Q. When you perceive that I am going to parry with the counter in tierce, what thrust are you to make in order to touch me?

Ans. I am to double carte within the arm.

Q. How if I had parried the counter in tierce and carte?

Ans. I should have been round once, and made the feint, une-deux, over the arm.

Q. When you fence with an adversary who keeps a straight guard, what are you to do?

Ans. I am to make several beats with the right foot upon the ground; if that do not put him in disorder, I am to give him a dry beat upon the foible of his sword, in order to put it aside, then push a straight thrust.

Q. When your adversary disengages and extends his arm to thrust, what are you to fear?

Ans. I perceive it is a snare to oblige me to form a parade, so I instantly cross his blade, put it aside, and push seconde.

Q. What do you risk in crossing the blade?

Ans. He may take the opportunity to push carte over the arm.

Q. Which parade would you make in that case?

Ans. Having missed his sword, I should parry tierce; my return would be, carte over the arm, or seconde.

Q. Which is the best time to attack one's adversary?

Ans. When the least motion puts him in disorder, or when he breaks ground.

Q. Do you not fear his retreat is but a snare to take the time?

Ans. In closing on him I make sure of his sword, and know by the feel of it whether he has a mind to thrust or parry.

Q. When you have to deal with an adversary that does not feel your blade, and puts himself in an open guard, with the point of his sword downwards, what would you do?

Ans. Make false attacks, to oblige him to take a proper guard, and only thrust when he answers them.

Q. Which are the best parades in fencing?

Ans. The counter parades and circles, because they baffle all the feints.

Q. How can you tell when your adversary will make use of them?

Ans. In disengaging either in carte or tierce, or by the feel of his sword.

Q. Which are the best thrusts in fencing?

Ans. The straight thrusts pushed with swiftness; they are the only ones we ought to use when within reach, because then the body is less exposed.

Q. What is the best method to acquire swiftness?

Ans. To practise thrusting perseveringly tierce and carte, for by that exercise only I gain swiftness, firmness, exactness, &c.

RIVER-BOATING.

INTRODUCTION.—When sitting down to teach the art of Rowing, we must confess that, had it been possible, we would rather have taken up an oar than a pen. First impressions, however, are not always to be depended upon: in this very instance, we are not at all certain that we cannot give a good deal of information and do a considerable amount of good even with the instrument to which we have been reduced.

If you know little or nothing about river-rowing, we may inspire you with a desire to excel in that noble art; we can prevent you from acquiring a faulty style and bad habits which are so fearfully difficult to drop; we can put you up to the boating vocabulary, so that, though quite a young hand, you will be able to avoid blunders which would turn a laugh against you. We can describe to you all the different classes of boats on the river, so that you will know what they are called, and what they are used for, when you see them; and when you hear people talking about "tubs," "canvasses," "whiffs," &c., you will know what they are speaking about; and, finally, among other things, we can—even if you are somewhat of "an oar"—give much information which will be most useful to you when on the river, and which, if you have

not been taken regularly in hand by a waterman, you must have had very little chance of obtaining. You cannot always have a professional waterman at your elbow, but you may easily carry the following advice in your mind.

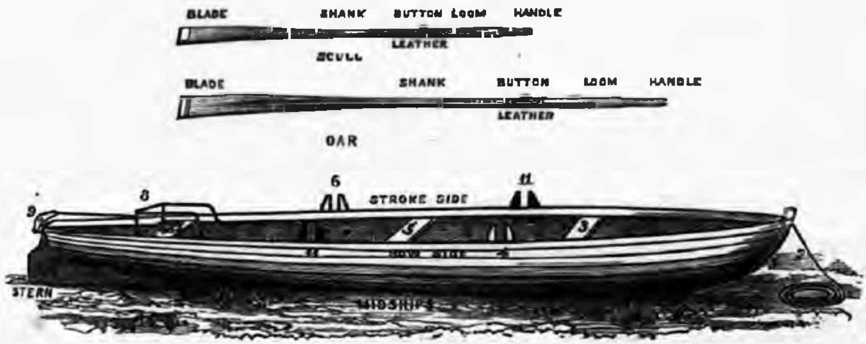
PRELIMINARY REMARKS.—Rowing is one of the most useful of the outdoor sports, as it is far more than a mere pastime, and ranks almost on a par with swimming. It is the most healthy of all exercises, as *good* rowing exercises every part of the body equably and at the same time; and if the rower is in a good state of health, and his strength is not over-taxed, it can not only do him absolutely no harm, but much good; and all violent exertion is hurtful to those of a weak constitution. However, it is not "boat-racing" which we wish to recommended, as that may be, and often is, carried to too great an excess, but the art of "boating," from which you will derive pleasure, and acquire skill, health, and strength. Before learning how to row, it is essential that you should know how to swim. Boats are liable to be upset even when in the most experienced hands, and any one unable to swim not only risks his own life, but seriously endangers those of others. Many of the rowing-boats on a river are so exceedingly light, or cranky as they are called, that a young oarsman, as he takes his place in one, cannot but feel that an upset is not an unlikely occurrence. The knowledge that he would sink like a stone in such a case would not by any means be an assistance to him in learning how to row skilfully and fearlessly. Almost the same arguments might be used as to the expediency of becoming a good "waterman," that is, mastering everything connected with river navigation, as well as becoming a good "oar." You may get into many an awkward fix on the river which, unless you are an old hand or have the necessary skill, will more than likely end in a ducking, a thing to be avoided under *any* circumstances.

Try and avoid being on the water either too early in the day, when the morning dew is unwholesome, or too late, when the heavy evening mist is equally objectionable. Darkness is infinitely more dangerous on the water than on the land: however well you may know the river, only skill will save you from being run down. Changing your clothes, both before and after rowing, is of great importance. "Flannels"—as boating costumes are called—show what you should wear. These should be taken off as soon as possible; and if you are not too hot, a good sponge over, or even a dip in the stream, is a wholesome thing to do before resuming your ordinary dress.

We shall restrict ourselves in this paper entirely to rowing on fresh water, for it is scarcely any exaggeration to say that on a river you see good rowing and bad sailing, and on the sea good sailing and bad rowing.

The popularity of rowing is remarkable, it seems so unmistakably a true British pursuit; and yet the first inter-University match was only in 1829; and boating trips, of which there are now dozens every year, were almost unheard of ten years ago. England is almost the only country in Europe in which one style of river-rowing is universal. On the Continent, standing up, forward rowing appears to be a very common method of propulsion. We also use much lighter boats than our neighbours across the Channel; but here again this is quite a modern practice: the earlier matches between the two Universities were rowed in heavy boats, and it was not until 1846 that outrigged boats were used. Inconceivably light as are some of our racing boats (a wager sculling-boat only weighs an average of 38 lbs.), there is this to be said in their favour, that they enable skill and science to compete on even terms with superior weight and strength.

Before describing all the different classes of river-boats, it will be best to begin with the model of an ordinary pair-oar GIG or DINGY.



References to Numbers.

1. Stem or Cutwater.
2. Painter.
3. Bow Thwart.
4. Bow Rowlock.
5. Stroke Thwart.
6. Stroke Rowlock.
7. Stem Thwart.
8. Chain-rail.
9. Yoke and Yoke-line.
10. Rudder.
11. Extra Rowlocks for double sculling.

The other parts of a boat, which cannot well be shown in the model, are—

The *Thole.*—That part of the rowlock against which the oar rests while pulling.

The *After-thole* or *Stopper.*—The opposite side of the rowlock.

Clockheads support the tholes.

Filling.—The leather at the bottom of the rowlock.

The *Keel.*—A long piece of wood running along the bottom of the boat.

Straiks.—The planks with which a boat is built.

Garboards.—Those nearest the keel.

Gunwale.—The top straik.

Bulwark.—Above the gunwale; seldom used in river-boats.

Stretchers.—Against which the feet of the oarsmen rest.

Stretch-pieces support the stretchers.

The *Lands.*—The inside supports of the boat.

Knees.—Pieces of wood which fasten the thwarts to the boat.

Burthens or *Bottom-boards.*—The flooring at the bottom of the boat.

State-room.—The space between the coxswain and stroke's seat.

The *Waist.*—Between the midship and forward thwart.

The *Stern-post* fits into the keel, and on it is hung the rudder.

Tintles attach the rudder to the stern-post.

Transom.—Square-sterned boats are made with one.

Bilge-piece.—A long piece of wood tapering off at the sides, and placed at the lans of the second and third straik, counting from the keel.

Lans.—Where one straik overlaps the other.

Skin.—The planking of a boat.

Steerage comprises yoke, yoke-line, and rudder.

The Technical Terms in Use.

Bow.—The name given to the rower who sits on the forward thwart in a four or eight-oar; he would also be called No. 1.

Stroke.—The sternmost oar in a boat in a four or eight-oar; No. 8 or No. 4 respectively.

Coxswain.—The steerer, who sits in the sternmost thwart.

Starboard is the right-hand side of the steerer.

Larboard or *Port.*—The left-hand side.

[These terms are really sea terms; on a river it is sufficient to say bow and stroke sides.]

Clinker-built boats have the straiks overlapping one another.

Corbel-built boats have the straiks edge to edge, which gives a perfectly smooth surface. (Wager-boats are corbel-built.)

Hitcher or *Boat-hook* consists of a *staff* or *hoe.*

To *Bale.*—To throw water out of a boat.

Tracking.—Another name for towing.

Kink.—A twist in a rope.

Beam.—Width of a boat.

Fore and *Aft.*—Front and back part of a boat.

Porting the Helm is more a sea than a river term: the effect is the same as pulling the right-hand yoke-line.

Unshipping or *Shipping.*—Taking the oar or scull out of and putting it in the rowlock. Unshipping is done by raising the hand smartly upward.

Backing Water.—Reversing the blade of the oar or scull, and rowing forwards.

Boat in technical language means the crew of the boat.

Ship.—The boat itself.

Catching a Crab—a terrible sound to all beginners—is caused by the oar turning in the water the wrong way; this forces the blade down, and causes the handle to knock the unfortunate oarsman off his seat. The only way of avoiding this misfortune is to unship the moment it is felt that all control has been lost over the oar.

Rowlocks.—There are three sorts of rowlocks:

Outriggers, introduced by the celebrated Clasper, of Newcastle, in 1841, who also invented the oars and sculls which are now used with all boats;

Swivel, principally used in sea-boats;

Inrigged, which may be of the gig or skiff clan. (*Vide* description.)

BOATS.

A GIG.—This plan of boat can be described shortly by saying that it is a broad high boat, with inrigged rowlocks, a straight gunwale, a narrow keel, nearly an upright stern, a transom, and that it carries a steerer.

There are sculling gigs, pairs, fours, and eights. They are perhaps the commonest class of pleasure-boats on a river, and the pair-oar (see model) are the most often seen of the class. Gigs, with short movable outriggers, are very popular out of Oxford and Cambridge. These boats are rather larger and narrower than the inrigged gigs. The rowlocks are either fixed alternately as in all-right boats, or are doubled so as to allow for sculling.

DINGY.—Another name for a short inrigged gig.

SKIFFS were once very popular, but have now been to a great extent supplanted by gigs. A skiff is not very unlike an inrigged gig; it is rather heavier, has not so upright a gunwale, and has a different rowlock, which is best explained by the annexed outline.

SKIFF ROWLOCKS.

SWIVEL ROWLOCK.

It is considered by some, and notably by the Author of the "Oarsman's Guide to the River Thames," to be the best class of boats for travelling purposes.

A SKIFF is a short, tight sculling boat, with skiff rowlocks.

A RANDAN may be either of the gig or skiff class, and it is the only boat which admits of a combination of sculling and rowing. Three persons row in this boat. 1 pulls a bow-oar, 2 rows with sculls, and 3 pulls a stroke-oar; it also carries a steerer. It is generally from 30 to 35 ft. long and 4 ft. wide amidships, in order to give ample space to the sculler. This rather "Cockney boat" is a very safe and handy one for river expeditions. The work in it is very easy; it carries luggage well, will sail very fairly and safely under a small lugsail, and is easy to get through a lock. On the other hand, it is barely possible to row or scull properly in it; the only chance is for the sculler to have outriggers.

A WHERRY is a boat we hear of more in history than see on the water. It is of the skiff class, but shorter, broader, stronger, and heavier, with bows projecting out of the water.

A SHALLOP.—An old-fashioned and large boat, used for pleasure parties and picnics. It may have any number of oars. Has a large state-room, and bows out of the water.

TUB BOATS, originally a *Tub*, was a name given to a boat which was not used for racing purposes; now the term is applied to all the heavier kind of racing-boats. They are long, narrow, gig-shaped boats, with long fixed outriggers, and may be either scullers, pairs, fours, or eights; the two first seldom carry a steerer. These boats on rough water, from their greater steadiness and from their carrying a keel (an immense advantage in steering), are almost as fast as the canvas or wager-boats. To all-right boats a strap is attached to the stretcher for the rower to put his feet in.

RACING OR WAGER-BOATS.—These boats are often called *Canvasses* or *Outriggers*. These, however, are wrong terms, there being canvassed and outrigged boats which are not wager-boats. A racing-boat, as may be imagined, is the lightest class of boat, the special characteristics of which are —whether sculler, pair, four, or eight (the first two never carry a steerer)—no keel, corbel-built, bows and stern canvassed over and barely out of the water, and extremely long outriggers. (See engraving of wager, pair-oar, and sculler.) All the principal races are rowed in these boats. An eight-oar is about 60 ft. long, and 2 ft. 3 in. wide; a pair-oar is about 36 ft. long and 1 ft. 8 in. wide; and a sculling-boat is 30 ft. long, 1 ft. 3 in. wide.

SCULLERS or SCULLING-BOATS have been already described under their different classes. In a wager-boat, very great care should be taken in getting in and out of the boat; but when the sculler is once seated and the sculls are *flat* on the water, they are difficult to upset. Whenever choosing a sculling-boat, the size and weight of the sculler should be borne in mind. The same sculls do not suit every one, and outriggers may sometimes be found to be too small for the sculls.

A FUNNY is a heavy wager sculling-boat; it has a keel, is canvassed over, and is generally clinker-built. It is shorter and broader than a racing-boat. At Cambridge this class of boat is often called a *Noah's Ark*, and a regular wager sculling-boat goes by the name of *Funny*.

A NOAH'S ARK.—The Cambridge name for an ordinary Funny. This is a very good boat for practising.

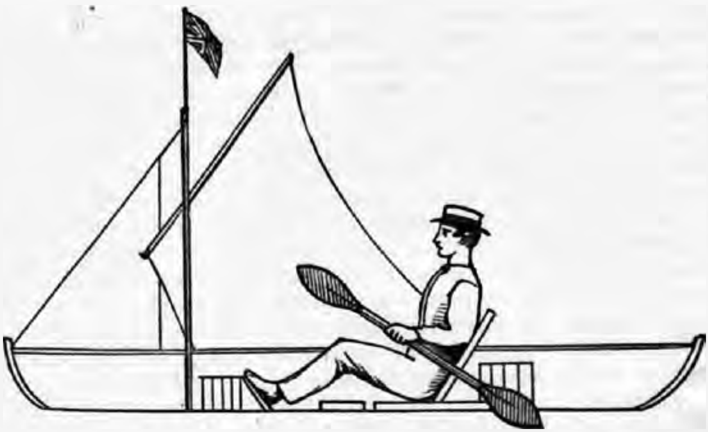
A WHIFF is a light sculling-boat, very like a Funny, except in not being canvassed over; it is easily upset.

A GALLEY.—Another name for a tub eight; originally it was only applied to an inrigged eight.

A CUTTER is, properly speaking, any boat which takes a full-lengthed oar. Now the name is generally given to a racing eight.

TOM-TIT or JOLLY-BOAT.—A very short broad boat, useful for sailing.

A PUNT.—A very strongly-built boat, with straight sides, flat bottom, and square ends. It is used for fishing and wild-fowl shooting. It is shoved along by means of a punt-pole, and has no rudder. Punting is a favourite recreation, but the art is by no means so simple as it looks. It may be easy enough merely to shove against the bottom of the river and keep the boat moving, but the knack of keeping it straight will take a long time to learn. After the shove, which should commence at the head of the punt and be continued to rather past the middle of it, the handle of the pole should be pressed against the side, by which means the natural impulse which the stern has of swinging round is checked. Beginners should be careful that, after a vigorous shove on a soft bottom, they are not left *minus* the pole, or that the punt has not slipped from under their feet, and left them suspended for a second in mid-air, to be shortly soused into the water. In deep water, punts are fitted with swivel rowlocks.



CANOES.—There are four different kinds of canoes. 1. The ordinary river-canoe, which is built of deal, is about 12 ft. long and 22 in. wide, and is canvassed over fore and aft. It has little or no keel, and is not suited for sailing; 2. A long, narrow, and light canoe, with a long spoon-shaped paddle, only used for sailing; 3. A heavy canoe, with a fan-keel, used almost entirely for sailing; 4. The "Rob Roy," a travelling canoe, designed by Mr. Mac Gregor, "to sail, to paddle, and to bear portage and rough handling." The sketch, on a scale of a quarter of an inch to the foot, gives a section of one of these canoes.

The original "Rob Roy," the one in which "a thousand miles" were compassed, was not nearly so perfect a boat for its purpose as the present one, which was designed for the cruise in the Baltic, and is now the model for all travelling canoes. (Searle of Lambeth has built over a hundred of these canoes.) The "Rob Roy" is built of oak, except the top straik, which is of

mahogany, and the deck of cedar. It weighs 60 lbs., and, with fittings complete, about 70 lbs. (An ordinary river-canoe weighs little more than half this.) Its length over all is 14 ft., beam outside 26 in., keel 1 in., and extreme depth 11 in. The paddle should not be too long; one about 7 ft. long, with flat blades of 5 in. in width, will be found to be the most useful; but for speed a longer paddle, with a spoon or clasper-shaped blade, is better. The paddle should have a leather cup or India-rubber ring on the clasp of each blade to catch the dripping water. A waterproof apron must also be used by the canoeist. The canoe sails very well and safely, but care should be taken that the sail—a working lug—is not too large. Canoes are not nearly so dangerous as is supposed. If you sit fairly straight and do not overreach yourself in your stroke, you cannot come to much harm. In paddling, work from the shoulder, and not merely from the elbows, and the exercise, though not nearly so fine a one as that of rowing, and particularly that of sculling, will develope and strengthen some important muscles.

THE ART OF ROWING.

In the beginning of this article we laid considerable stress on the importance of beginning to row well and in good style. This can only be done by the young oarsman placing himself in the hands of a good oar, and implicitly following his directions. Unfortunately, as good oarsmen are not to be found everywhere, the result is that by far the larger majority of young people learn how to row on a sort of innate "rough-and-tumble" way, which is not conducive to good style, though it may enable them to row sufficiently well for enjoyment. The best test of good rowing is "pair-oar" rowing without a steerer. A pair-oar wager-boat is shown in the illustration on p. 326. The men are "forward all," and on the point of commencing their stroke. The attitude should be carefully compared with the directions which are given below. The best way of beginning to learn is in an inrigged pair-oar, with a coxswain who should act as coach. The very worst way is pulling seven "land-lubbers" in an eight-oar, with a decent oarsman as stroke, and an old hand to steer, teach, and race. You should choose, therefore, a heavyish boat to begin with. Row really well in that, and a little confidence and practice will soon do the rest.

Step into the boat carefully—no jumping in—and notice how the waterman holds the boat against the bank in order to steady it. See that the mat is fairly fastened to the thwart, and on the proper side of the boat, and take your appointed place. Stroke (No. 2) always sits on the right hand of the steerer, and rows on the port side or left hand of the steerer; Bow (No. 1) exactly the reverse. Understand your stretcher—how to lift it, and what length you require; your knees should be neither too high nor too low. There are three kinds of stretchers: the common old-fashioned one, secured by means of stretch-pieces; those which, in addition to the stretch-pieces, are fastened with an iron band and hook and eye; and those which are secured by means of screws. Stretchers in light boats have straps attached to them. Place both your feet in them, otherwise you may pull sideways, or *screw*. You ought, however, to be able to row without the assistance of any straps. The oar, which should be roughened in the handle, ought just to clear the side of the boat; a full-lengthed oar is about 13 ft. 5 in. long, but in an inrigged boat the oar is shorter. Grasp the handle of the oar with both hands, thumbs under, the top hand close to the end of the oar, the other two inches nearer the rowlock. Some oarsmen keep the thumb of the outside hand over; in rough water they must be liable to have the oar jerked out of their hands altogether. Stretch out your arms before you to their fullest extent, elbows straight, hands low, and the blade of the oar at a *right angle* with the water. Your head should be erect, though a little forward, the shoulders square, the back straight, and your knees well bent. The men in the pair-oar illustration are exactly in this position. Drop the oar into the water and *feel* the water at once—that is, begin to pull instantaneously. This is what is called the *catch in the beginning*, and it is, perhaps, the most important part of the stroke. The blade of the oar should be covered and no more, but this should be done at the very commencement of the stroke, and kept to exactly the same depth in the water to the end. There is no greater mistake than beginning with a shallow stroke, and then deepening as you go on. We now come to the end of the stroke. You have been pulling with the *whole weight of your body* as well as with your arms; you have been pulling with your feet pressed hard against the stretcher, so as to bring every muscle in *your legs and thighs* into play. Continue the pull until your body is rather past the perpendicular and your knees straight, when you will find that your stroke has done its utmost, and that it is mere waste of power to continue it. Bring your oar out of the water, drop your wrists, and turn the back of your hands towards the chest; this will bring the blade of your oar in a line with the water, which process is called *feathering*. Feathering will require some practice; you should not attempt it at first. At Cambridge, where the water is very smooth, after the feather the blade of the oar is kept very low on the water; at Oxford and elsewhere, it is usual to feather much higher. Though not so graceful to look at, the latter method is by far the most useful. Your oar out of the water, recover your body with an elastic bound from the hips. Throw forward your arms *simultaneously* with your body, as already described, still keeping the blade of the oar horizontal with the water until you have got your hands well over your toes, when you are ready to turn the blade at a right angle with the water, and recommence your stroke. We have not half done yet. Besides rowing well on your own account, you should try to row in the same style and pull the same kind of stroke as the other man or men in the boat. You should keep exact time; hurrying on the stroke is a very common fault. Your oar should drop into the water at the same moment as the other oar or oars are dipped, and you should finish the stroke at the same time. This can only be done by keeping your eyes in the boat, carefully watching and imitating whoever is in front of you. The stroke should be as long as possible: it is the length and strength of a stroke which wins a race, and not the number of strokes which can be pulled in a minute. In swinging up and down on the stroke, you must swing straight and evenly. Any jerking, screwing, or pulling sideways is utter destruction to yourself and to everybody else in the boat.

In a light or outrigged boat more care will be necessary than in a heavy inrigged one. In the case of outriggers the oar is placed in the rowlock after you have taken your seat, but before you arrange the stretcher.

Sculling.

Sculling is rowing with two small oars or sculls. A sculling boat may be of any size or of any class, only the heavier sort carrying a steerer. The sculler sits exactly in the centre of the boat. The sculls, which should not be too heavy, should overlap three or four inches. The sculler should grasp the handle of each scull, thumbs under, and scull according to the directions given for rowing, with this difference—that each hand has to do in sculling the work of two in rowing. The two pictures give an accurate illustration of the beginning and end of the stroke.

To prevent the handles of the sculls dashing against each other, one hand should be kept slightly uppermost. Sculling, to a beginner, is certainly more difficult than rowing. To make the two sculls do exactly the same amount of work and act as exact counterparts of each other will require considerable

practice. Another difficulty is the steering. At least once in every half-dozen strokes the sculler will find it necessary to turn his head and neck—but not his body—to look behind him. The principal

Faults in Rowing,

most of which are given in treatises on the subject, are:

1. The rower or sculler omits to straighten both arms before him.
2. Continues to place his hands forward by a subsequent motion after the shoulders have attained their full reach, which is getting the body forward without the arms. Every part of the person should move in unison.
3. Extends the arms without a corresponding bend on the part of the shoulders, which is getting the arms forward without the body.
4. Catches the water with unstraightened arms; thus time may be kept, but not stroke.
5. Hangs before dipping downwards to begin the stroke.
6. Rows shallow; that is, does not cover the blade up to the shoulder.
7. Rows too deep; that is, covers the bladed part of the shank of the oar or scull.
8. Rows round and deep in the middle of the stroke, with hands high and blade still sinking after the first contact.
9. Curves his back forward or aft. Persistent stooping is most injurious to the rower.
10. Keeps one shoulder higher than the other.
11. Jerks.
12. Rocks.
13. Bends over the oar at the feather, thus bringing the body up to the handle, instead of the handle up to the body.
14. Strikes the water at an obtuse angle, instead of at a right angle.
15. Rows the first part of the stroke in the air.
16. Cuts short the end of the stroke, prematurely slackening the arms,
17. Shirks—a combination of Nos. 4 and 16.
18. Screws or rolls backwards, with an inclination towards the inside or outside of the boat.

19. Turns his elbows at the feather, instead of bringing them sharp past the flanks.
20. Keep the head depressed between the shoulders instead of erect.
21. Looks out of the boat instead of straight before him. This inevitably rocks the boat. Looking at the blade of the oar whilst rowing is a very common fault with beginners.
22. Throws up water forward instead of aft.
23. Causes a splashing by dipping the oar in the water before finishing going forward.
24. Leans on the rowlock.
25. Runs away with the stroke.
26. Rows a single careless stroke.
27. Moves in his seat whilst rowing.

Steering.

The steering of a *sculling-boat* has been already explained.

In a light *pair-oar* without a coxswain the bow-oar steers, so regulating his stroke as to keep the boat straight in its course. The stroke-oar rows on steadily, in no way interfering with the steering.

A *Coxswain* should commence learning his duties, which are as important and as difficult to learn as those of a rower, in a small but heavy boat. When he has learnt to steer this boat with a moderate use of the rudder and as few zigzags as possible, let him try a larger one. The coxswain sits on the steer thwart, keeps his legs well under him, and the yoke-lines twisted round his hand. At each stroke his body may bend forward evenly, but on no account with a jerking motion. To whatever side he wishes the boat to move, he pulls the line on that side. The pull should be a steady and even one, not hard or jerking; the yoke-line should also always be kept tight. Whenever necessary, the coxswain should call upon the bow or stroke-side oars to assist him, by pulling, backing, or holding water, in altering the course of the boat. The only chance of keeping a straight course while steering is to steer for some fixed point. The strength of the current or tide, the effect on the waters by a projecting point of land or by a small bay, the nature of backwater and of eddies, can only be learnt by experience. Wind is one of the greatest enemies of the young steerer. With a strong side wind the stern of a boat has a tendency to turn away from the wind, which gives increased labour to the oars on that side. As in such a wind the boat is driven bodily to leeward, the bows should be directed to some place to windward (the point from which the wind comes) of its destination.

The coxswain, if a good oarsman, has other duties besides that of steering. His position enables him to see what all the crew are doing, and he should not allow any fault to pass unnoticed. Coaching may be done from the river bank, but it is more effective from the coxswain's seat. It is for this reason that we advise the captain of the boat occasionally to assume the yoke-lines. In a race, besides steering, the coxswain should keep an eye upon the other boats, to prevent fouling. He should keep the stroke informed of the position of the race, state when a spurt is absolutely necessary, and, in fact, bring to bear all the intellect and pluck he possesses on the race.

Management of a Boat.

Boats are generally kept under cover in a boat-house, and the crew are expected to lend a hand both in launching and stowing away. The captain should tell off the crew according to the position they are to row, each man taking his proper oar, which for fours and eights are always numbered. Bow or coxswain should be the first person to enter the boat. The getting into a boat has already been described. All the directions of the coxswain should be implicitly obeyed.

TURNING.—A sculler would turn his boat by backing or holding water with one scull and rowing with the other. A rowing-boat is turned on the same principle, with the assistance of the rudder.

BACKING.—How to back water has been already explained. It must not be forgotten, whilst backing with the rudder fixed, that the yoke-lines are to be pulled on principles the exact opposite of ordinary steering.

LANDING.—In landing or getting a boat alongside, it is better, if possible, to row up stream. The head of the boat should be steered for the landing-jetty or wharf, and the tide or current will drift the stern level with the shore. In a heavy or inrigged boat, the oars or sculls would be unshipped and placed in the boat blades *forward.* In a tub or wager-boat, each man, after unshipping, would—according to his turn—rise, take the oar with him, and stow it away.

PASSING.—In passing, a boat—unless there is plenty of room between the boat and the shore—keeps on the outside.

MEETING.—If the boats are very close, the sculls or oars should be unshipped and allowed to drift alongside. The boat which has the tide in its favour must get out of the way. The general rule is, that boats pass each other on the left side; that is, a steerer would pull his right yoke-line, and a sculler would pull his left scull. The rule is the same on a river for boats as it is on a footpath for pedestrians. Different rivers have sometimes different rules. On a race-course every boat is expected to get out of the way of any boat going over the course, whether racing, practising, or otherwise. The winners should also always be allowed their own course as they return.

CROSSING.—A boat crossing another should, if coming down stream, keep astern of it; the same if crossing the course of a barge, as by so doing you avoid the danger of "heading" it.

TRACKING or TOWING.—All pleasure-boats should be furnished with a towing-rope and mast. If there is any tracking to be done, the steerer should at starting so hold the rudder that the bows of the boat are sent out into the stream, otherwise they would to a certainty be pulled into the bank.

WEIRS.—In going down stream great care should be taken not to approach too closely to a weir, which in England is seldom protected. Keeping on the same side of the river as the towing-path, and crossing where the ferry shows the path has changed sides, will prevent any unfortunate mishap on a strange river. A weir always announces the presence of a lock.

LOCKS are the greatest nuisances on a river. They occur every two or three miles on the Thames, and about ten minutes should be allowed for getting in and out of one. In every respect it is more difficult to pass a lock going up stream than down: some skill and considerable care is *always* required to avoid danger. Boats are more easily managed with sculls than with oars. On arriving near a lock, call out, "Lock!" and keep well away from the gates until they are completely opened. You will find all sorts of cross-currents and back-waters will try to get the upper hand; but as long as you keep clear of any obstructions and have the free use of your oars and sculls, you are all safe. On entering the lock you will have to contend against the strength of the water, which, in issuing out of the lock gates, has a tendency to turn the boat round the moment her nose shows inside the gates. Ship your oars and be ready with the boat-hook; and if you have outriggers, be particularly careful they do not hit or get jammed against anything. When inside the lock and the gates closed, you may either keep in the middle of the lock with the sculls out, or be alongside, holding fast to the sides, but looking out that the boat's gunwale or outriggers are clear of any projection. The boat must be kept as close as possible to the lower gates—the one which has just been passed—as the drawing of the upper sluices, in order to fill the lock, will cause an eddy, out of which it is better to keep. When the water has risen to its proper height, the upper gates are opened, through which it is easy enough to pass. Passing a lock down stream is much more simple. The water outside it is quiet; the principal thing to be avoided is not to go in too fast. When inside, keep by the upper gates, as the water which is being let out of the lock always sucks the boat towards the lower gates. Inside a lock strict command should be kept over the boat, otherwise she will either hitch against the side, or be thrown athwart the lock and inevitably be filled.

On the Thames below Oxford, and on the main portions of other English rivers, there are lock-keepers attached to every lock. We have not, therefore, thought it necessary to go on to the subject of opening them. Locks are also constructed upon various principles; but we strongly advise the young oarsman not to attempt to open one without the assistance of a competent person.

It may be useful to mention that the first lock on the Thames is at Teddington; and that to the time of high water at London Bridge there should be added—if you wish to know the time of high water on other parts of the river—35 minutes in the neighbourhood of Chelsea, 50 minutes at Putney, 1 hour at Hammersmith, 1 hour 10 minutes at Barnes, 1 hour 30 minutes at Kew, and 1 hour 50 minutes at Richmond.

We will conclude with some remarks on the subject of

BOAT-RACING.

A large number of boat-races are held at *regattas*. These are managed under certain rules; but as we may take for granted that our young oarsman will be a member of some boating club before he takes part in one, it is unnecessary to give them here. However, as many a friendly contest is sure to take place long before he aspires to the higher dignity of inter-club contests, it will be useful to give a summary of the *laws of boat-racing* which have been approved of by the Universities and by the principal boat-clubs.

1. That there be an umpire and a judge.
2. That the umpire may act as starter.
3. That the starter may recall the boats to their stations if he should consider the start to have been a false one.
4. That no fouling whatever be allowed.
5. That the umpire decide a foul only when appealed to.
6. That the umpire's decision be final.
7. In case of a foul, the non-fouling boat to row on over the remainder of the course, in order to be able to claim the race.
8. Any competitor, by his oar, boat, or person, coming in contact with the oar, &c.. of another competitor, to be considered to have fouled.

9. Such contact while attempting to cross a competitor's water to be a foul; but when once a clear lead has been obtained by a boat, that boat to have a right to keep the water which then becomes its own. At Eton the water assigned to a boat at starting belongs to it throughout the race.
10. When the stern of the foremost boat has clearly passed the stem of the hindmost, it shall then be considered to have a clear lead.
11. A boat's own water at starting is the straight or most direct course from the starting-post.
12. The umpire to be the sole judge of the boat's true course.
13. Unless the fouled boat comes in first, the race to be rowed over again.
14. Any boat refusing to row again to be distanced.
15. Every boat to stand by its accidents. When the width of a river will not allow all the boats which are entered for a race rowing at the same time, the race is rowed in heats, the victors of each heat afterwards contending against one another. At the Universities nearly all the races are either time or bumping races. This last description of race may be best described as a stern race, all the boats starting one after the other, with a clear boat's length between them; and if any boat can bump another (it is here that a clever coxswain may show his skill), the boat which has been bumped loses the race and rows into the bank.

In selecting a crew for a race, great care should be taken that there is not too great a difference between the weight of the rowers. In an eight-oar the heaviest man rows No. 5, and in a four-oar No. 3. The stroke need not be the captain of the boat or the best oarsman; but he should possess an even temper, sound judgment, indomitable pluck, and, above all, a perfectly steady stroke, so that the *time* from one stroke to the other should not vary by a fraction. Nos. 3 and 7 in a four or eight-oar respectively are very important oars; they have no one directly in front of them, and upon them depends all the oars on the bow-side keeping time. Before going in for a race training is considered to be necessary. This may be described in a few words as getting up at seven and going to bed at ten o'clock; meals at stated periods; the most moderate use of liquids; no smoking; a couple of hours' sharp exercise on land, and three hours' practice on the water. The great aim in practising is to row well together. A moderate crew which has arrived at this invaluable result is more than a match for a much more powerful crew unaccustomed to pull in the same boat. The more pair-oar rowing the men have, the more likely will they be to keep good time and pull the same kind of stroke, both as to form and strength. Practising should be easy at first; but towards the expiration of the training time, the whole course should be rowed over with a long swinging stroke; the time taken should be kept; short spurts should be attempted and good starts effected. Whenever the crew is found to be rowing wildly, an "ease all" should be immediately called.

We hope that our remarks on the subject of river-rowing will not only have been of use to the reader, but will have inspired him with a love for the art. There are innumerable opportunities for practising it: boats and rowing clubs are to be found on almost every sheet of water in England. Eton, Cheltenham, Radley, Shrewsbury, Winchester, and Westminster schools have boat clubs. The Universities have sculls, pair, four, and eight-oar races, both in tub and canvas boats. Every college in the University is a separate club, the members of which have races with one another. The principal clubs on the Thames are the London, North London, West London, Thames, Ariel, Twickenham, Kingston, Ilex, Ino, Leander, &c. On the Tyne, the home of the celebrated Clasper, the rowing almost more than rivals that on the Thames. We go to Paris to row races, and America comes to row against us on our own waters. The principal regattas on the Thames are those at Henley and on the Metropolitan course. There are a great number of races rowed in the year, both among amateurs and professionals. The two most important events are those for the championship of the Thames; the amateur championship goes by the name of the "Wingfield Sculls." The principal boat-builders on the Thames are Searle of Lambeth, Simmonds of Wandsworth, Salter of Putney and of Oxford, Biffen of Hammersmith, and Massinger of Kingston.

SAILING.

As a general rule, Sailing can only be fully enjoyed upon salt water,—in the bays of our coasts or the estuaries of large rivers. Inland waters are the best for rowing; but that nobler sport which Englishmen love—are they not sprung from the Vikings of old?—seeks wider fields for its gambols. A sailing-boat on a river can rarely hold a straight course up and down, on account of the windings of the stream, which bring the wind first on the side, then on the bow, and at last dead against her. If she try to "tack," she is no sooner under way on one tack than she is into the bank, and must put about on the other,—of course with the same result. Moreover, the main pleasures of sailing are absent—the dancing, springy motion, the "plash, plash!" of the waves, and the sweet sea air. The river has none of these, and nothing can make up for them. Good sheltered roadsteads like Spithead, the Solent, Plymouth Sound, and a hundred other harbours on our coasts, and the mouths of rivers like the Thames, are the places for sailing.

First Principles of Sailing.

The head or fore-part of a boat is called the *bow* or *the bows;* the other or after-end is the *stern.* Sitting aft in the *stern-sheets*, as the place for the steersman is called, and looking towards the bow, the left hand is called the *port* side (formerly "larboard"), and the right *starboard.* The sides of the boat near the stern are called respectively the port and starboard *quarters. Beam* means breadth: thus, "the boat has 6 ft. beam;" "great breadth of beam." *On the beam* means on or opposite to the side. (The beams of a ship are the transverse timbers which support the decks: their length, therefore, becomes a measure of the ship's breadth; hence the term.) (1.)

The direction in which the wind blows is called *to windward;* the opposite direction, *to leeward.* When a ship drifts sideways or backwards from the wind, she is said to be *making lee-way.* The *weather* side of anything is that against which the wind blows; the other is the *lee* or sheltered side. To weather an object is to pass on the windward side of it—between it and the wind, in fact. (2.)

The horizon, like the compass, is divided into thirty-two "points," the names of which are well known. If you face the wind, that point in the heavens full on your right or left will be "eight points from the wind," and straight behind you will be sixteen points, and so on. Four points from the wind would be half-way between the point you face and the point on your side. (See Fig. 1.)

In Fig. 2 the wind is said to be against the boat, or

Ahead, when blowing from A.
On the starboard bow, from anywhere between A and B.
On the starboard beam, between B and D, but especially from C.
On the starboard quarter, between D and E.
Astern or abaft, from E.
On the port quarter, between E and F.
On the port beam, between F and H, but especially from G.
On the port bow, between H and A.

In Fig. 1, wind blowing from 2 *a* would be called "two points on the port bow;" from 5 *a*, "three points before the starboard beam;" from 10 *a*, "two points abaft the port beam."

SAILING WITH THE WIND NEARLY OR QUITE ASTERN.—If a sail or anything capable of catching the wind be raised up in a boat when the wind is

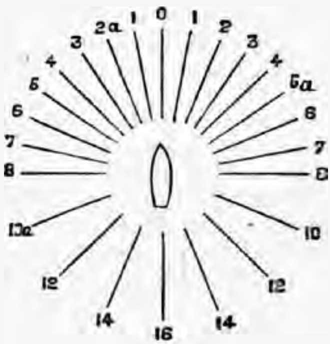


FIG. 1.

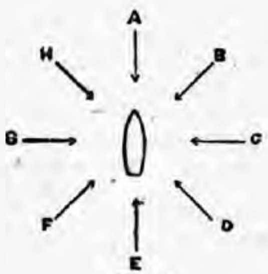


FIG. 2.

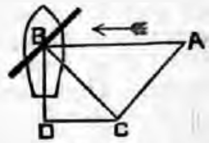


FIG. 3.

FIG. 4.

astern, any one can see that she will *scud*, or *run before the wind*, so long as the rudder keeps her straight; and it is easy to understand that the rudder will be able to do this even with the wind from D or F in Fig. 2. An open umbrella has done the writer good service on the Thames, and has carried him up against stream as long as the wind kept well behind the boat.

This kind of sailing is plain enough to every one; but many people are puzzled to see how a boat can advance when the wind is "a-beam," and tending only, as they think, to blow her sideways; and how it can be possible to sail *against* the wind, or *beat up to windward*, as sailors call it, passes their comprehension altogether. At first sight it does appear strange that the very breeze which should blow us to the west is pressed into our service to take us to the east. Truly the wind is mighty and man is weak, but skill makes up for lack of strength; thus we prove mind superior to matter, and learn that in sailing, as in all things else, "knowledge is power."

SAILING WITH THE WIND ON THE BEAM—called also *Sailing on a Reach or Reaching.*—In Fig 3 is shown a vessel with a sail represented by the thick line. The wind blows from A in the direction A B. Now, under these circumstances, if the sail were set right across the vessel (as it would be to fit her for moving before the wind), the wind would only strike it on the edge, and produce no effect beyond shaking it. On the other hand, if it were turned "fore and aft"—*i.e.*, with its length in the direction of the length of the vessel—the wind would act upon it with great force, perhaps overturning the boat, and certainly blowing her more or less to leeward. But when the sail is held by suitable ropes in the position shown, then each particle of the stream of air which strikes the sail bounds off, after striking, right astern, or parallel with the line B D, just as a marble bounds off when thrown slantwise against a wall. Now, though this little paper is upon sailing, and not upon mathematics, it is yet necessary to point out, since "action and reaction are always equal," that the wind, in bounding off towards the stern, exerts a pressure—a kind of parting kick—upon the sail *in the contrary direction.* Two forces are thus at work upon the sail, one trying to drive it sideways, the other forwards. If the boat were round instead of long and pointed, it would, by the law known as the "composition of forces," be driven in the direction C B; but as the shape of the boat is such that it will easily slip bow first through the water, while it will only move sideways through it with difficulty, it follows that of the two pressures mentioned, the forward one, D B, alone produces much effect. Any little falling away to leeward caused by the pressure A B is corrected by the rudder. Thus the wind on the beam sends the boat ahead.

Taking the line A B to represent the force as well as the direction of the wind in Fig. 3, we can, by the law of "composition of forces," resolve it into the forces A C and C B, the latter representing the real pressure of the wind upon the sail. But C B, by the same law, resolves itself into C D and D B. D B (just half of A B) stands for the power finally available to drive the boat *forward,* while C D represents the power wasted in the fruitless attempt to drive her sideways. When the wind is on the beam about half the effect produced by it on the sail is thus wasted.

SAILING WITH THE WIND ON EITHER BOW, called also *Sailing on a Wind* or *Sailing close-hauled.*—In Fig. 4 we have the wind on the starboard bow. By setting the sail to the angle shown, and by the same process of reasoning as in the last case, we get a force resulting in the direction C B, resolvable into C D and D B as before, but with the difference that C D, the part wasted, is now very much larger than the useful force, D B. No arrangement of sail can enable the vessel to advance when the wind is dead against her, and few boats can sail when it is more unfavourable than is shown in Fig. 4. Some have done so, but to sail "within less than four points of the wind" is a rare achievement: a boat must be built expressly for sailing to do so well, since the amount of useful power then gained from the wind is too slight to move a clumsy hull through the water.

TACKING.—With the wind blowing in the direction of the arrows, it is evident that the boat at A in Fig. 5 can easily reach B or C, or any point between them, by merely moving there "before the wind." As easily can she reach D or E, having the wind upon her beam in going there; and the last paragraph shows how she can reach F and G, by merely sailing there close-hauled and just within four points of the wind. But how is she to approach any point between F and G—H, for instance—seeing that the wind is then

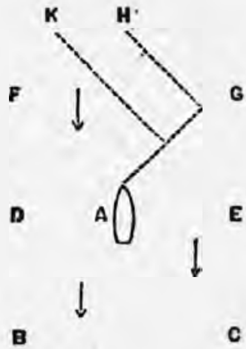


FIG. 5.

dead against her? A little contrivance overcomes the difficulty. The boat must first sail towards G, with the wind on her port bow; when she has gone far enough she "puts about," and sails to H with the wind on the starboard bow. If K were the point aimed at, she would "make a short leg and a long one"—an expression easily understood by looking at the dotted lines. If the boat had to sail a long distance against the wind, she would make a number of these "tacks" or "boards" (B C, C D, &c., in Fig. 6), going first to the right and then to the left of her proper line of journey until she reached her destination. This zigzag method is called "tacking" or "beating up to windward," and is the most important part of the sailor's lesson. Any lubber can go to leeward (and often does, whether he wants to or not), but only a sailor can get to windward.

In Fig. 6 the boat A, sailing to H, makes successive "tacks" to B, C, and D, thus getting about half-way, she being but a clumsy sailer; but if of better build, the same tacks may bring her to B′, C′, and D′, in which case she has only to make one short tack to H to reach her destination. The clumsy boat has still the tacks D E and E F before her ere she can "lay her head" for H. This great difference arises from the one being able to sail within *four* points of the wind, while the other cannot get nearer than five.

On the line B C the boat is on the *port tack*, because the wind is then on the port bow; from C to D she is on the *starboard tack*, and so on. The change from one tack to another is called *putting* or *going about*. The longer each tack can be made without going too far out of the way the better, but in this the sailor is guided by circumstances. Some obstacle, for instance, at K may prevent the completion of the tack C′ D′, and call for some ingenuity to arrange tacks which shall keep the boat clear of it.

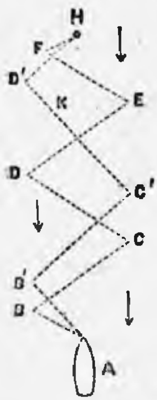


FIG. 6.

These explanations are dry, but very necessary. A man who understands the *reason* of what he does, in a boat or anywhere else, is worth twice as much as one who works by "rule of thumb."

II.—THE BOAT AND HER SAILS.

Ships and boats are rigged very differently. The former depend chiefly on *square sails* hung to horizontal yards, placed *across* the ship (as in Fig. 3), half of the yard and sail being on each side of the mast it hangs from. Square sails are best for running before the wind; but they cannot be braced round far enough to enable the ship to sail as close to the wind as is shown in Fig. 4 (although for convenience the boat is there represented with a square sail). Small vessels and boats carry *fore-and-aft sails*—*i.e.*, sails which naturally hang in a line with the keel: these are more manageable. The "lug" is the only approach to a square sail carried by a boat.

Perhaps the best and safest rig for an open boat is the *sprit-sail and fore-sail* rig, with the addition of a *mizzen*, a sail often but not always added to boats of all kinds. We accordingly take this rig first. (See Fig. 7.)

The *mast*, D, passes down through a hole in one of the *thwarts*, as the cross seats in a boat are called, and its *heel*, or lower end, is "stepped" in the floor of the boat. A rope called a *stay*, G, on each side keeps it steady. The *main-*

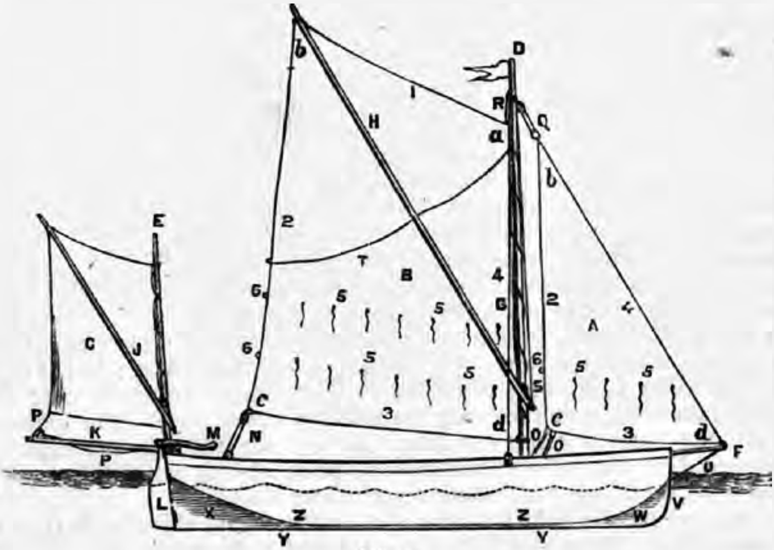


FIG. 7.

sail, B, is laced to the mast by a small rope, passed through little metal rings sewn into the edge of the sail, called *thimbles*. The sides and corners of this and all other four-sided fore-and-aft sails are thus named:

Sides	1. Head. 2. After-leach. 3. Foot. 4. Fore-leach or luff.	Corners	*a.* Throat. *b.* Peak. *c.* Clew. *d.* Tack.

These names, except the "head" and "throat," apply also to the fore-sail in Fig. 7, and all other triangular sails. The small hanging ropes marked 5 are *reef-points* or *knittles:* they are arranged in pairs on opposite sides of the sail. The canvas below a line of these being gathered up close, they are tied in couples beneath the gathered up portion, thus reducing the size of the sail by as much canvas as lies between them and the foot. This is *reefing*. 6, 6 are *reef-cringles* or thimbles, to which the sheet is made fast when reefing, instead of to the original clew. When there is a boom (see 25), the cringles are lashed to it by the *reef-earrings*—ropes attached to the boom for that purpose. The main-sail is hoisted by the main halyard, R, a rope passing over a *sheave* or pulley let into the mast near the top, and thence brought down below, where its end or "fall" is made fast or "belayed" round a thwart or elsewhere. The sail is extended by a spar called the *spreet*, H, pointed at each end. The smaller end is pushed into a rope "eye" at the peak of the sail; the other end is held close to the mast by fitting into an "eye" in the *snotter* or

FIG. 8.

snorter (Fig. 8), the largest loop of which encircles the mast. When fixed, the snotter is pushed up the mast until the sail is strained tight. It will not slip down unless the spreet is a heavy one, in which case its weight is taken by the *heel-rope*, S, which also has an eye at the end, into which the spreet fits. The heel-rope passes through a block at the mast-head, and is hauled tight from below.

The position of the main-sail is regulated by the *main-sheet*, N, the most important rope in the boat. As there is much strain upon it, a system of *blocks*—pulleys contained in wooden cases or "shells"—is used to gain power. Such a combination of blocks is called a *tackle* (pronounced "taykle"); a more powerful combination is a *purchase*. Fig. 9 shows the smallest and least powerful kind of tackle, sufficient, however, for the sheet of a small boat. It consists of two blocks, C and D: the lower one (shown in section) usually slides across the boat, as the sail changes sides, along an iron bar, B, called a *horse* or *hawse*. When there is no bar and the sail has no boom, the lower block is hooked to a ring on the lee side of the boat, and shifted across by hand as required. The rope in every tackle, &c., is divided into the *standing* part (E in Fig. 9), between the fixed end and the first pulley it passes through; the *running* part (F), included between the first and last pulleys in the series; and the *fall*, G, the part outside the pulleys altogether. The parts of an ordinary halyard are named in the same way. A is the clew of the sail.

FIG. 9.

THE SHEET MUST NEVER BE MADE FAST: keep it always in your hand. If a squall strikes the boat when the sheet is made fast, she must upset, for you have no time then to lower the sail or brail it up; but let go the sheet, and the sail yields directly. Keep the end in a neat coil, free of all obstacles, and ready to run through the blocks in a moment, lest in running out at the critical moment it may "kink" or curl round a thwart, another rope, or some one's foot, and lead to the same misfortune. The sheets of smaller sails may be made fast, but the main-sheet never. Hauling in or "easing off" the main-sheet is the only means of regulating the angle at which the main-sail is set.

Too large a sprit-sail is difficult to hoist. The spreet cannot be got into its place without practice, and the beginner's only chance of doing it is with the boat's head to the wind. A sprit-sail boat should be under 20 ft. long for an amateur.

The *fore-sail*, A, usually, though not always, acts the part of a *fore-stay*, for which purpose a stout rope is sewn along its fore-leach to strengthen it. The "tack" of the fore-sail hooks or fastens to a ring on the stem, or else to the bowsprit, and the peak to a single block (one of a pair arranged on the same principle as those in Fig. 9), through which the *fore-halyard*, Q, passes. The upper block of the pair is attached to the mast. Sometimes the upper block is replaced by a sheave in the mast, when the standing part of the rope is fastened to the mast, instead of to the upper block. The fall of the rope is secured somewhere below, and its loose end neatly coiled up.

The fore-sail has two sheets, O O, both, for convenience, carried right aft (through rings fastened to the side of the boat), one sheet coming aft on each side. By easing off the port fore-sheet, and hauling in the starboard one, the foresail can be set over to starboard, and *vice versâ*. Two blocks (one for each sheet) are generally fastened to the clew of the sail.

It is usual, with short boats, to add a small iron bowsprit, F, called a *bumkin*, held down by the *bob-stay*, U. Pieces of wood or metal, called *cleats*, are fastened to different parts of the boat, to attach the ends of halyards and other "running rigging" to, when they are hauled taut (tight).

The main-sail must be fitted with a *brail*, T, a rope for suddenly gathering up the sail in a squall. One end is fastened to the mast near the throat of the sail; the other end passes through a block close by, but on the *other side* of the sail (which is thus enclosed in a kind of loop). When the fall or free end is pulled, and the sheet loosened, the sail is gathered up. The brail should *not* enclose the spreet as well as the sail.

The *mizzen*, C, and its mast, E, require no stays or halyards, and give no trouble at all. When the boat goes about, the sail swings over just as far as the mizzen sheet will let it, and thus takes care of itself. A miniature sprit-sail is shown in Fig. 7. A "lug" is perhaps more general, but the kind is no great matter. With a mizzen you do not want so large and heavy a main-sail; besides which, it is like the flat part of a weathercock, always tending to bring the boat's head to the wind—an important matter, as we shall see further on. The chief difficulty is in arranging the sheet. In short boats, the sail must overhang the stern; it is therefore usual to put out a fixed boom or bumkin, K; the sheet, P, is led in through a block at the end of this. Sometimes the boom swings with the sail: the sheet is then fastened half-way out on the swinging boom, and led in, as before, by means of a *short* fixed one (as in Fig. 20). The mast is stepped "right aft" (quite at the stern). If the stern rises straight, as in Fig. 7, the mast must be fixed rather to one side, to allow the tiller to work, or it may be in the centre if a *curved iron tiller* be used. A good plan is to fix it outside the stern, a little to one side of the rudder-head. If the stern overhangs beyond the rudder, the mast is stepped on the overhanging part, out of the way: this is the best arrangement.

The *rudder*, L, is a flat piece of wood, hinged to the stern-posts by long hooks called *pintles*, which admit of its being removed (mind that it never comes unshipped, though, when out cruising). To the top, or head, is fastened a long wood or iron handle called the *tiller* or *helm*, M, by which it can be turned to either side. Remember that the "helm" is the tiller, not the rudder itself: since the boat's head turns to the same side as the rudder, and since pushing the helm to the right sends the rudder to the left, remember that to turn the boat to the right, you put the helm a-port, or to the left; to turn it to the left, put the helm a-starboard. In Fig. 10 the helm and rudder are in their natural positions amidships—*i.e.*, in the middle; in Fig. 11 the helm is "a-port," and the boat's head, therefore, going to the right; in Fig. 12 it is "hard a-starboard," and the boat's head flying fast to the left.

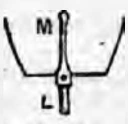


Fig. 10.

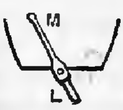


Fig. 11.

Fig. 12.

When running exactly before the wind the boat is "on an even keel;" but at other times the wind must be on one side or the other. With wind from the starboard side the boat "has a list," or "heels," or leans over to port. To put the helm-a-port is therefore to put it *down* or *a-lee*, since the port side is then the lowest; and to put it a-starboard is to put it *up*, or *a-weather*. The side the wind comes from is always the highest; to put the helm down is therefore to put it away from the wind; this we know will bring the boat's head *towards* the wind. These terms, "up" and "down," are very important to be remembered.

HULL, or body of the boat.—A sturdy little sailing-skiff, like that in Fig. 7, should be 15 or 16 ft. long by 5 or 6 wide. The depth may be moderate—2½ to 3 ft.—as the press of sail is not great. The draught of water will be about 1½ ft. Cutters and racing-boats, intended to sail very close to the wind and to carry much canvas, are built deep in the water, with plenty of keel to give them a grip or hold upon it; this prevents their driving to leeward when on a wind, as flatter-bottomed boats will do. The ends of a boat, being made sharp for speed, are the parts with most hold on the water; W is the *fore-foot*, X the *dead-wood.* The tapering part which ends in the dead-wood is called the *run.* A fine or sharp run is as important for speed as a fine *entrance* or bow. Y Y is the *keel*, connected with which, but along the *inside* of the bottom, is a timber called the *keelson*, to which the *ribs* are fastened. The upright supporting the stern is the *stern-post.* The one at the bow is the *stem*, and its front edge is the *cutwater*, V. The rounded sides of the boat, on which it would rest if aground, are called the *bilges*, Z Z.

To sail well a boat must be in proper *trim*, so as to "sit" the water rightly. The bows must be well out, to keep her dry; they should also "flare outwards" a little. The hull must be weighted artificially with *ballast* to prevent it overturning; but the best of all ballast is CAUTION. Too much ballast is better than too little (and so is too much care if there can be too much). Place it amidships, but rather aft than forward: weight in the bows is always objectionable. Above all, see that it cannot shift or break loose. If it goes tumbling into the lee bilge when the boat is already heeling over to the limit of safety, then it's all up—or rather all down—with the good ship and her crew. Iron "pigs," or bars of 56 lbs. each, laid crosswise on the bottom, are convenient. The boat in Fig. 7 should have four or five of these. But it is nearly useless to give directions as to *quantity:* the opinion of one practical boatman who has sailed the boat is worth that of a dozen advisers who have never seen her. Lead is the best ballast, but expensive; like the precious metals, however, it always fetches its price when sold. Bags or boxes of shingle, and even kegs of water, are used; but they are not so good as metal.

Never use "shifting ballast," *i.e.*, ballast which has to be heaped up to port when on the port tack, and to starboard when on the starboard tack, to increase its effect. Be content to carry enough to keep your boat steady, without moving it from its proper place in the centre. Shifting ballast will bring you to grief some day, by shifting of its own accord once too often. Its use is now forbidden by all good yacht clubs, as unsailorlike.

Another kind of "trim" has to be seen to. If you had no sail set but the mizzen, of course the stern would fly round away from the wind directly; so would the bow if only the fore-sail were set. Now, in proper trim, these two sails should be so balanced in point of size that if the boat, with only these two set, be placed broadside to the wind, the stern shall gradually and slowly fall away and bring up the head to the wind. The same thing should happen when all three are set. This is called *carrying a weather-helm*, which every boat should do. It means that when on a wind the helm must be kept slightly up or a-weather (to windward), to prevent the head from coming up in the wind or "luffing" of itself. The safest of all positions for a boat is head to wind; the wind cannot then capsize her by its pressure on the sails, which flap harmlessly like flags in the breeze, while the buoyant bows "lift" easily to waves which, if received on the stern, would very likely break over and sink the boat. Whenever anything goes wrong, or any change requires a temporary stoppage—when a squall strikes you, or any emergency arises—then down with the helm and *luff* directly. If the occasion be a squall, of course you will let go the sheet as well. With a weather-helm the boat does this for herself, and even with a disabled rudder she puts herself out of mischief by uffing spontaneously in a moment.

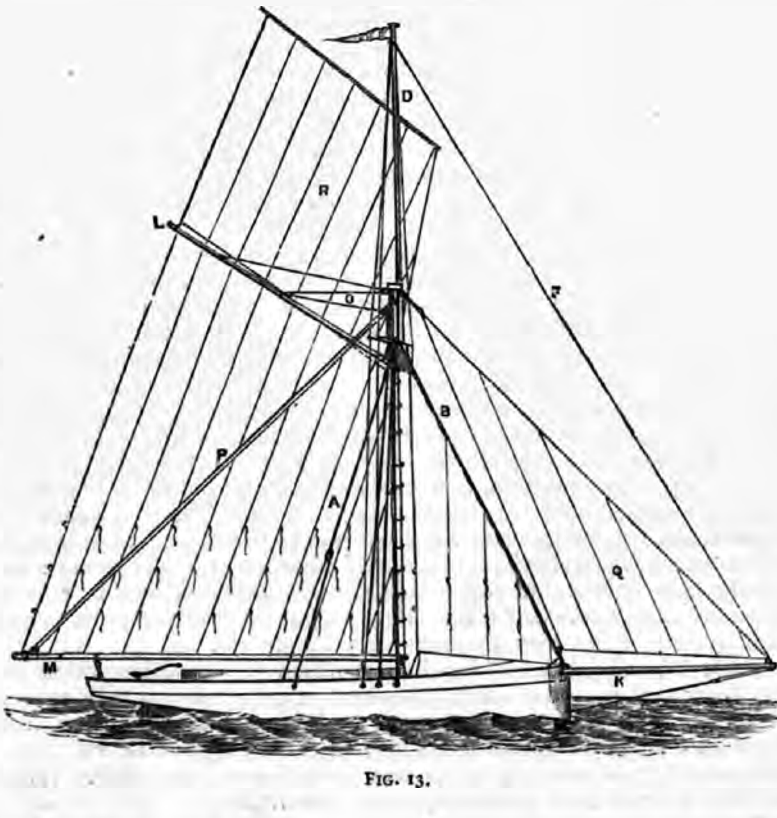


FIG. 13.

We next take that ancient favourite and most perfect sailing boat, the CUTTER (Fig. 13). A half-decked cutter of from 7 to 10 tons is a capital boat for two hands. Smaller boats are often rigged as cutters, but without the top-mast or gaff-topsail.

Cutters and all small boats intended to carry much sail should be "half-decked," *i.e.*, should have a deck from the bow to the mast, and a narrow deck called a *waterway*, about a foot wide, running along each side to the stern, which is also decked over. The crew occupy the "well," as the undecked part is called. The boat in Fig. 13 is about 21 ft. long by 7 ft. wide. The deck has no bulwarks, but a guard or *coaming* round the well, a few inches high, which keeps out the water. The rudder rises through a hole in the overhanging stern. Under the half-deck is a kind of store cabin called the *cuddy*.

The cutter's mast is a fixture, strongly secured to the "bulkhead," or division which separates the little store cabin from the well, and firmly supported by two or three shrouds on each side, and a *back-stay* (A in Fig. 13), and the *fore-stay*, B. The latter is fastened to the stem; at the top it divides in two, so as not to interfere with the top-mast (see also Fig. 14). The top-mast, D, is held up by the two *caps* of wood or metal, C C, through which it slides up and down. It is raised by the *top-rope*, E, a rope fastened to the upper cap, and passed through a sheave or pulley let into the heel of the top-mast, and then through a block at the upper cap. When the fall of this rope is eased off, the top-mast descends by its own weight. It can be raised again directly by merely hauling on the rope. The top-mast is steadied by the *top-mast shrouds*, G G, which, to make them act with greater effect, are held out by the *crosstree*, H, a piece of wood or iron secured transversely to the lower cap. Sometimes two crosstrees are employed, a few inches apart. The top-mast fore-stay, F, passes through a block at the end of the bowsprit, so that, like the top-mast shrouds, its length can be adjusted when the topmast is lowered.

The running-bowsprit, K, is secured on much the same principle as the top-mast, so as to slide in and out through a ring at the stem called the *gammon*, and between two pieces of wood called the *bits*, half-way to the mast. The bob-stay is adjustable so as to shorten easily. The bowsprit has often a total length of about two-thirds the length of the boat; the lower mast, from heel to cap, the same length as the boat.

The head of the main-sail is laced to the *gaff*, L, while the clew is held out by the *boom*, M, which enables the sail to be kept flatter than the sprit-sail. The Americans *lace* the sail to the boom, which keeps it flatter still. When the sails are furled, the boom is supported by the *boom-rest*, a portable iron like a rowlock, placed near the stern. Both gaff and boom end in a kind of fork (called the *jaws*) which fits loosely to the mast, with free play sideways and up and down. The jaws are held to the mast by a piece of rope passed behind it, connecting the two points of the fork.

The *luff* or *fore-leach* of the main-sail is held to the mast by wooden hoops, which slip up and down. The gaff is raised by the *throat-halyards*, N, and the *peak-halyards*, O, which must be hauled upon alternately when hoisting sail. The main-tack is sometimes gathered up, when you wish to reduce sail a little, by hauling a rope called the *trice-rope*, and easing the *tack-tackle* (which holds down the tack). The weight of the boom is taken off the sail by the *topping-lift*, P. The main-sheet does not differ from that of a sprit-sail, except that it is fastened to the boom,

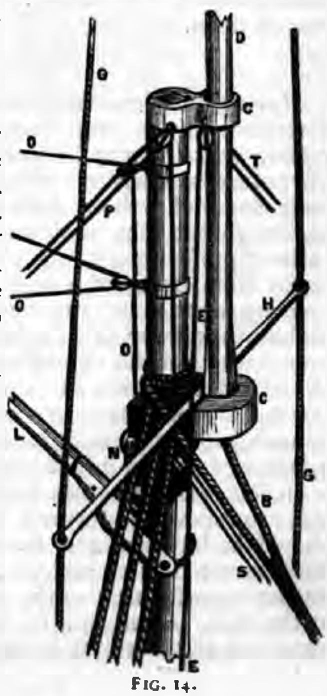


FIG. 14.

and not to the clew itself, and that it consists of a more powerful tackle, with at least one double block or pulley. It is also secured in the middle of the stern, and does not run upon a hawse.

The fore-sail (*fore-stay-sail*, more correctly) is connected with the fore-stay by rings called *hanks*; otherwise it resembles the fore-sail already described. S, *fore-sail-halyards.*

The *jib*, Q, is a sail requiring careful management. Better have it too small than too large. If too large, it destroys the weather-helm and is for ever blowing the boat's head into mischief. The tack is hooked to an iron ring called a *traveller*, which is drawn in and out along the bowsprit by a rope called the *out-haul.* The *jib-sheets* are treated much as the fore-sheets are. The *jib-halyards*, T, with a very heavy sail, become the *jib-purchase* (a more powerful arrangement) by pulling on the other end of the rope in a manner which we have not space to explain.

The square *gaff-top-sail*, R, is only suited to light winds or when running free. It is raised by its appropriate halyard, and its lower corners are extended by the *top-sail-sheet*, which is always kept rove through a block at the end of the gaff, and by a rope called the *tack.* A triangular top-sail without a yard is often used, especially by fishing and trading-boats.

Large cutters carry a great square sail and yard for running before the wind, and other fancy sails, such as the *ringtail*, a kind of extension of the main-sail farther aft; but little boats have no business with such gear. Racing yachts hoist immense "balloon jibs," which draw very powerfully, but which must be well managed to be of much use in beating to windward. He who wants to win a race must risk many dangers which our young friends will do well to avoid, and having the boat's head blown round by the balloon jib is one of them.

III.—Practical Lessons.

Having thus described the most important rigs, we proceed to such practical directions as this little treatise gives space for. We can but point out *principles; practice* must be learnt from very different teachers. Much nonsense, nevertheless, is written about the absolute need of long experience and the uselessness of written description, by which some authors escape from explaining what they doubtless know little about. Too much homage is paid to the "professionals," the old boatmen, whose skill, through great in its way, is far from being of a high order. From them must be learnt the arts of splicing ropes, making many mysterious and useful *knots*, deftly furling, reefing, and stowing away sails, trimming the ballast, and the thousand and one little points which make the difference between handiness and unhandiness. But the broad principles of sailing, which a clever boy may learn in a day, are beyond the old boatman's comprehension; and if in practice he gets on well enough without them, it is only after long years of apprenticeship, from which a better education might have saved him.

In Running before the Wind, all but the smallest boats require back-stays to relieve the forward strain on the mast; the back-stay on the lee side should be loosened and the main-sheet eased out, to let the main-sail place itself as much as possible at right angles to the boat; boom out the fore-sail on the opposite side to the main-sail by sticking the boat-hook into the eye at the clew, and resting its end against some object inboard. Set the fore-sheets so as to keep it in this position; ease out the jib-sheets, to give that sail a chance of catching some of the wind escaping past the other two. The gaff-top-sail takes care of itself. Running before the wind is simple, but not without peril. With a gusty wind or a lively sea the main-sail is apt suddenly to *gybe* or change sides. A heavy sail may go over with a jerk sufficient to carry away mast, stays, and everything, besides sweeping the crew overboard with its boom as it flaps across the vessel. Watch for the least suspicious movement of the sail. If it threatens to come over, down with the helm, so as to get the wind more upon the beam : this will probably check it ; if not, seize the sheet and haul in what you can, to be let out again *gradually* when the sail has partly gone over.

WEARING, or bearing up from the wind, is the opposite of luffing. The boat in Fig. 15, from sailing with the wind on the port bow, bears up until it is on her port beam, port quarter, and at last on her starboard quarter. Between *a* and *b* the main-sail has to gybe or change sides, as is evident by noting the direction of the arrows. If the sail has brails, brail it up, and you may gybe without danger ; otherwise, haul in the sheet discreetly, and let it out gently as the sail goes over; besides which you may loose the peak-halyards. With wind before the beam you can relieve the sail from pressure by letting go the sheet, when of course it puts itself edge to the wind; but remember that with too much wind *abaft* no such relief can be given : reducing sail is the only resource. Haul up the main-tack, lower the peak, then reef the main-sail and take in the jib. If the wind still rises, sail under fore-sail and mizzen only, if you only have one; if not, under close-reefed fore and main-sails. At length the boat will refuse to answer the helm, owing to the violent pitching. Choose another course: run for any port you can reach, close-hauled; if that will not do, then heave to. Watch for a smooth interval to luff in, such as is known generally to follow after three large waves.

FIG. 15.

SAILING WITH THE WIND A-BEAM, or "on a bowline," is the pleasantest way of any. Long boats with two or three masts, where the sails do not rob each other of wind, are particularly in their glory on a bowline. See that your sails are at the proper angle for drawing powerfully, and keep the sheet in one hand and the tiller in the other—which is about all the counsel we can offer. Look out for squalls, and luff when you see them. If that won't do, let go the sheet as well. With plenty of well-secured ballast, don't be nervous at heeling over—it is half the fun. But though brave, be cautious, and be ready to luff in a moment when the pressure is too great.

The theory of BEATING TO WINDWARD has been already explained elsewhere. Sailing close-hauled is similar to sailing with the wind a-beam, except that the sails (*i.e.*, the clews of the sails) are hauled close in, so as to be more nearly in a line with the keel; hence the term "close-hauled." The angle to which the sails are set must also be adjusted with greater nicety, and the steering must be your very best. The great art is to keep the sails always full of wind, without going farther from the wind than is necessary, or to keep as close to the wind as you can without allowing the sails to flap. Watch the fore-leach of the main-sail. If it quivers, up with the helm, and ease her off a bit; but never cease your effort to edge up as close to the wind as possible. Many people steer by a flag or vane at the mast-head; but the luff of the main-sail is a better guide. The worst plan of all is to keep straight for any fixed object, because the wind is never quite steady, and you can edge up closer in one gust than you can, perhaps, in the next.

Sailing close-hauled, or "on a wind," is the safest of all positions for a boat, because she keeps, as it were, her face to the danger, or at least can face it in a moment by putting the helm down. If a squall comes, or a heavy wave bears down from the weather bow, luff at once; but try to get on your course again as soon as possible, as it does not do to lose "steerage way," *i.e.*, sufficient movement through the water to enable the rudder to take effect.

PUTTING ABOUT, GOING ABOUT, or changing from one tack to another, is a neat manœuvre, requiring some judgment. Suppose your boat close-hauled on the port tack, that is, with the wind on your port or left side—say on the line B C in Fig. 6. On reaching C you think it time to go about, so as not to get too far from your proper course (from A to H). All your sails are over to starboard, the main-sail kept there by the wind only (being otherwise free to swing to either side as far as the sheet will let it). The fore-sail and jib, however, are kept in position by their respective sheets on the starboard side

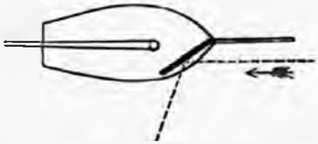


FIG 16.

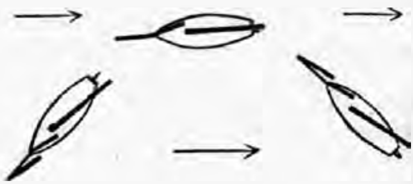


FIG. 17.

being hauled in and made fast (somewhere aft, as before explained). At the selected moment you put down the helm, not suddenly or impatiently, but rather gradually. At the same instant, or just before, loosen the jib-sheet on the starboard side, so that as the boat's head turns to port the jib may flutter in the wind. The main-sail is now in the same state, its boom hanging fore and aft. The boat is said to be "in stays,"—a critical moment if she has not sufficient way upon her. But if she has way enough, her head still goes round to port, to which side the main-sail swings just as far as it formerly was to starboard; meantime the port jib-sheet has been hauled in, and the boat springs forward on the starboard tack. The gaff top-sail, of course, swings with the main-sail.

Hitherto no mention has been made of the fore-sail (fore-stay-sail). Unlike the others, it is *not* allowed to swing over when the boat is brought head to wind, but is "kept a-weather to pay her head off," as shown by the dark line in Fig. 16. It scarcely needs the dotted lines to show that by this "dodge" the boat's head is pressed over to port, and the action of the rudder much assisted, for with light winds or a heavy sea, a boat, especially a long one, may not have way enough to get round under the rudder alone. Directly the head is well over, and there is no longer any chance of "missing stays," as failure in this turning movement is called, shift the fore-sail to port at once, or it will merely check the boat's way. This is also called "keeping the fore-sheet to windward" just long enough to make sure that the boat will come round.

The position of the sails in changing from port to starboard tack is shown in Fig. 17. The same description applies to changing from starboard to port, transposing those words throughout. If there be no jib, merely omit the part relating to that sail. The mizzen, if there be one, takes care of itself. If the boat has but one sail, you must trust to the rudder alone for going about.

Be not in too great a hurry to put the helm amidships again after going about, or you may miss stays after all; neither keep it over so long as to get your head blown right round by an over-large jib or fore-sail.

In a heavy sea, choose the quietest moment you can for putting about. It is a simple operation after all, but young sailors must not *superintend* it in bad weather without cool heads and previous experience.

MISSING STAYS in smooth water is easily corrected by keeping the fore-sail to windward; but should the boat be struck by a squall in this position, the consequences may be very serious, and can only be met by promptly releasing sheets and even halyards.

LYING TO or HOVE TO.—A boat is hove to, *i.e.*, kept stationary, by hauling in the main-sheet as much as possible, and setting the fore-sail a-weather. As the head "pays off" under the latter, it is brought up again by the vane-like action of the main-sail, and this is repeated *ad infinitum.*

When heavy waves make it difficult to lie head to wind, and to prevent the boat from *broaching to—i.e.*, turning broadside to the waves—it is good to lash a few spars together, throw them overboard, and make fast to them by a short rope at the bow, using them, in fact, as a floating anchor, which not only holds up the head to the wind, but also acts as a *breakwater*, breaking the force of the heaviest waves in a wonderful manner.

SQUALLS are dangerous to boats in proportion to the inexperience of their managers. If you can see their approach, brail up the sail, or lower the peak, as the case may be. Luff a little, if on a wind, but not so as to lose way. If off the wind or running free, put down the helm and ease off the sheets. Look sharp after squalls in land-locked waters, where sudden gusts rush down the openings between hills; also when emerging from a large vessel's lee, with little way on. If, from newness of the rope or mismanagement, the sheet *sticks*, your only chance is to cut it away with a knife. And do not, from sheer nervousness, hold on tight to the main-sheet just when you ought to let go of it: this has been done before now. Don't expect to arrange the sheet in a neat coil, once for all, and so get rid of further bother: you must keep constant guard over it, or it will catch in something or other. "Self-acting" arrangements, in small boats, are not to be rashly encouraged: they always act beautifully *until* the day of trial, "not, *of course*, that there is anything *wrong* in them, but only because," &c., &c.

To sum up: keep your boat in trim both as regards ballast, sails, and passengers. Have no skylarking, no lolling over the sides, and, above all, no drinking. Lead sheets and halyards aft, so that you can work the sails without rising to go forward. Don't carry too much head or any other sail; reef at once when danger threatens. Have your rigging strong and well looked after, but don't have masts or spars too heavy: it is better that the squall should carry away the mast than upset the boat. Remember that the safest sports are dangerous to the reckless man; while the most perilous are almost safe to the cautious. Happily, sailing is far from being the most perilous of sports.

REDUCING SAIL.—The gaff top-sail is the first sacrifice; then the jib, for which a smaller one must be substituted. A little relief is given (if off the wind) by raising the tack and lowering the peak of the mainsail. But the chief resource is *reefing*, which should be done betimes, and with the boat hove to. Lower the gaff as much as necessary; remove the main tack from the lower hoop, and adjust the tack-tackle; tie the lowest reef-cringle (very securely) to the boom with the reef-earring, or, if there be no boom, make a corresponding change in the attachment of the sheet. Now gather up the loose canvas below the first line of reef-points; tie each pair together with a "reef knot" (to be learnt of the "old boatman"). If necessary, take in a second or third reef, but without undoing the previous work, by which plan the reefs can afterwards be let out one by one, as required. The fore-sail is reefed in the same way. Reefing must be carefully practised. The *brails* of small boats which have no boom give the very desirable power of reducing sail instantaneously. A well-found cutter should have a *try-sail* on board (a strong small main-sail), to substitute for that sail in heavy weather.

GETTING UNDER WAY.—If the boat is moored as usual to a buoy, hoist the main-sail, reefed or not as the wind requires; lay out the fore-sail ready for hoisting; pull out the tack of the jib by the out-haul; have fore and jib-sheets in their places, and the sails hooked to their halyards. Run up the fore-sail and let go the moorings. Haul the fore-sail a-weather, to pay off the head in the direction you wish. If the wind is on or towards the shore, let the head fall off only enough to fill the sails, which must be close-hauled, unless you wish to run along shore. If the wind be off shore, let her go quite round, if you wish to sail seawards. Sometimes you have small room for manœuvring, and have to turn sharp round at starting. To do this, put both head-sails a-weather and ease off the main sheet. The head swings round directly, and you can assist it by putting the helm up. Ordinarily you do not hoist the jib till well under way. Small boats have often to start from wharves, stairs, sides of ships, &c: in such cases use your wits; shove off with a boat-hook, "warp" out with a rope, or do anything else likely to answer.

PICKING UP MOORINGS with grace and facility is an excellent test of the young sailor's seamanship, but it can only be acquired by practice. Always, by preference, pick up moorings to windward. Beat up to them, and at the last moment luff, and run alongside them, head to wind. If approaching the buoy before the wind, pass it, sweep round, and pick it up to windward, making a nice calculation of the space required for the sweep, which depends on your boat's power of turning. If, from want of room, you *must* bear down upon the buoy, go at it under the fore-sail only. Steer deftly, and hook the buoy with a firm hand.

As a general rule, when two boats approach one another, that on the port tack gives way to the other, bearing up from the wind enough to pass the other on the port side. The one on the starboard tack holds on, or luffs if it seem necessary, and if he has wind enough to spare. On the other hand, the boat sailing free, or comparatively free, gives way to the boat sailing close, or comparatively close, to the wind, because the former can either luff or bear away, as required, without losing much ground, which the latter cannot. But in these matters the old boatman is the best guide. Local usages vary, and much is always left to discretion; but it is a wholesome rule for little boats to get out of the way of big ones without stopping to argue the question of right. Give steamers a *very* wide berth, especially men-of-war.

IV.—MISCELLANEOUS RIGS OF BOATS.

It now only remains for us to describe a few more "rigs." We begin with

The SLOOP, a name of varied application, but which, applied to a small boat, means a kind of cutter with fore-sail and main-sail only. The fore-stay is fixed to the end of a small "standing" (*i.e.*, permament) bowsprit, which may be lengthened by a movable *jib-boom*, if it is desired to add a jib. The rig is a handy one, and a favourite with the Americans, who are good judges.

The SCHOONER is a two-masted vessel. It is the favourite rig for large yachts, but it is also good for long narrow sailing-boats (not that that form of boat is to be encouraged). Square-top-sail schooners have square sails on the fore-mast; they are mostly trading vessels. "Fore-and-aft schooners" (see Fig. 18) have main-sail, fore-sail or "spencer," and fore-stay-sail or jib. The American practice is now much adopted, of carrying a gaff top-sail only on the main-mast, or rather of having no fore-top-sail at all. The fore-stay-sail is sometimes laced to a boom at the foot, to keep it flat. A small fore-stay-sail with one or more jibs is still common; but a jib-boom and flying jib can be added in Fig. 18, if required. In putting about, keep the spencer or fore-sail a-weather, to pay her head off, and treat the fore-stay-sail as you would the jib in a cutter. The spencer is boomed out when running before the wind, and in all respects takes the place of the cutter's fore-sail.

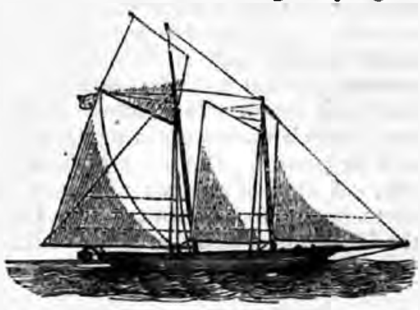


FIG. 18.

A DANDY or YAWL is a cutter with a mizzen-mast. The main-sail is therefore narrower, smaller, and more manageable; the boom is dispensed with, and the annoyance of its swinging backwards and forwards thus got rid of. This is not perhaps the fastest, but it is certainly the handiest, of all yacht rigs.

The SLIDING-GUNTER is a curious sail fitted to ships' boats, &c., which, for convenience of "unstepping," require very short masts. Two are usually carried. The yard or gaff, or rather top-mast—for it is a little of both—slides up and down the mast by two iron rings; the sail, in fact, is a kind of shoulder-of-mutton sail attached to a top-mast, which is let down by the run when it is necessary to strike sail. It is a safe and rather pretty rig, but not common for pleasure boats, or worth the space its description would occupy.

The SHOULDER-OF-MUTTON SAIL is triangular, with neither gaff nor boom. It is held to the mast by rings or lacing as far up as the fore-halyards. The main-halyard is hooked to the peak of the sail, which is very lofty. The fore-sail may be made larger by using a bowsprit, if the boat is stiff enough to bear much canvas. Brails must be fitted; the sail can then be furled in an instant without lowering it. This rig is simple, cheap, and effective, but the great height of the mast confines it mainly to smooth waters.

The famous BERMUDAN BOATS hoist a nearly triangular main-sail, with a very small yard—not a gaff—at top. They are very wide and deep. The mast is close to the bow, and *rakes*, or leans aft, very much: it is *twice* the total length of the boat. There is a bowsprit for the fore-sail, and a jib-boom and jib are added in light winds, together with other extra sails not easily described. The great proportionate height of mast limits this rig to comparatively small boats. They are marvellous sailers to windward, and have been known to sail within *one* point of the wind.

A somewhat similar rig is adopted for the CENTRE-BOARD BOATS on the Thames. These are very broad in proportion to their length, and, for convenience, draw very little water. To give the requisite steadiness and hold upon the water when sailing with the wind a-beam, a plate of metal, or wood shod at the lower edge with metal, is lowered down edgeways through a slit in the bottom, amidships. The slit is about 3 ft. long, and a kind of well with the sides only an inch or two apart is built up round it, water-tight, and carried up level with the gunwale. The water fills the well, but of course does no harm there. In shallow water, or when running before the wind, the keel (which makes up in depth what it lacks in length) is hauled up into the well or "box." The mast is close up to the stem, lofty, and *raking* (leaning aft). A kind of cutter's main-sail, small at the top, is the only sail carried, there being no bowsprit. The keel, or "centre-board," works on a pivot at the fore-end. The finest boats of this class are built by Burgoine, of Kingston.

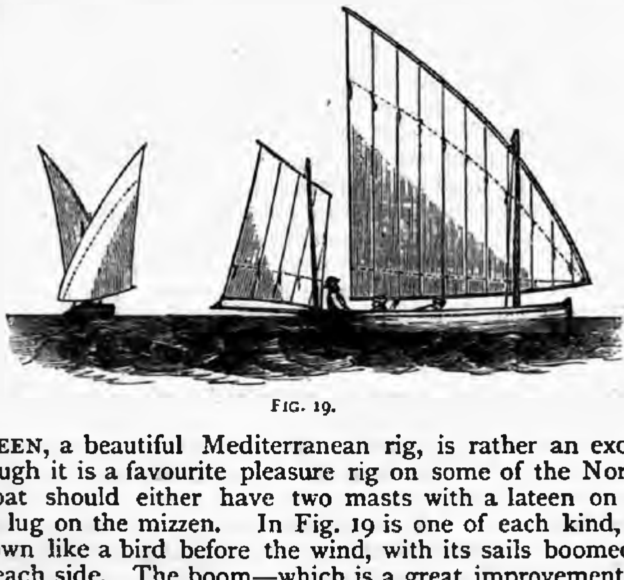


FIG. 19.

The LATEEN, a beautiful Mediterranean rig, is rather an exotic in this country, though it is a favourite pleasure rig on some of the Norfolk rivers. A lateen boat should either have two masts with a lateen on each, or a lateen and a lug on the mizzen. In Fig. 19 is one of each kind, the former sweeping down like a bird before the wind, with its sails boomed out, wing fashion, on each side. The boom—which is a great improvement to a lateen sail—must be connected with the yard by a joint, and held to the mast by a hook or ring, to prevent it from rising. Thus fitted, the sheet alone gives full command over it. The yard is generally left standing, and the sail brailed up to it. It is reefed along the top or fore-leach, though it would be better to reef it below. In the Mediterranean, the sailors climb along the yard to reef the sail. The lofty peak requires a wide steady boat, and a short, strong, well-stayed mast. The beauty of the lateen depends upon the curve taken by the yard when the sail fills with wind. It is not a rough-water rig, but is suited to rivers, from its power of going close to the wind and its quickness in putting about.

The SETTEE is a lateen at top and lug at bottom, or rather a stumpy lug with a long yard and lofty peak. It is pretty well extinct now.

Last of all we take the LUG, the parent of all sails. Originally a mere square piece of canvas suspended from a yard *across* the boat, it has gradually edged away to one side until its yard has become something very much like a gaff, while its "tack," formerly secured to the weather gunwale of the boat, has at last come to an anchorage at the foot of the mast (see Figs. 19, 20, and 22). In this form it is a convenient main-sail, and needs no boom. Being neither laced nor hooped to the mast, it can be let down by the run when a squall threatens.

Formerly, when a large portion of the sail hung before the mast, it was necessary, when putting about, to lower the sail. The tack was shifted from one gunwale to the other (hence the expressions *on the port tack*, *on the starboard tack*, which still hold good with square sails), and the yard re-hung on

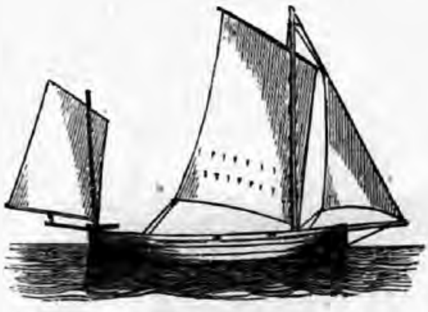


FIG. 20.—A HASTINGS FISHING-BOAT.

FIG. 21.

the lee side of the mast. Where the practice is still maintained of "dipping the lug" in going about, it is usual to hang one-third of the yard before the mast. The halyard being slacked a little, the yard is caught by a man on the look out for it, and rapidly shifted to the other side of the mast. This is a smart manœuvre, but it is better dispensed with by keeping the sail always on the same side, in which case one-fourth instead of one-third of the yard should hang before the mast. With a tolerably high peak this makes it practically a fore-and-aft sail.

Luggers carry one, two, or three masts, according to size and fancy, and with or without jib or fore-sail—and even top-sails in the larger craft. Fishing-boats are nearly always luggers. The ease with which the sail can be lowered makes it a favourite rig with pilots and others who have to run quickly alongside ships, &c. To attempt to describe all the different kinds of boats rigged wholly or in part as luggers would be impossible: the great simplicity of the rigging required, and its rough-and-ready usefulness, make the lug a favourite with beachmen of all sorts. We can but allude to the YARMOUTH YAWLS, and the north-country COBLES: the former long, narrow, open boats of immense speed, and the latter stumpy boats, with one large lug and a fore-sail, and distinguished by having no keel aft and a rudder projecting far below the bottom.

The tiny canoes on the model of Mr. Mc Gregor's famous "Rob Roy," which voyaged through half the rivers and not a few of the seas of Europe, generally carry a miniature lug-sail not much larger than a pocket-handkerchief. They have probably the distinction of setting the smallest sails ever hoisted.

A curious and elegant modification of the lug is shown in Fig. 21. The sail is laced to a light boom, which is held to the mast by a ring. This sail sets very flat, and is graceful and handy for a river boat, when no fore-sail is carried.

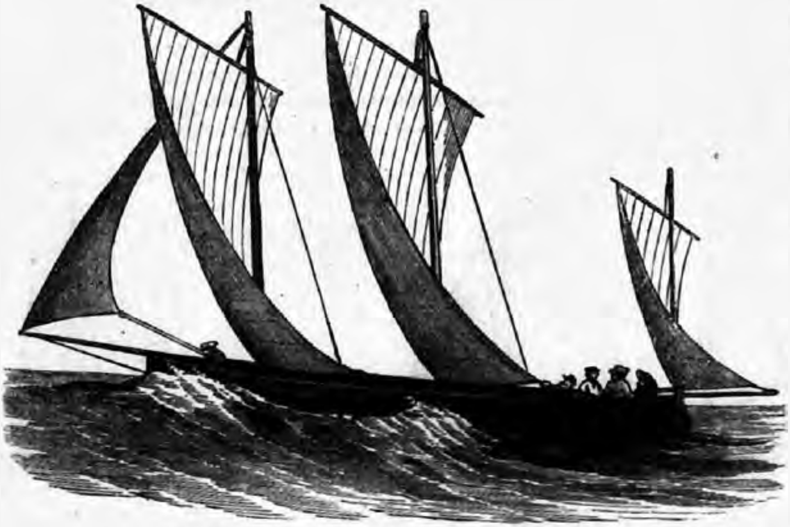


FIG. 22.—A YARMOUTH YAWL.

SWIMMING.

We need scarcely say that every one ought to know how to swim. There is not a man, woman, or child in the kingdom that cannot learn, and ought not to learn how to swim. There is no absolute necessity for learning the various aquatic tricks which are performed by masters and mistresses of the art; but there is a necessity that all should know how to support themselves in the water.

There is, perhaps, no athletic exercise which is so easily learnt, which is so well adapted to both sexes of all ages, and yet is so little known. There is really no art whatever in ordinary swimming—that is to say, in the ability to keep the head above the water, and to propel the body in any given direction. Art certainly confers greater grace, gives more endurance, and ensures greater speed; but in the mere support of the body, nothing is needed except confidence, and very little even of that quality.

As to the value of swimming, it is simply incalculable. How many most

precious lives might have been saved had the deceased persons only known the least rudiments of swimming! How many families have been thrown suddenly into grief and distress because the father and bread-winner happened to fall into a canal or a pond that a swimmer could cross at a single stroke! How many parents annually lament the loss of some beloved child, who has been accidentally drowned by falling into a river, or by stepping into a hole in the stream in which he is bathing!

We have seen a fine young lad of sixteen drowned by simply stepping into a hole not eighteen inches in width and barely seven in depth. Even when standing at the bottom of the hole, he was tall enough for his nostrils to be above the surface; but he was so frightened at the sudden slip that he lost his presence of mind, opened his mouth to call for help, allowed the water to run down his throat, began to cough, sank beneath the surface, and was swept away by the tide long before we could descend from the top of the cliffs.

Since seeing this lamentable accident, we have lost no opportunity of impressing upon all whom we could influence the absolute necessity for learning to swim—at all events, for learning the rudiments of the art, so that under similar circumstances they would be able to sustain themselves until help arrived. We have taught very many pupils to swim, and, although the attainment of any bodily exercise is not easily learnt from a book, we will try to convey, in a few instructions, sufficient information for a beginner to teach himself.

Of course the instructions apply equally to both sexes, and I have generally found that girls learn to swim much faster than boys.

The first care of the intending swimmer is, of course, to find a proper piece of water in which to learn his first lessons. The very best water that can be found is that of the sea, on account of its saltness and bitterness, whereby two great advantages are obtained.

The first advantage is, that, on account of the salt and other substances which are dissolved in it, the sea-water is so much heavier than fresh that it gives more support to the body, and enables the beginner to float much sooner than he can expect to do in fresh water.

The other advantage is, that the taste of the sea-water is so nauseous that the learner takes very good care to keep his lips tightly shut, and so does not commit the common error of opening the mouth, which is fatal to all swimming, and is sure to dishearten a beginner by letting water get down his throat and half-choke him.

As to place, there is nothing better than a sloping sandy shore, where the tide is not very strong. In some places the tide runs with such force, that if the beginner is taken off his legs he will be carried away, or, at least, that he will have great difficulty in regaining his feet.

We strongly recommend him to walk over the spot at low water, and see whether there are any stones, sticks, rocks, or holes, and if so, to remove all the movable impediments and mark the position of the others.

Take especial care of the holes, for there is nothing so treacherous. A hole of some six or seven inches in depth and a yard in diameter looks so insignificant when the water is out that few persons would take any notice of it; but, when a novice is in the water, these few inches may just make the difference between safety and death.

On sandy shores the most fertile source of holes is to be found in large stones. They sink rather deeply into the sand and form miniature rocks, round which the water courses as the tides ebb and flow, thus cutting a channel completely round the stone. Even when the stone is removed, the hole will remain unfilled throughout several tides.

The next best place for learning to swim is a river with a fine sandy bed, clear water, and no weeds. Since that extraordinary river-weed, the *anacharis*, has swept throughout our canals and rivers, it is extremely difficult to find a stream that is free from weeds. However, it will be easy enough to clear a sufficient space in which a learner can take his first lessons.

When such a spot has been found, the next care is to examine the bed of the river and to remove very carefully everything that might hurt the feet. If bushes should grow on the banks, look out carefully for broken scraps of boughs, which fall into the stream, become saturated with water, sink to the bottom, and become fixed with one of the points upwards.

If human habitations should be near, beware of broken glass and crockery, fragments of which are generally flung into the river, and will inflict most dangerous wounds if trodden on. If the bed of the stream should be in the least muddy, look out for mussels, which lie imbedded almost to their sharp edges, that project upwards and cut the feet nearly as badly as broken glass.

Failing sea and river, a pond or canal is the only resource, and furnishes the very worst kind of water. The bed of most ponds is studded with all kinds of cutting and piercing objects, which are thrown in by careless boys, and remain where they fell. Then, the bottom is almost invariably muddy, and the water is seldom clean. Still, bad as is a pond, it is better than nothing, and the intending swimmer may console himself with the reflection that he is doing his duty, and with the prospect of swimming in the sea some time or other.

Of course the large public baths possess some of the drawbacks of ponds; but they have, at all events, the advantage of a regulated depth, a firm bank, and no mud.

As the very essence of swimming lies in confidence, it is always better for the learner to feel secure that he can leave the water whenever he likes. Therefore, let him take a light rope of tolerable length, tie one end to some firm object on the bank, and let the rest of the rope lie in the water. "Manilla" is the best kind of rope for this purpose, because it is so light that it floats on the surface instead of sinking, as is the case with an ordinary hempen rope.

If there is only sand on the shore, the rope can be moored quite firmly by tying it to the middle of a stout stick, burying the stick a foot or so in the sand, and filling up the trench. You may pull till you break the rope, but you will never pull the stick out of its place. If you are *very* nervous, tie two sticks in the shape of a cross and bury them in like manner.

The rope need not be a large one, as it will not have to sustain the whole weight of your body, and it will be found that a cord as thick as an ordinary washing-line will answer every purpose.

On the side of a stream or pond, tie the rope to a tree, or hammer a stake in the ground. A stake eighteen inches in length, and as thick as an ordinary broomstick, is quite large enough. Hammer it rather more than two-thirds into the ground, and let it lean boldly away from the water's edge. The best way of fixing the rope to it is by the "clove hitch."

Now, having your rope in your hand, go quietly into the water *backwards*, keeping your face towards the bank. As soon as you are fairly in the water, duck completely beneath the surface. Be sure that you really do go fairly under water, for there is nothing more deceptive than the feel of the water to a novice. He dips his head, as he fancies, at least a foot beneath the surface; he feels the water in his nose, he hears it in his ears, and thinks he is almost at the bottom, when, in reality, the back of his head is quite dry.

The best way of "ducking" easily is to put the left hand on the back of the head, hold to the rope with the right hand, and then duck until the left hand is well under water.

The learner should next accustom himself to the new element by moving about as much as possible, walking as far as the rope will allow him, and jumping up and down so as to learn by experience the buoyancy of the water.

Perhaps the first day may be occupied by this preliminary process, and on the second visit the real business may begin.

In swimming, as in most other pursuits, a good beginning is invaluable.

Let the learner bestow a little care on the preliminaries, and he will have no bad habits to unteach himself afterwards. It is quite as easy to learn a good style at first as a bad style, although the novice may just at the beginning fancy that he could do better by following his own devices.

The first great object is to feel a perfect confidence in the sustaining power of the water, and, according to our ideas, the best method of doing so is by learning to float on the back.

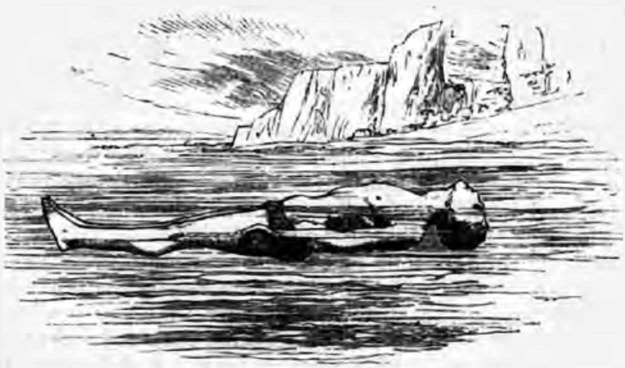
We will give a separarate paragraph to this important point.

Floating on the Back.

Take care that the cord is within easy reach, so that it may be grasped in a moment, should the novice become nervous, as he is rather apt to do just at first. Take it in both hands, and lay yourself very gently in the water, arching the spine backwards as much as possible, and keeping the legs and knees perfectly straight and stiff.

Now press the head as far back as possibly can be done, and try to force the back of the head between the shoulder-blades. You can practise this attitude at home, by lying on two chairs and seeing whether your attitude corresponds with that which is given in the illustration.

When you have thus lain in the water you will find that you are almost entirely upheld by its sustaining power, and that only a very little weight is



sustained by the rope. On reflection you will also discern that the only weight which pulls on the rope is that of your hands and arms, which are out of water, and which, therefore, act as dead weight.

Indeed, you might just as well lay several iron weights of a pound each upon your body, for the hands and arms are much heavier than we generally fancy. Just break an arm or a leg, and you will find out what heavy articles they are.

Now let your arms sink gradually into the water, and you will see that exactly in proportion as they sink, so much weight is taken off the rope; and if you have only courage to put them entirely under water, and to loose the rope, your body will be supported by the water alone.

These are facts, but we may as well have reasons.

Bulk for bulk, a human being weighs considerably less than water, *i.e.*, at the temperature of ordinary sea or river-water. Now, as the lighter substance will float in the denser, it follows that the human body will float in water. If a dead body be flung into the water, some part of it will float above the surface until the lungs get choked up with water, and so the whole body is much heavier than it ought to be.

Now, supposing that a living person in a fainting condition, and therefore unable to struggle, were to fall into the water, some part of the body would remain above the surface. But as the head, which is one solid mass of brain, muscle, and bone, is much heavier than water, it follows that the head would hang down in the water, and the shoulder-blades would appear above the surface, being buoyed up by the air-filled lungs. The hands and arms, of course, follow their natural inclination, and fall forward, thus turning the body on its face.

This, then, is the natural position of a living human being in the water, provided that he does not attempt to struggle or alter his position. And the knowledge of this fact is the key to all swimming on scientific principles.

A considerable part of the body remains above the water, but it is the wrong part, as far as the preservation of life is concerned. We want to breathe, and it is very clear that we cannot breathe through our shoulders. Therefore the first point in swimming is to reverse the natural order of things, and to bring the nostrils above the surface of the water.

The mouth may be set aside altogether, because there is no necessity for that aperture in swimming. It is meant for eating and for talking, but was never intended for breathing, which is the only function that a swimmer regards.

Swimming, therefore, resolves itself into the ability to keep the nostrils above water; and the difficulty lies in the fact that the nostrils are set in the heaviest part of the whole body, and that which is absolutely certain to sink below the surface unless continual efforts are made to keep it in its right position.

On looking at the illustration, it is evident that the simplest method of attaining this object is to reverse the entire position of the body. Let, therefore, the learner be on his back, let him arch the spine in directly the opposite direction, and bend the head backwards instead of letting it hang forwards.

The result of this change of posture will be at once apparent. The heaviest part of the body, the back of the head, will be partly supported by the water, and partly by the air which fills the lungs. The nostrils will then become the lightest part of the body, and will, of course, be above the surface when the remainder is submerged.

Practically, the bather will find this result. If he will assume the attitude which has been described, and will be content to keep his lips tightly shut and his limbs perfectly still, he will find that when he takes an inspiration the face will rise almost entirely out of the water. At each expiration the face will sink as far as the eyebrows and lower lip, *but no farther*, the nostrils being always left free for the passage of air to the lungs.

Any one who will give this plan a fair trial will gain more real knowledge of swimming in an hour than can be obtained in a year by mere practical teaching. So powerful, indeed, is the buoyancy of the water, that if any one, whether he can swim or not, will only lie in the attitude that has been described and will not stir hand or foot, *he cannot sink if he tries.* A cork will sink as soon as he.

So impressed are we with the extreme value of floating on the back, that we recommend our readers to practise that and that alone until they feel perfectly confident that, when they lie in the proper attitude, the water cannot fail to support them.

If the bather wishes to lie quite horizontally on the surface of the water, he can do so by stretching his arms as far as possible over his head. Their weight will counterbalance that of the legs, and will cause the toes to appear at the very surface. This position is sometimes called the Balance.

The directions which we have given are intended for those who are obliged to bathe in fresh water. Those who are fortunate enough to bathe in the sea will find the lesson much easier. The water supports the body so much more perfectly that even during an expiration the face seldom sinks lower than the chin, while a fair inspiration raises the whole face out of the water.

Swimming on the Back.

The next division of our subject will be swimming on the back.

The power of floating on the back is invaluable to the beginner, but he soon begins to acquire something more. It is very well to be able to float like a cork, but a swimmer wants to direct his course as well as to float like an inanimate object.

When the learner has learned to lie on his back without moving hands or feet, let him gently paddle with his hands, keeping the fingers together firmly, and scooping the water, as it were, towards his feet.

He must be careful to keep the hands below the surface, and the head well back. Most persons, when beginning this movement, are tempted to raise the head so as to see whether they are moving, or, if so, in which direction. Consequently, the water no longer supports his head, its weight is thrown on the body, and down goes the swimmer.

When the learner can propel himself at a moderate pace head first, he should turn his hands round and scoop the water towards his head, thus propelling himself with his feet first. It will be found that the course can easily be directed merely by using one hand rather more forcibly than the other.

Having learnt this simple paddling process, the young swimmer now begins to use his legs.

It is possible to paddle for a considerable distance by using the hands alone, and there are sometimes circumstances when this process is invaluable. If, for example, the swimmer should be seized with the cramp in his legs, he is certain to be drowned if he does not have recourse to this expedient. Of the cramp and other dangers we shall write presently.

Still, although the swimmer *can* propel himself, it is a very slow process, and he naturally would wish to get on at a faster rate. This is done by striking out the legs, with the feet wide apart, and then bringing them together again.

These directions are simple enough; but something more must be mentioned. People generally fancy that the progress of the swimmer is only caused by the pressure of the soles of the feet against the water, and the usual opinion is that the fastest swimmer is he who has the broadest and the flattest feet. Of course, the pressure of the feet has something to do with it, but the chief part of the work is done, not by the feet, but by the legs.

When the legs are spread, they enclose between them a mass of water of a wedge-like shape, and, as they are drawn together, the body is propelled forwards on exactly the same principle that a vessel is propelled by a screw. In fact, the principle of the inclined plane comes into operation, and the swimmer urges his way onwards just as the sails of a windmill are driven round by the air, or the fan of a smoke-jack is turned by the ascending currents of the chimney, and as a fish shoots through the water by the vibration of its tail.

Any one who wishes to see in action the real principle of swimming, cannot do better than go to the Zoological Gardens and look at the seals as they glide so swiftly and gracefully through the water. There is no direct action at all, no scooping of the water with the fore-paws, which are kept closely pressed against their sides. But the two hinder paws are pressed tightly together, and moved backwards and forwards with a steady sweep, this alternate action giving precisely the same sort of wedge, or inclined plane, that is formed by the simultaneous action of a man's legs while swimming on his back.

Man, however, when he really can swim well, exhibits this principle very clearly. When a good swimmer is lying on his back and propelling himself as fast as he can, he always gives a kind of half turn to the body, so as to obtain a screw-like action of the legs, thus increasing his speed without increasing the force of his stroke.

Steering the course is easily managed by means of the legs. If the left leg is allowed to remain still, and the right leg is used, the body is driven to the left, and *vice versâ* when the left leg is used and the right kept quiet. The young swimmer must remember that when he brings his legs together they must be kept quite straight and the knees stiff. The toe should also be pointed, so as to offer no resistance to the water.

Swimming on the back is a most useful branch of the art, as it requires comparatively little exertion, and serves to rest the arms when they are tired with the ordinary mode of swimming. All swimmers who have to traverse a considerable distance always turn occasionally on the back. They even in this position allow the arms to lie by the sides until they are completely rested, while at the same time the body is gently sent through the water by the legs.

Let swimming on the back be perfectly learnt, and practised continually, so that the young swimmer may always feel secure of himself when he is in that position.

The feet should be kept about twelve or fourteen inches below the surface of the water, as, if they are kept too high, the stroke is apt to drive the upper part of the head and eyes under the water.

It must always be remarked that it is impossible to arch the spine too much, or to press the head too far between the shoulders.

Swimming on the Chest.

We now come to swimming on the chest, which is the mode adopted by most persons, and which, together with swimming on the back, will enable the learner to perform almost any aquatic feat.

In order to begin with confidence, walk into the water until it is almost as high as the chest, and then turn towards the land, so that every movement may carry you from the deeper to the shallower water. Next place your hands in front of the chest, the fingers stiff and pressed together, and the thumb held tightly against the forefinger. Do not press the palms together, as too many books enjoin, but hold the hands with the thumbs together, the palms downwards and the backs upwards.

Now lean gently forward in the water, pushing your hands out before you until the arms are quite straight, and just before your feet leave the bottom give a little push forwards. You will now propel yourself a foot or two towards the land. Try how long you can float, and then gently drop the feet to the ground. Be careful to keep the head well back and the spine arched.

Repeat this seven or eight times, until you have gained confidence that the water will support you for a few seconds. The accompanying illustration shows the proper attitude.

Now go back to the spot whence you started, and try to make a stroke. Lay yourself on the water as before, but when the feet leave the bottom draw them up close to the body, and then kick them out quickly. When they have reached their full extent, press them together firmly, keeping them quite straight and the toes pointed.

This movement will drive you onwards for a short distance, and when you feel that you are likely to sink, drop the feet as before. Start again and make another stroke, and so on until the water is too shallow.

At first you will hardly gain more than an inch or two at each stroke; but after a little practice you will gain more and more until you can advance three or four feet without putting the legs to the ground. It is a good plan to start always from the same spot, and to try in how few strokes you can reach the land. There is a great interest in having some definite object in view, and one gets quite excited in trying to reduce the number of strokes.

The action of the legs may be seen in the illustration.

The next point is the movement of the arms.

In reality the arms are more valuable in swimming than the legs, and for this simple reason: any one who has the use of his limbs at all is obliged to use his legs daily, and that to a considerable extent. However sedentary he may be, he must walk up and downstairs twice at least in the day. He must walk from one room to another. He must get into and out of his carriage, and walk a few paces to his office. And in all these little walks his legs have to carry the weight of his body, which, to set it at the least figure, weighs from seventy to ninety pounds.

The legs, therefore, are strengthened and hardened by continual practice; but the arms have scarcely anything to do. They hang quietly by the side, they rest on the knee or on the table, and their average work is comprised in turning over the leaves of books or wielding a pen. They are unaccustomed to hard work of any kind, and therefore fail as soon as they are put to severe and novel labour. They soon become tired, the muscles refuse to obey the orders of the mind, and in a few hours the arms are so stiff that they can hardly be used at all.

In a swimming match of any length, we should always look at the arms of the competitors rather than the legs, and we would invariably select as our favourite the man with the broadest and deepest chest and the most wiry arms.

Now for the use of the arms.

Place yourself with your face to the shore, as already directed, and make the stroke according to the regulations.

But, just before the force of the leg-stroke is exhausted, spread the arms as widely as possible, turn the palms of the hands a little outwards, and bring them towards the hips with a steady, regular sweep.

This movement will have two effects. It will support the body, and it will continue the propulsive force which was just given by the legs.

Be very careful not to hurry this stroke, and especially not to shorten it. Beginners generally make six or seven little strokes, keeping their arms bent during the whole time; but in correct swimming the arms should be sent forward to their utmost length, and the hands brought to the hips in a slow, uniform sweep.

Let this be practised over and over again, until it is perfectly learnt.

Even at home and on dry land it can be practised with tolerable success, by lying on a chair in front of a large mirror, and making the stroke repeatedly until it looks quite exact. About eighteen or nineteen strokes to the minute is quite fast enough for all ordinary purposes. In a short race of a hundred yards or so the quickness is, of course, increased; but if we were to swim a race of one or two miles, we should be content with eighteen, or at the most twenty, strokes per minute. In ordinary swimming sixteen is our usual average. Still, we cover so much water at each stroke, that in the long run we come in far ahead of more showy swimmers, who wear themselves out in the first half-mile, and then are caught and passed with ease.

A COMMON FAULT.—When swimming on the chest, take particular care to avoid an error into which the beginner almost invariably falls.

Being extremely anxious to keep the nostrils well above the surface of the water, the swimmer is apt to press downwards his hands, so as to raise his head and neck, and often part of the chest, completely out of the water.

Now, it is scarcely possible to make a worse mistake than this. By so doing the swimmer actually supports a considerable weight *in the air*, and might just as well hang some four or five pounds' weight of lead round his neck. In the second place, he tires his arms most needlessly by forcing them to perform a totally unnecessary action. They will have quite enough work to do in making the ordinary stroke, without adding to them the labour of supporting the head above water.

The very principle on which all swimming is founded is that of making the water support the body, and, therefore, of supporting every part of the body by the water. If even a finger be lifted above the surface, the unsupported weight of that finger tends to press the body under water. A showy or "high" swimmer may look very well to an inexperienced eye, and may take the fancy like those lofty-actioned trotting horses, which are so appropriately called "flat-catchers."

But there is no endurance about either one or the other; and it may be assumed as a self-evident fact that if two persons of equal strength enter in a match of any athletic exercise, and that one uses exertions which the other does not employ, the former will be tired sooner than the latter.

So our advice to our readers is: first practise the stroke quietly and repeatedly, putting down the feet after each stroke is completed; then try to manage two strokes without putting the feet to the ground; then try three strokes, and so on, until you can make some four or five strokes without distressing yourself.

Having achieved thus much, make your mind easy: you have conquered the art of swimming. If you can make five strokes, you can make fifty, provided that you do not hurry them.

Should you feel yourself getting tired, or if a feeling of nervousness should come over you, the remedy is easy enough. Turn on your back, and paddle along quietly until your arms are rested. Then turn over and proceed on your course. So important is this one rule that we repeat it again: DO NOT HURRY YOUR STROKE. It is hardly possible for the learner to be too slow.

In connection with the ordinary breast-stroke we must mention one very important point, namely, the manner of taking breath. If the swimmer lies, as he should lie, as low as possible in the water, he will find that at each stroke the water reaches to his lips, and will sometimes curl even over his nostrils.

If, therefore, he were to take an inspiration while he is making the stroke, he would immediately draw some water into his lungs, and the only result would be that he would begin to choke and to cough, and would probably sink.

But if he makes a habit of expelling the air from his lungs as he makes the stroke, he need fear no danger of the kind, for the expelled air will drive away the water, and even if his nostrils should be covered, they would not take in one slight drop. It naturally follows that the proper time to take breath is while the arms are just beginning to make the stroke, and when the force of the leg-stroke is almost expended.

Whilst we are on this point, we will just mention two cases in which it is extremely difficult to manage the breath. One is when the swimmer is bathing in the sea, and when the wind has suddenly chopped round, so as to knock up a cross sea.

We know nothing so worrying as a cross sea. There is no possibility of calculating upon it. All seems to be going on right, there is a nice smooth piece of water which seems as if it would last at least three strokes; suddenly, up starts a watery hillock from the smooth green surface, its top becomes whitened with foam like the neck of a champagne-bottle, and the wind picks off the foam and dashes it in the swimmer's face, stinging him as if every drop of water were a birch twig.

Then, just as the bather has revived from the sudden blows, and is trying to get a quiet breath, one of the regular waves comes rolling up, dashes in a solid mass over his head, and entirely disconcerts his projects.

We have swum in many a sea both when the surface was as smooth as a mirror, and when it was rolling in huge mountain masses. But we never felt nervous about ourselves except on one occasion, when a nasty rough cross sea was knocked up by a sudden change of wind. It was the first time we had experienced a cross sea, and we did not like it—realizing, indeed, for the first time, and we hope the last time, in our lives, that water was an element that might be dreaded.

Now we know better, and care very little for a cross sea. Under such circumstances we only use one hand at a time, and whenever we wish to take a breath, we hollow the other hand and place it over the nostrils. Quite enough air can be drawn between the fingers; but the water can make no entrance. Of course, this is rather an awkward-looking method of swimming, but when we want air we care very little about looks.

The second case is when the swimmer is descending a fresh-water rapid. Many a young man has been drowned by a rapid, when in reality he might have passed through the rushing waters without the least difficulty. We have often swum down rapids and cared nothing for them.

The novice is apt to lose his head at the rapidity with which he is whirled along, and at the great foam masses that leap over and about him. He should not, however, allow fear to enter his mind, for in ninety-nine cases out of a hundred it is fear that drowns the man.

Nothing is easier than going down a rapid. Do not try to swim at all, and never make a stroke unless you wish to alter your course; but keep one hand over the nostrils, as above mentioned, and with the other and the feet keep beating the water, so as to raise yourself as high as you can out of it. Keep your legs as high as is consistent with holding the head well out of water, so as to avoid the chance of being caught in one of the whirlpools which are mightily prevalent in rapids, and which pull the swimmer under water as quickly as if his feet were tied to a weighted rope.

THE SIDE-STROKE.

We now come to that particular stroke which, in our opinion, and in that of most professional swimmers, is by far the most valuable.

This is the celebrated SIDE-STROKE, so called because the swimmer lies on his side.

There is no stroke that enables the swimmer to last so long as this does, and for this reason: instead of employing both arms and legs simultaneously in the same manner, the side-stroke employs them simultaneously but in different manners; so that when the swimmer is tired of exercising one side he can just turn over and proceed with the other, the change of action resting the limbs almost as much as actual repose would do. Mr. Beckwith, the ex-champion of England, who held the belt for so many years, always employed the side-stroke when swimming his matches, and the present champion follows his example. Indeed, out of all the professionals, there is now scarcely one in twenty who adopts the old-fashioned breast-stroke.

The side-stroke is thus managed: the swimmer lies on his right side, stretching his right arm out as far as he can reach, keeping the fingers of the right hand quite straight and the hand itself held edgewise, so as to cut the water like a shark's fin. The left hand is placed across the chest, with the back against the right breast, and the swimmer is then ready to begin.

He commences by making the usual stroke with his legs, and the right leg, being undermost, doing the greater share of the work. Before the impetus gained by the stroke is quite expended, the right arm is brought round with a broad sweep, until the palm of the hand almost touches the right thigh. At the same moment, the left hand makes a similar sweep, but is carried backwards as far as it can go.

The reader will see that the hands act directly upon the water like the blades of a pair of oars, and do not waste any of their power by oblique action.

In ordinary swimming we seldom use the left arm, but allow it to hang quietly in the water, so that it may be perfectly ready for work when wanted. Then, after some little time, we turn round, swim on the other side, and give the left arm its fair share of labour.

There is a modification of swimming on the side, which is sometimes called THRUSTING, and sometimes the INDIAN STROKE, because the North American Indians generally employ it.

These terms are rather vaguely employed, but the former is generally used when the swimmer thrusts his arm forward, and the latter when he swings it.

In performing this stroke the swimmer starts upon his right side, and sweeps his right hand through the water as above mentioned. While that arm is passing through the water, the left arm is swung just above the surface with a bold sweep, the hand dipping into the water when the arm is stretched to its utmost. This movement brings the body over to the left side, when the two hands change duties, the left being swept under the body while the right is swung forward.

This is rather a showy style of swimming, but we do not think very much of it. It certainly propels the swimmer with great rapidity for a time, but it requires so much exertion that he is sure to tire before very long. We recollect seeing a race for a silver cup, in which the merits and defects of this stroke were well shown. The swimmer shot ahead of all his competitors with ease, and if the course had been a short one he would quickly have won.

But the course was a tolerably long one, and the consequence was that when he had traversed almost half the distance his exertions began to tell on him, and his strokes got rather wild and irregular. Before very long some of the steadier swimmers began to creep up to him, and before two-thirds of the distance was traversed he was passed by two of them. The result of the race was, although he was well ahead half-way, he did not even get a place at the finish.

Variations in Swimming.

We now come to a few of the most useful variations in ordinary swimming.

The first of these is the stroke which is called TREADING WATER. This is employed when the swimmer wishes to raise his head as high out of the water as possible, and is particularly useful if he is reconnoitring, or if he is trying to save a drowning person, or if he wishes to grasp a bough or a rope above his head. The illustration shows the attitude that is assumed, and the best method of making the stroke is as follows: Keep the body perpendicular, and make precisely the same stroke with the legs as is done in ordinary swimming. This action will keep the head freely out of the water, and if assisted by the hands the body will rise as far as the shoulders.

Some persons literally "tread" the water, striking each foot alternately as if they were ascending a staircase. We have thoroughly tried both methods, and much prefer the former.

SWIMMING LIKE A DOG.

The name of this method explains itself. The swimmer lies on his chest, and moves his hands and legs alternately, exactly as a dog does when swimming.

The chief use of this stroke is that it affords a change of action to the muscles, and if the swimmer has to traverse any considerable distance, say a mile or two, he will find that a few occasional minutes employed in swimming like a dog will be very useful in relieving the strain on the muscles of both legs and arms.

Having become tolerably expert at these exercises, the young swimmer should now learn to support and propel himself, first without his hands, and next without his legs.

He should therefore place the hands along the sides of the body, sink the legs much deeper than in ordinary swimming, and make a succession of strokes with the legs. These strokes should be much shorter and quicker than are used when the hands are at liberty.

Next suppose that the hands are tied at the wrists, and that the swimmer is a manacled captive trying to escape across a moat. Press the hands tightly together, with the fingers close to each other, and the whole hand made as flat as possible. Turn slightly on the left side, making the ordinary stroke with the legs, and bring the hands towards the left hip with a quick sweep, taking care to part them from it as soon as the stroke is made.

Then try to swim without the legs. Allow the feet to hang as low as they like, keep the head well back, and make the ordinary stroke with the hands. But, instead of merely bringing them back, press them down at every stroke, so as to lift the chin well out of the water. This is a very slow business, but still it should be practised, as the swimmer may happen to disable his legs, and ought to know how to manage without them.

Lastly, he should learn to swim when both hands and feet are tied together. This feat is a very superior one, and always elicits much applause from spectators, being what is technically named a "gallery" stroke. Yet it is really very easy, and can be performed by any one who has practised the two former exercises.

Hold the hands together, as already mentioned, and press the feet together at the ankles. Then give short, sharp strokes, the hands and feet working nearly but not quite simultaneously.

If you are performing this feat before spectators, add to the effect by tying the hands and feet with handkerchiefs. Swimming is not made more difficult by the ligatures, while the appearance of difficulty is very much increased.

Diving.

Having now tolerably mastered the surface of the water, the learner must proceed to explore its depth. It is, of course, a great thing to be able to support the body in the water; but the swimmer's education is only half completed until he knows how to dive. Many lives have been saved by the ability to dive; many have been lost from its absence.

Many a man has saved his own life when escaping from enemies by diving and swimming under water to some place of refuge, or by passing along out of sight of his enemies, merely allowing his nostrils to appear above the surface at intervals. Many a man—and woman too—has saved the life of another by diving after the sunken body and bringing it to the surface before life was extinct. Therefore, our counsel is that the young swimmer learn to dive without delay.

The first object is to keep the eyes open while under water. In order to do this, sink yourself well under the surface, hold your hand before your face, and try to look at it. Don't be afraid of water getting into the eyes. A chance drop of fresh water flirted into the eyes will make them smart, but you may keep your eyes open even in salt water as long as you like without the least irritation.

Some persons recommend that the first experiment be made with a basin of water, in which the head is to be plunged. We specially recommend that this should *not* be done, and that the first experiment should be made while bathing.

When the young swimmer has learnt that he really can keep his eyes open under water, he should drop to the bed of the sea or river, where it is about four feet in depth, some white object—one of the well-known alabaster eggs used for deluding sitting hens is as good an object as can be found. Still, a lump of chalk, a thick gallipot, or anything of a like nature, will do very well.

Now try to stoop and lift the egg, and you will find two results. The first is that the egg will look as large as a hat, and the second is that you will find very great difficulty in getting to it.

Now try another way of getting to the egg. Drop it as before, spring up as high as the waist, bend your body well forward, throw the feet in the air, and try to reach the egg, head foremost. At first you will find this rather difficult, but after a little practice it will come easy enough. Be careful to stand at some little distance from the egg, or you will overshoot it.

Next drop the egg, go back some eight or ten yards, swim towards the object, and dive for the egg from the swimming posture. This is not very easy at first on account of the difficulty in getting the chest below the surface. If, however, the legs are thrown well up in the air, the weight forces the body under water.

The next object is to try how far the swimmer can proceed under water.

Swimming under water is managed in nearly the same manner as swimming on the surface. But, in order to counteract the continual tendency upwards, the swimmer must always keep his feet considerably higher than his head, so that each stroke serves to send him downwards as well as forwards.

One of the chief difficulties in diving is to keep a straight course, because there is seldom anything under water by which to steer. In a river, when the water is clear, it is generally easy to look upwards and watch the trees, posts, or other objects on the banks; but in the sea it is a very different business, and the swimmer must have learnt to make his stroke with great regularity before he can dive in a straight line.

It is hardly possible to give too much time to diving. The learner should first take nothing but easy diving, such as have been mentioned, and then try to achieve more difficult feats. He should learn to dive at a considerable distance from any object, swim towards it by guess, and try to bring it to the surface. He should throw two, three, or more eggs into the water, and try how many he can recover at a single dive. When he has attained a sufficient mastery over the water, he should stand on the bank, or in a boat, throw an egg into the water, dive after it and catch it before it reaches the bottom.

This is a favourite feat of ours, and when we were yet in the jacketed state of humanity, we used to secure many a penny and occasional sixpences by thus diving after them, the copper coins being wrapped in white paper to make them more visible. Sixpences were easy enough to see, but not so easy to catch, because their flat form and light weight made them move backwards and forwards instead of descending steadily through the water.

THE HEADER.

Now the young swimmer must learn how to enter the water in a proper and graceful manner. It is as easy to enter the water gracefully as clumsily, and only requires a little care at first.

Most beginners are dreadfully alarmed when they are told to jump into the water first. They cannot rid themselves of the instinctive idea that their heads will be dashed to pieces. Consequently, when they try the "header," they only come flat on the water with a flop and a great splash, and hurt themselves considerably, the blow against the water having almost as stinging an effect as a stroke from a birch rod.

Therefore, let not the beginner try too much at first. He should go to the bank of a river where the water is only a few inches below him, and there make his first attempt at a header. He should stoop down until he is nearly double, put his hands together over his head, lean over until they nearly touch the surface, and so quietly glide, rather than fall, into the water. At first he will be sure to lose the proper attitude, but in a little time he will manage without difficulty. This should be done over and over again, and each time from an increased height.

Next, the learner should take a short run, and leap head first into the water from the place where he took his first lesson at plunging, so that the water is no great distance from him.

He should then remain quite stiff, straight, and still, and see how far his impetus will carry him. This is technically termed "shooting." At last he should accustom himself to leap from a considerable height, say from ten to twenty feet, and to do so either running or standing.

It is our firm belief that when the young swimmer has once ventured to jump from a height of ten feet, he will not be in the least alarmed at thirty or forty feet. At first there is a curious sensation as if all the internal machinery of the body were left in the air; but the feeling very soon goes off, and the diver quite enjoys the rapid rush through the air. The oddest thing is that he does not seem to be falling, but the water appears to rise up and meet him.

Also he should practise leaping into the water at a distance from the bank, and also should try to leap over obstacles, such as reeds, branches, or similar obstructions. Very good practice may be gained by fixing a couple of upright sticks in the ground close to the bank, tying a string across them, and going head foremost over it. Of course, the string should be set low at first, and its height increased by degrees. The height over which an experienced person can leap is really astonishing. The great difficulty is to avoid catching the string with the knee, and this brings us to an axiom in all diving from a height.

KEEP THE BODY, ARMS, AND LEGS PERFECTLY STIFF, AND ALL IN THE SAME RIGHT LINE.

Any one who will do this can leap from extraordinary heights without the least fear of danger. The hands, joined over the head, form a kind of wedge, which cuts its way into the water and opens a passage into which the body passes. The head is so bent over the chest, that even the slight shock which ensues when the water is reached only affects the crown of the head, which is the part which is best able to bear it.

Those who wish to see the attitude of the body in perfection, cannot do better than watch the ex-champion of England, Mr. Beckwith, while performing his well-known series of aquatic feats. As he passes through the air from the elevated leaping-board, his body and limbs become as straight as a dart, and as stiff as if he were a statue carved out of wood.

When he reaches the water there is not the least alteration of attitude, and he shoots through the water like a fish, traversing a wonderful space by the impetus of a single spring.

In jumping out of a boat, the best way is to go to the stern and leap over, as there is more resistance to the feet than is obtained by leaping over the side; and in getting into the boat again always come to the stern, never to the side. Swim towards the boat with the feet high. Grasp the stern in both hands and kick the feet on the surface of the water, so as to keep them up; otherwise, the legs will be sucked under the boat.

Then give a vigorous kick with the feet and a spring with the hands, and you will be lying on your breast over the stern, and to crawl fairly into the boat is then easy enough.

We have bathed from a boat in rivers, lakes, and the sea, in calm and rough weather; also we are not inexperienced in the lore of the gymnasium, and can make the best use of both arms and legs; yet we do not like getting into an ordinary boat after a swim. It is at the best a worrying process, and is a kind of incubus on the mind, destroying greatly the pleasure of the swim. Therefore, we always like to have a short ladder, of four steps, hung over the stern by hooks and staples, and having a couple of iron braces, which make it project at an angle from the boat, and allow the bather to get on board without the danger to his shins which is usually caused by a perpendicular or a loose ladder.

If, however, there should be no ladder, we employ another plan.

We take an oar, or, in preference, a boat-hook, and pass it under the after-thwart, so that it projects well over the stern. This can be grasped by the hand, and is of wonderful assistance in getting into the boat.

MISCELLANEOUS INSTRUCTIONS.

In this, the concluding section, we give our readers some instructions which will be found of great practical use.

In the first place, practise every possible method of keeping afloat under disadvantageous circumstances, so that, if any accident should happen, you may always know instinctively what to do, and may do it without having to think about it.

In the first place, when a boat is upset, or when an accidental fall into the water takes place, the clothes are always found to be a serious impediment. It is true that they are partly supported by the water; but they are always heavy and most troublesome to the wearer, especially the coat and boots.

So, take an old and worn-out suit to the water-side, put them on when you enter the water, and try how long you can swim in them. There is no great difficulty in swimming a short distance when thus encumbered; but for a long distance they are almost unbearable.

Practise, therefore, to take them off while in the water. First take off the coat, by treading water, and releasing one arm at a time. Fling the coat well away, so as to be clear of it, and then set to work at the boots.

These are very troublesome articles of apparel to remove. Lie on the back, bend the right leg, get the foot in front, and with one hand losen all laces or buttons. Then, with the heel of the other foot, get the boot half off, but no more. Go through the same process with the left foot, and you will find that both boots can be taken off without much difficulty.

If the trousers are heavy remove them also. This is done by lying on the back and giving little short strokes with the feet, while the hands are employed in unfastening the buttons and slipping the garment as low as the knees. Then paddle with the hands, giving a shake every now and then with the feet, and the trousers will generally slip off of their own accord. If they do not, a hand judiciously employed will soon complete the operation.

We will now mention that terrible swimmer's bane, the CRAMP. Perhaps more good swimmers have been drowned by cramp than by anything else, and only those who have suffered from it can conceive its fatal power. Strong men and good swimmers, when seized with the cramp, have been known to sink instantly, overcome with the sudden pain; and nothing can save the victim but the greatest presence of mind.

The usual spot where the cramp is felt is the calf of the leg, just below the knee; and it sometimes comes with such violence that the muscles are gathered up into knots.

There is only one method of proceeding under such circumstances. Turn on the back at once, kick out the leg in the air, disregarding the pain, and rub the spot smartly with one hand, while the other is employed in paddling towards shore.

These directions are easy enough to give, but most difficult to be obeyed: cramp seems to deprive the sufferer of all reason for the time, and to overpower him with mingled pain and terror. Still there is no other hope of reaching shore than that which is here given.

The causes of cramp are generally twofold. The principal cause lies in indigestion, for it is seldom that a person in really good health is attacked by this malady. The second reason is over-exertion of muscles that have been little used, and therefore too strong a leg-stroke should always be avoided.

Another thing which demands great practice is the method of saving a drowning person. The chief difficulty lies in the fact that a person who cannot swim feels, in deep water, much as if he were falling through air, and consequently clutches instinctively at the nearest object. And if he succeeds in fixing a grasp upon the person who is trying to save him, both will probably sink together.

Therefore, every precaution should be taken to prevent such a misfortune, and the drowning man should always be seized from behind, and pushed as it were in front. Should he succeed in fixing his grasp, the only remedy is to dive, when it will be found that he will loosen his hold on finding himself below the surface, and will allow his rescuer to take a better position. We used to practise this art, each in turn enacting the part of a drowning person, and trying to grasp our companion, who was trying to bring us ashore. It was capital practice, and one that is much to be recommended.

SKATING AND SLIDING.

There is none of the athletic sports which is so difficult to learn from books as is Skating; and all that can be reasonably expected from a book is that instructions shall be given in the position of the feet, the carrying of the body, and the avoiding of faults which often mar the appearance of an otherwise good skater.

In the first place, let the skates be exactly the length of the foot, neither more nor less, and rounded (not turned up) at both ends. By far the best skates are those which are permanently affixed to the boots; but as this plan sacrifices a pair of boots for the amusement of only a few days in each year, and is moreover a very costly one, the beginner had better procure a pair that can be put on and removed at will.

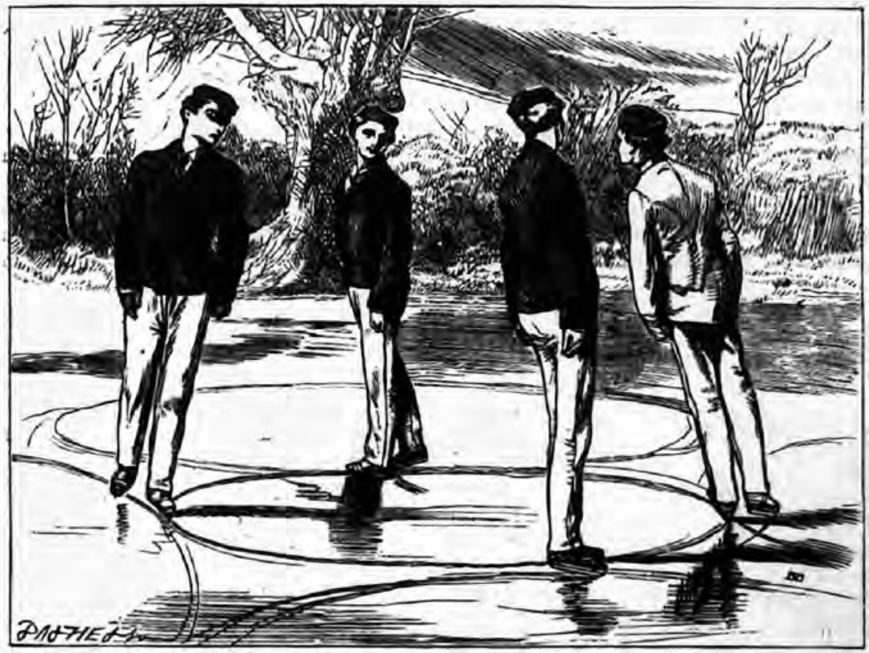
The mode of fastening the skates should be well considered. Avoid those which have the strap crossing over the instep, and choose those which have a very broad strap just over the toes, and one to hold up the skate at the heel. Pegs or screws at the heel are matters of choice.

When you are about to start for the ice, fit the skates carefully to your boots, and with a small gimlet bore a hole in each heel for the reception of the screw. This will save you much time and trouble at the ice's edge, as you will then only have to clean out the hole, instead of going through the process of boring the hole with half-frozen fingers.

Having got the holes so that the irons are exactly in a line with the centre of the boot, put the pegs or screws into the hole, and press the foot down sharply, so as to drive the three little front spikes well into the sole. Then buckle the straps moderately, but not very, tight, and you are ready for your first essay.

If you have a friend who can skate, get him to take you into the middle of the ice. The best way is to place both feet together, and get him to push you gently along without your attempting to move either foot. This will also give you confidence in the supporting power of your skates. Should you feel yourself falling, do not attempt to save yourself, but drop down gently. Struggling is quite useless, and it is much better to sink down gently without a struggle than to fall heavily in consequence of it.

The best plan that can now be pursued is, that you should be left alone in the midst of the ice, and get on as you best can without the aid of an arm or even a chair.



Begin by putting out of your mind the notion of walking. Skaters place their feet *flat* on the ice, so as to slide along it, but do not rise on the toe as if they were walking.

The best way to learn to advance on skates is as follows: stand as if in the "third position" in dancing, as in diagram, Fig. 1, but with the heel of the right foot a few inches away from the hollow of the left. Then, with the *edge* of the left foot press against the ice, so as to push the right forward. Bring up the left foot parallel with the right and slide along until the impetus is exhausted. Do this with both feet alternately for some little time, and you will then begin to "feel your skates," as the saying is.

After you have practised these movements for some time, gradually increasing the length of each stroke, you will begin to find yourself skating on the "inside edge," a movement to which nine out of ten skaters restrict themselves. It is, however, an ungraceful plan and is of little use, except in racing, and, moreover, tires the ankle sooner than the "outside edge" skating, which is the only mode worth practising.

The mode of learning this is very simple. Put a stone or stick on the ice, to act as a centre for the circle which you are about to describe.

Now stand about three or four yards from the stone, with your right side towards it, and your head looking over your right shoulder at the stone. Press the outside edge of your right skate as firmly as you can into the ice, and with your left skate propel yourself round the stone, leaning as much inwards as you can.

After a short time you will be able to lift the left foot off the ice for a short time, and as soon as you can do this, try how long you can keep the left foot in the air. Practise these movements with both feet alternately until you feel that you can confidently trust yourself to the outside edge.

As soon as you are firm on the edge, try to describe a complete circle, taking care to keep the right knee quite straight and the left foot the least particle in advance of the right (see Fig. 2.) When you can get completely round on either foot, combine the two circles, as in the figure, and you have the 8, which with the 3 is at the bottom of all figure-skating.

Now for the 3. Start *forwards*, as before, on the outside edge of the right foot, but leave the left foot well *behind* the right, the toe slightly behind the heel, as in Fig. 3. Do not change the position of your feet, and you will find

Fig. 1.

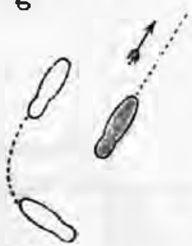


Fig. 2.

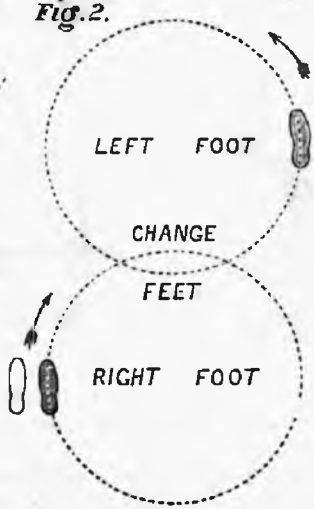
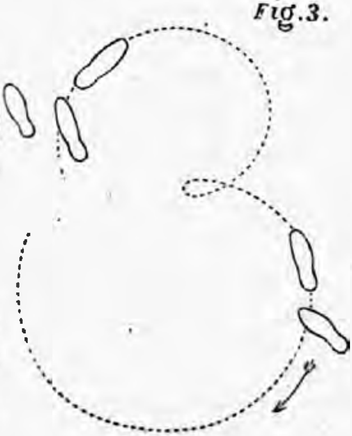


Fig. 3.



that when you have rather more than half completed your circle, you will spin round on the right foot and make half another circle *backwards*, as in the figure.

The books on skating say that, in order to turn round, the skater ought to rise on his toe a little. I consider this advice as totally wrong. True, the rising on the toe does bring the body round, but it gives an appearance of effort, which a good skater never shows. If you will only keep the off foot well behind the other, you *must* come round at the proper spot, and without effort of any kind.

In fact, in all outside edge skating you steer yourself by the foot which is off the ice, and on no consideration ought any of the work to be done by the foot which is on the ice.

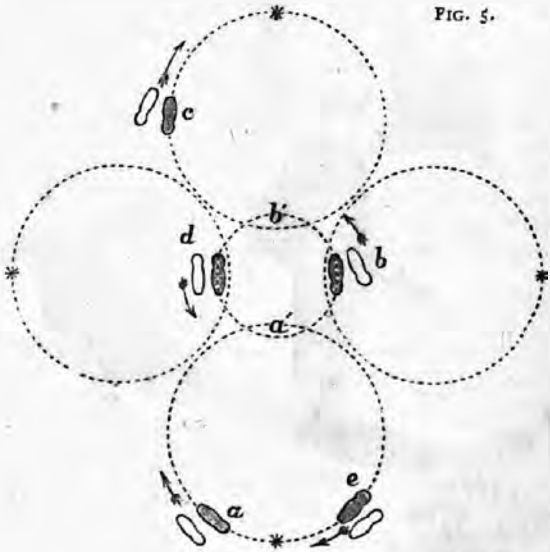
When you can cut the figure 3 equally well with either foot, combine them, as in Fig. 4, passing from one foot to the other without jerking yourself. Practise this until you do it without any effort, the mere swing of the body at the time supplying just enough impetus to carry you round.

The next thing to be done is to get on the outside edge *backwards*. This feat, difficult as it looks, and indeed *is* at the first attempt, in reality is easy enough. It all depends on the position of the feet. If you have kept your feet precisely in the attitude which has been described, the outside edge backwards is a necessary corollary of the figure 3.

After you have turned on your right foot and got partly round the lower half of the 3, simply put your left foot on the ice and lift your right foot. Don't be afraid of it. Press the outer edge of the left foot well into the ice, and you *must* complete the circle. Provided that you do not alter the position of your head, body, or limbs, it is the easiest thing in the world. Only dare to do it, and it will be done.

When you have learnt to shift in this way from one foot to the other with ease, you will soon attain to the summit of a skating ambition, the quadrille.

FIG. 5.



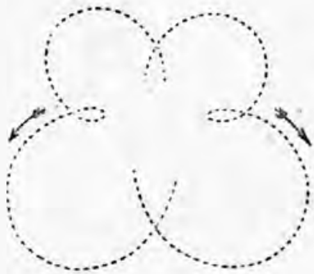


FIG. 4.

This is skated by four persons, who describe the course shown at Fig. 5. They take their positions at the spots shown by the asterisks, and, at a given signal, all start at once. The first figure is shown by the diagram. The skater starts off on the *right* foot, as at *a*, and completes half the large circle. He proceeds to *a′*, where he changes feet, and on the *left* foot, or at *b*, goes half round the small circle as far as *b′*. Here he shifts to the right foot, on which he goes completely round the upper circle to *b′*, where he shifts to the left foot, changes to the right again at *a′*, and so on continually

It will be found that if four skaters perform this manœuvre in exact time, they never interfere with each other, but that they diverge from and converge to the centre with absolute accuracy.

This is the simplest mode of doing the quadrille figure, but it has many varieties. For example, instead of simply going round the outer circles, the skaters spin round at the * and come backwards to the central circle, as in the figure 3; then they shift to the outside edge backwards, and so on. Practice will soon make perfect.

We will end with a few cautions.

Keep the knee of the acting leg perfectly rigid: a knee ever so slightly bent ruins the effect of the best skating.

Never carry a stick.

Never raise, bend, or fold your arms; but let them hang easily by your side, and keep your hands out of your pockets.

Keep the toe of the off foot within an inch of the ice, and the heel rather up.

SLIDING.

The only remark that need be made about sliding is that the feet should always be kept close together and parallel with the line of the slide. The sideways sliding adopted by many boys is altogether wrong, and is sure to lead to a nasty fall some time or other.

Accustom yourself to put your weight on each foot alternately, so as to be able to lift the other off the slide, and with the off foot give a double stamp on the ice. This is called the "postman's knock." Keep the arms close to the body, and, as in skating, if you find yourself likely to fall, slip down and roll aside, so as to be out of the way of those who are following you.

PEDESTRIANISM
AND TRAINING.

By Pedestrianism we understand, in racing parlance, the contest between two or more men, or between a man and time, in walking or running, or between two or more men in jumping.

In QUICK WALKING, which is the only kind useful in racing, the body should be kept upright, with the shoulders well back, and the arms across the chest, swinging with the loins at each stride. The outside of the back of the heel should be the first part of the foot to touch the ground, and should be well dug into the earth, the body being brought forward over the heel, almost before the toe touches the ground. The ball of the foot and the toe should hardly remain on the ground for a perceptible space of time, but the progression should consist as much as possible of *a series of quick, firm steps from heel to heel.* Dwelling long on the foot, and especially on the ball or toe of it, developes a tendency to bend the knee, by putting an immense strain on the toe, which is unable to bear it. The right arm should go well over the left shoulder, in unison with the right leg, and the left arm similarly over the right shoulder.

One foot should always be on the ground in fair walking, which thus consists of a succession of *steps*, not of *leaps*. "Lifting"—the usual term for unfair walking—is accomplished by bending the knee too much, or by leaning too much forward with the body; as in either case the steps become shorter, and gradually lapse into a trot. I shall not give any of the fastest times that have been accomplished in walking, as doubts often exist as to whether the "going" was fair or not.

The conditions of walking matches are, that they shall be fair "toe-and-heel;" and a referee is appointed to see that this rule is not infringed. One or more cautions are generally given by this official (according to the conditions of the match), before a competitor is disqualified, in which case he entirely loses his chance. In professional matches, articles are drawn up stating the method of starting, the distance of ground to be walked over, and number of cautions to be given.

RUNNING may be divided into three heads—viz: "Sprinting," which includes all distances from 100 to 400 yards; "Quarter and Half-Mile Running;" and "Long-distance Running,"—*i.e.*, one mile and upwards. The best time for 100 yards is 9½ seconds. One hundred and twenty yards has been done in 11½ seconds. A "quarter" has been covered in 48½ seconds, and half a mile in 1 minute 55½ seconds. The quickest time for a level mile is 4 minutes 17¼ seconds; and for two miles, 9 minutes 11 seconds. In running matches the only conditions necessary are those naming the ground, distance, method of starting, and referee, whose duty it is to see that no jostling or cannoning takes place, and who generally acts as judge.

TIMING MEN.—This is a most difficult operation, especially in sprint races, and can only be done accurately with a good stop-watch, which should be started *directly* the competitors' bodies bend, and stopped instantly the first man's chest breasts the tape.

HURDLE RACING is a sport which has become very prevalent amongst amateurs during the last few years. The distance in vogue is 120 yards, with 10 flights of hurdles 3 ft. 6 in. high and 10 yards apart, which leaves a start and finish of 15 yards at each end. By far the quickest way of surmounting the hurdles is to take them in stride or "buck" them. "Topping" them will nearly always ensure a mishap, and an attempt to jump them puts the competitor out of his stride. "Bucking," however, requires long and constant practice. The best amateur time for the usual 120 yards hurdle race is $16\frac{1}{2}$ seconds.

LEAPING is effected by a sudden contraction of the legs, followed by a still more sudden and jerking extension of all the joints, by which the body is projected into the air clear of the ground. It may be either from a standing position or with a run; and both may be over a height or across a width. The greatest authenticated height ever jumped, without a spring-board or any artificial take-off, is 5 ft. $10\frac{1}{4}$ in. In leaping, besides those of the lower limbs, the whole of the muscles of the body are violently in action, and especially those of the abdomen and back.

In the STANDING LEAP OVER A HEIGHT the legs are brought close together, the knees are considerably bent, the hips are thrown back and the shoulders forward, with the head well up. The arms are slightly and slowly swung backwards and forwards, the body sinks till the calves touch the back of the thighs, and then by a rapid extension of all parts in unison with the swing of the arms, the body is projected over the height to be cleared, and descends upon the toes and ball of the foot, with the legs bent in order to form a spring to break the fall.

The STANDING LEAP OVER A WIDTH is effected in the same way, but with less contraction of the limbs, and more swinging of the arms.

The RUNNING LEAP OVER A HEIGHT requires a start of about from nine to twelve paces. The take-off should be at the distance of half the height of the object to be cleared, and the legs should be well drawn up in front of the belly during the spring.

The RUNNING LEAP OVER A WIDTH will be better managed with a run of about twenty paces, and the steps should be very quick and short, increasing in these points up to the moment of springing, which is from the very edge of the space to be cleared. The jumper comes down either upon his heels in a very wide leap, or upon his toes in one where his whole powers are not exerted. The longest authenticated jump without any artificial take-off is 21 ft. 4 in.

HOP, STEP, AND JUMP is a very common kind of contest in leaping, and is conducted as follows: A line is drawn at scratch from which the competitor's take a flying start, and the one who can cover the most ground by one long hop, one long step, and a similar jump, is the winner.

VAULTING is rather a gymnastic exercise than pedestrianism, as the *feet* are not used in it.

The LEAPING-POLE is either of fir or ash, about two, three, or even five feet higher than the height of the party using it, and becoming stronger towards the bottom. This kind of contest is generally over a height. It is necessary to fix the attention on the bar or other object to be cleared, and endeavour to surmount it by an effort of the legs, at the same time raising the weight by the arms while in the air, and reversing the face from the side to which the body springs to that from which it sprung. When the leap is to be a very high one indeed, the leaper leaves his pole on the taking-off side, quitting hold of it just before it touches the bar.

Preparatory Treatment.

It is an indisputable fact that no animal is so much improved by training as man—none stands such long and severe preparation with advantage—and none displays the difference between condition and its absence in so great a degree. But it is not only that man may be enabled to do certain feats of activity and strength that training is desirable, but that he may do them with pleasure to himself, and even with advantage to his general health; and this marks the grand principle which every man who values health should constantly keep in view, namely, that no one should attempt to compete in any contest requiring agility or strength, unless he has had such a preparation as shall enable him to perform his task without feeling any ill effect from it. For instance, the man in condition can row through a race of three or four miles, in which his whole powers are taxed to their very utmost, and shall, at the end of it, be almost blind from the exertions he has made; and yet before he gets out of the boat he is "all right," and could go through the same in half an hour without injury; whilst the man out of condition lies nearly fainting, or perhaps quite insensible, for many minutes, or even still longer, and is only revived by stimuli to an extent which will not allow any further liberty to be taken with his naturally strong constitution. Pluck will do much in place of condition; but numberless are the instances of ruined health from the excessive drafts which have been made upon this valuable quality, whilst a little care and abstinence would have prevented any such irreparable misfortune. To enable the man who is of sound constitution—but, from mismanagement, out of health—to restore himself to such a state as will allow him to go into training without mischief, is rather a difficult task in most cases, because it not only requires some skill to know what to do, but also great self-command to avoid that which ought not to be done. In the vast majority of instances the health has been impaired by excess of some kind, and in many by every variety of excess which human ingenuity can suggest. But it is wonderful how completely the anticipation of an Oxford and Cambridge match at Putney, a pedestrian or any similar contest, will enable a "fast man" to throw all temptation on one side, and adhere to all the rules laid down for his guidance with the rigidity of an anchorite. His reply to all tempting offers is, "No, that is bad training." Such is not always the case, but it is true to a great extent; and more pluck is frequently shown in abstaining from temptation, than in sustaining the prolonged efforts which such a race demands.

Actual Training—General Management and Diet.

Training for Walking.—Whether the object is to compete in running or walking, an easy walk before breakfast for half an hour will just empty the small intestines of their last meal, and prepare the stomach for the breakfast; more than half an hour, however, I am confident, is too long to wait, especially if, as always ought to be the case, the supper has been a mere apology for that meal.

For an hour after breakfast, that is, till near eleven o'clock, the pedestrian should amuse himself as he likes best, with billiards or any other game; but at eleven he should be ready dressed in his walking costume. The best dress is what is usually called "University costume," which consists of a pair of drawers, made of coloured merino or silk, reaching to the knee-cap only, and secured round the waist by a single elastic band over the hip-bones. For upper clothing a thin jersey is worn. The shoes should be large enough to give the feet free play, be laced nearly down to the toe, with a sole about a quarter of an inch thick and a slipper heel, with a few "sparrow-bill" nails in it. If socks are worn they should be of the best chamois leather, merel- covering the toes and not showing above the shoe.

From eleven till two or half-past two, his first walk should be kept up without stopping for a moment, that is to say, after the first week, during which time he has been gradually increasing the time from an hour and a half to the above lengthened period. In any case the pedestrian should be accompanied by his trainer, who should amuse him as much as possible by anecdote or other mode of conversation. After dinner, one or two hours should be allotted to rest, in the recumbent position, on a hard mattress or horse-hair sofa; and then a short distance according to the length of the race should be gone over at *top* speed. It should be borne in mind that according to the intention of the pedestrian must be the distance over which he is trained; thus, if he is only preparing for a short race, either running or walking, he need only get himself into good health, and keep in that state by the means I have already described, and, in addition, take two or three hours' walking and running exercise per day. More than this has a tendency to diminish the speed, though, if the intention is to train for a long distance, that quality must, to a certain extent, be sacrificed. There is no question that speed is, to a great extent, lost, if the work is kept up more than three or four hours a day, that is to say, speed for one hundred or two hundred yards. But if the object is to attain the highest speed for ten or fifteen miles, then the powers of endurance are to be tested, and the training must be not so much at a top speed for that distance, as at a less pace with occasional spirts for five miles farther at the least.

The trainer should be a good walker himself, and should draw out the powers of his pupil by walking against him, taking care not to dishearten him, even if he has the power, by walking ahead; but just stimulating him by competition, and yet keeping up his spirits by allowing him to beat him in the amicable contest. Everything in many cases depends upon mental treatment, and many races are lost by the anxiety which is felt for many days and nights prior to the day of trial. In other animals there is not this knowledge of what is to come; but this is the worst difficulty met with in training men, many of whom will lie awake night after night from a nervousness as to the result. Hence, the trainer should by all means encourage his man, and endeavour to do away with this fear of losing by inspiring confidence in his powers on all occasions.

TRAINING FOR RUNNING is conducted on similar principles to that for walking, except that it is necessary to avoid too much *running* work in short matches. Here walking must be made the means of improving the general health, and running only adopted for about the length which is to be run. Beyond this, long-continued running makes a man slow, and he is apt to get his hands down, a habit which is fatal to running spirts. The trainer will, in preparing his man for these short matches, make him run daily two or three times over the distance intended; and either run against him *with a start* of a few yards in advance, which gives him confidence, or time him exactly, keeping the result to himself. When the distance is a longer one, it must not be done more than once every other day, according to its length, but at a good speed, and with all the encouragement and excitement of competition with the trainer.

In all cases of training for long distances, at least five or six hours a day must be spent in walking and running, changing from one to the other as a relief during the early part of training. Two golden rules to be observed are, never to let a man do his *utmost* until the *actual* race itself, and always to give him immediate rest for a few days if he appears jaded, as by this means his spirits will be revived and elasticity of body restored. Man, however, bears severe work in a wonderful manner; and if the appetite continues good and the sleep is sound, without dreaming or starting, the trainer need not be apprehensive that his man is doing too much.

Reduction of Fat.—It will, I think, generally be advisable, before commencing strict training, to take an ordinary dose of aperient medicine. This may be either castor oil or Epsom salts and senna, commonly known as black draught, or the compound rhubarb pills will answer very well in some persons. For any other purpose aperient medicine is to be avoided, and it will generally be found that, beyond the first dose, which I think good as clearing off all undigested food, it will seldom be wanted. Some men have such an abundance of fat that they weigh two or even three stone more than they ought to do. The consequence is that not only is all that weight a dead loss, but the fat itself actually interferes with the due action of the muscles, and especially of the heart. Two modes of sweating may be adopted—one natural, the other artificial: the former is by far the best and healthiest; but either should be used the first thing in the morning, rising from bed a little earlier for the express purpose.

NATURAL SWEATING is managed by putting on extra clothing over those parts more particularly which are loaded with fat. Thus, if the legs are very fat, two or three pair of trousers should be drawn on; if the abdomen is full, then a double apron of flannel should be suspended from the neck under the trousers; and if the arms and neck are loaded, one, two, or three thick jerseys may be pulled on, and a woollen shawl wrapped round the neck. When thus clothed, a brisk walk, or slow run of a few miles, brings on a profuse perspiration, which may be kept up for an hour or so, either by being covered up with horse-rugs or a feather bed, or by lying in front of a good fire. At the expiration of this time the whole of the clothes should be stripped off, beginnning with the upper part of the body, and sponging each limb with hot salt and water before drying it with a coarse towel, after which Dinneford's gloves should be used freely, and the dressing may be as usual, taking care to expose each limb as short a time as possible. Such is the natural mode.

ARTIFICIAL SWEATING can be accomplished by a Turkish bath, or the plan first proposed by Priessnitz, and since then so much used in this country by other practitioners. It is as follows: The whole body should be stripped, and immediately wrapped in a sheet wrung out of cold water, but not so as to get rid of all the water. Then, rolling the patient in a thick blanket, and including the arms, like a mummy, he is to be placed beneath a feather bed, covering all up to the chin. In a quarter of an hour, or rather more, reaction comes on, and a most profuse perspiration breaks out over the face, and, in fact, over the whole body. Among the hydropathists it is usual to supply the patient liberally with cold water, by small draughts at a time, during the sweat; but for our purpose this is not desirable, because it causes too great an action on the kidneys, thereby weakening the frame considerably. When this sweating has continued for an hour to an hour and a half, everything should be taken off, and cold water poured over the whole body, either by means of a shower-bath or a common watering-pot; then rub dry, and clothe. This artificial mode of sweating is not so likely to give cold as the natural one, and it does not exhaust and tire the frame nearly so much. It also produces great buoyancy of spirits, and it may be graduated much more exactly. It has, however, the disadvantage of producing a liability to boils, which in the rower are sufficiently annoying without this sweating process. Wherever there is an unusual collection of fat, on that part must, in either mode, be heaped a greater amount of clothing, and especially if the shoulders should be clogged and loaded. No one can reach well over his toes if his shoulder-blades are confined, or if his abdomen is too bulky; and the first thing to be done is to sweat down the fat as I have described. Either of the above processes may be repeated two or three times a week, and they are far better than night-sweating by Dover's powder or any of the sweating liquors which formerly were so much recommended. Their use is most objectionable, and should never be resorted to if possible.

The following DIET will, I think, be found the best for all training purposes, except the reduction of weight for riding, where a great restriction must generally be put upon the appetite.

Breakfast.—There is no doubt that the very best food for this meal is oatmeal porridge, with the addition of a certain allowance of beef or mutton, and a little bread; but many have the greatest objection to this diet, and never eat it without loathing. For them, I believe, the next best beverage is a pint of table beer, home-made, and not too strong, and giving with it a larger allowance of bread. It is not desirable to stint the appetite unless very enormous, or unless there is a great superabundance of fat; but I believe it will, in most cases, be found more advantageous to reduce the weight by work and sweating, than by starvation. The best mode of dressing the meat is to broil it; and here I must say a word about the degree of cookery to which it should be subjected. It is generally directed that the steak or chop should be quite underdone; this, I am sure, is a fallacy. In broiling, very little nutriment is lost, after the outside is once caught by the fire. Now, if nothing is lost, there is much gained by keeping the steak on the gridiron till properly done through; for the food is rendered much more palatable to most, and certainly more digestible to all. I have known many who were thoroughly disgusted by their "red rags" as they have called their underdone steaks, and from their dislike to such food quite unable to digest them. Tea and coffee are not good for training purposes, though I do not think them so bad as is generally supposed, if not taken too strong; cocoa is too greasy, and not so good as tea—which, if taken, should not be green. I am inclined to think that in those cases where tea or coffee is habitually taken, and porridge or beer is much disliked, it is better to allow them than to attempt too great an alteration in diet. Butter, sauces, and spices should be carefully avoided, and nothing but salt, and a very slight dash of black pepper, used as a condiment.

Dinner.—This important meal should consist of roast beef or mutton, or occasionally a boiled leg of mutton may be allowed as a change; but veal, pork, and salt beef or bacon should be avoided; also goose, duck, and wild-fowl generally. Roast fowls, or partridges, or pheasants, are very good food. Hare is too apt to be accompanied by high-seasoned stuffing, without which it is scarcely palatable. Nothing is better than venison, when comeatable; but it should be eaten without seasoned sauce or currant jelly. As to vegetables, potatoes should be eaten sparingly—not more than one or two at a meal; cauliflower or broccoli, or any vegetable in season, except cucumber or any hard root, is allowable as a digestive. Bread may be given *ad libitum*, and about a pint to a pint and a half of good sound home-made beer. If this does not agree, a little sherry and water, or claret and water, may be allowed with the meal; and a glass or two of the former wine, or of good sound port, after dinner. When the training is continued for any length of time, and the previous habits of the party have accustomed the stomach to it, I have found the occasional use of white fish—such as cod or soles—a very useful change. Nothing disorders the stomach of man more than keeping to one diet; "*toujours perdrix*" is enough to tire any one even of so good a fare; and this must be constantly borne in mind by the trainer. The round he can make is not very extensive, but let him by all means stretch it to the utmost limits of which it is capable. It is even desirable to give an occasional pudding, but it should always have bread for its foundation. A good cook will easily make a very palatable pudding of bread, with a little milk and an egg or two; and this, served up with fresh green gooseberries boiled, or any common preserve, is by no means disagreeable to the palate or unwholesome to the stomach; but let it be only as a change, not as otherwise useful. The grand articles of diet are beef and mutton, with bread or porridge; and, if the stomach and palate would accept them gratefully, no change would be necessary; but, as they seldom will, the best plan is not to attempt too much.

Supper.—Many trainers object to this meal; but I am satisfied, from experience, that unless the training is of so long a duration as to thoroughly accustom the stomach to the long fast from dinner to the next morning, it is much better to allow a light meal at eight o'clock. Oatmeal porridge is for this purpose the best; and no one will be the worse for a pint of it, with some dry toast to eat with it, or soaked in the porridge itself. I do not believe that meat is ever necessary at night, except for very delicate constitutions, which require unusual support. For such cases I have found a chop at night, with a glass of port wine, or even of egg and sherry, a very valuable means of keeping up the strength. Indeed, it will be found that no absolute rule can be laid down for all cases. Hence, as I have before remarked, some will require much more liberal and generous diet than others. If, for instance, the habit is gross and the appetite good, it will be needful to allow only the plainest diet, and to vary it very little. By this precaution, enough, and not too much, is sure to be taken, and the amount of work will insure its digestion. If, on the other hand, the constitution is delicate, with a want of appetite, want of digestion, and tendency to too great a loss of flesh, then it is desirable to allow considerable change from day to day, and, as far as is prudent, to comply with the particular fancies of the palate. Many stomachs bear port wine well; and in those who have a tendency to diarrhœa it is often indispensable. Others, again, are purged by oatmeal, and this is a sufficient reason for avoiding porridge. In some all the bread should be toasted, to prevent diarrhœa, whilst in others, when constipation is present, coarse brown bread made from the genuine undressed flour is a good remedy for that troublesome evil. Whatever bread is eaten should be two days old, and the beef and mutton hung as long as the weather will permit. The best part of the sheep for chops is the leg of a two or three-year-old wether; and for steaks, a well-hung rump or the inside of the sirloin. In the early days of practice, and in the race itself, great distress sometimes occurs; there is considerable blueness of the face from congestion, and the breathing is laboured and difficult. The best remedy for this state is a glass of warm brandy and water, and plenty of hard friction on the feet, legs, and thighs; or, if it still persists, a warm bath at 98 degrees.

Treatment of Accidents occurring in Training.

Blisters of the Hands and Feet.—These troublesome little companions occur either on the hands from rowing, or on the feet from walking; in both cases without due preparation. They also occur in a still more troublesome situation, either from the thwart in rowing, or from the saddle in riding; but in the latter case only in the very *raw* and young equestrian. Should they arise on the hands, they should be pricked with a fine needle, if this can be done before they have burst. The needle should be inserted obliquely, and the watery fluid contained in the blister should then be pressed out; and this should be repeated as soon as the blister has filled a second or third time. In this way the contact of the air is avoided, and in two days the true skin becomes protected by a new cuticle or scarf-skin. If, unfortunately, the blister is broken, the best plan is to apply some collodion with a brush; but it gives considerable pain, and seldom remains on more than six hours, after which time it requires renewal. If the pain of this is objected to, then apply either finely-carded (medicated) cotton in a thin layer under a kid glove, or finely-powdered gum arabic; but, in either case, the hands must be kept from water carefully until the expiration of twenty-four hours. If possible, three days should elapse before the oar is again taken in hand; but if the oarsman cannot be spared, a kid glove should be put on over the collodion. When the feet are the seat of the mischief, there is the same necessity for the preservation of the cuticle, and the needle should be used in the same way; if, however, this protection is removed, a piece of fine kid should be spread with soap plaster, and applied over the skin, extending for at least half an inch beyond the blister in every direction. This treatment answers on feet, while on the hands it is wholly useless, because the friction of the oar soon rubs off the plaster, while under the shoe it remains tolerably well, if smoothly applied. Where the blister exists on the seat of honour, in consequence of the friction of the thwart, it is very difficult to manage, and I have seen hundreds of men with their flannel trousers extensively stained with blood from this cause. Collodion is the best remedy, but even that is of little use, and the only plan that I have ever known at all effectual is to wear a pair of tight wash-leather drawers, extending only a few inches down the thighs. If these are made to fit very nicely, and are well oiled with neatsfoot oil, they will afford astonishing relief, and enable a man with extensive "raws" to row in tolerable ease and comfort; they require, however, to be carefully cleaned and oiled each time they are worn, without which attention they are worse than useless.

Corns and Bunions.—Blisters are troublesome enough to the pedestrian, but corns are a thousand times worse. The former are only temporary evils, whilst the latter are a perpetual cause of discomfort and misery. Corns are of two kinds, hard and soft; and this distinction is not only dependent upon situation, as some people imagine, for the essence and even the cause of a soft corn are entirely different and distinct from those producing the hard variety. The soft corn occurs only between the toes, and partakes more of a warty character than of that of the true corn.

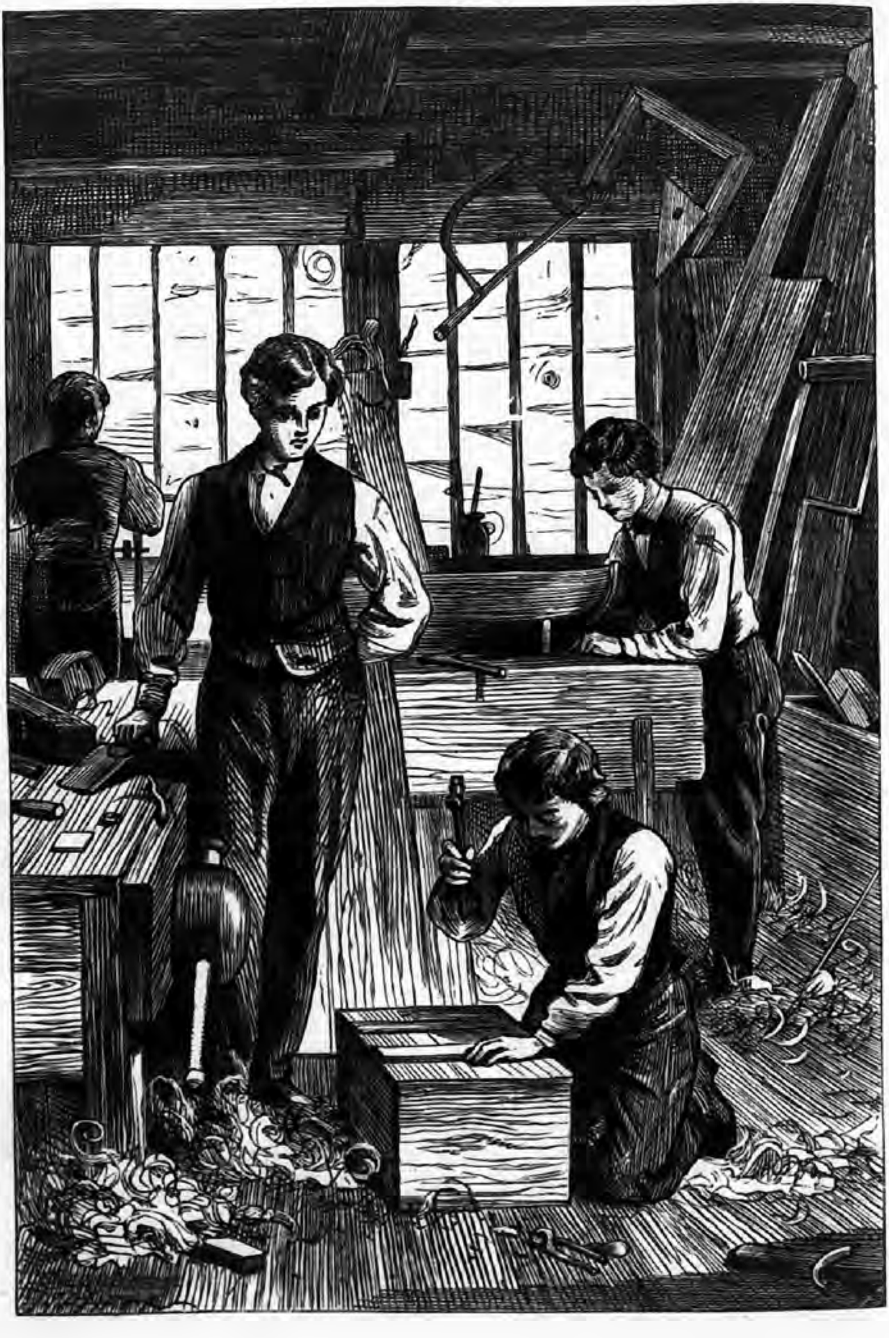
Bunions are different in appearance and character from either hard or soft corns. In all cases they are soft, pulpy, bag-like projections, often, though not always, without hardness or roughness of skin. They are attended with great pain and tenderness, and cause considerable lameness. The treatment of soft corns should be as follows: With the nail, pick off as much of the cheesy matter as can be removed; then, if the next day can be given up, apply a piece of lunar caustic to the surface, rubbing it pretty well in, but avoiding contact with the adjoining skin. After this, keep a piece of carded cotton between the toes night and day, and it will be found that after twenty-four hours' rest all pain will have disappeared, the surface will have lost its moisture, and will have become hard, black, and dry. If the cotton is renewed daily, this state of ease will be maintained for a week or ten days: but then it is necessary to pick off the blackened surface and re-apply the caustic, again using the carded cotton. This second application will probably last a fortnight, but by that time the edges of the blackened cuticle become loose, and the application should be repeated, but not, in all probability, till three weeks have elapsed. In this way, by three or four applications, the most obstinate and painful soft corns yield to treatment and become permanently cured; but the skin between the toes should be kept constantly washed and rubbed with a soft towel, so as to remove every particle of secretion daily.

With regard to hard corns, nothing will be effectual as a cure unless the pressure which caused them is discontinued. In that case they require very little treatment; but if it is continued, as it must be when they occur on the sole of the foot, the only remedies are palliative, and require constant and careful repetition.

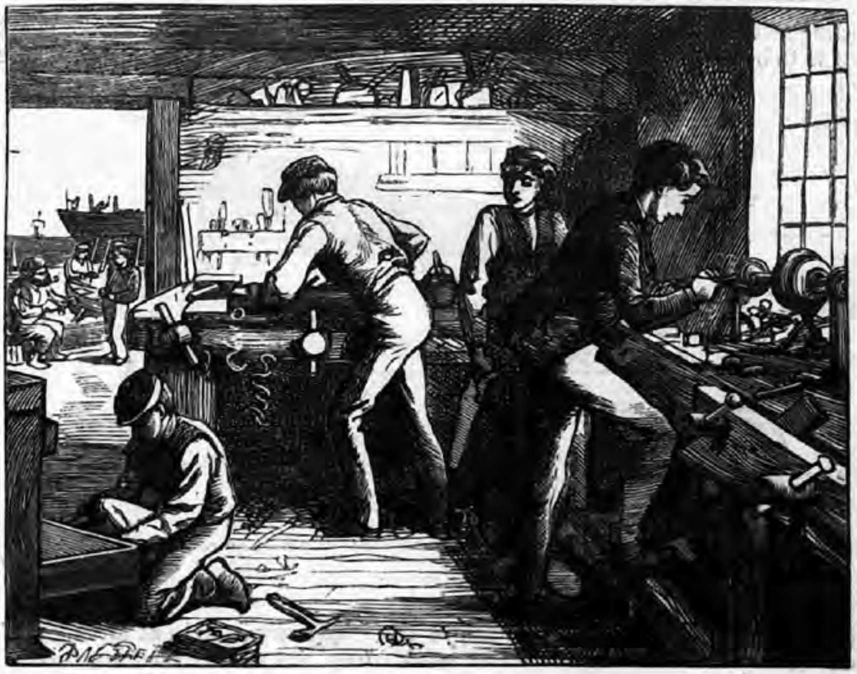
Any one who has the use of his hands may readily treat his own corns, if he will attend to the following directions: In the first place, the cuticle should never be allowed to grow to such a degree as to occasion pain; it should be carefully removed before that time, and the best instrument for its removal is a pair of nail-scissors; with these a small piece of the thickened cuticle should be caught hold of *and raised from its bed at the same time*, then gradually closing the blades, it is removed without any great pain; for if much is given, it is only necessary to raise the scissors still more, and, as it were, drag the corn out of its bed, when the pain ceases, and the excision of that portion is effected. After removing this small slice, another adjoining slice is to be taken hold of and removed in the same way, till all vestige of the hardened cuticle is gone; after which the part may be either covered with a piece of wash-leather spread with soap plaster, or left to its fate. The former is of course the better plan; but, if the corn is removed as often and as fast as it grows, there is no necessity for adopting it. On the sole of the foot the scissors cannot be used, and this is the most unmanageable situation by far. It is almost impossible for the sufferer to cut these himself, either with a knife or scissors; and he should remove them either, when dry, with a piece of coarse sand-paper fixed on a rounded surface, or, when soaked, with a piece of pumice-stone. This treatment will suffice for corns which are troublesome while training; but when rest can be given they should be removed, either with caustic, as described for the soft corn, or with tincture of iodine applied with a paint-brush. In either case the cuticle should be first pared down, and then one or other of the above remedies should be applied; but the inflammation, especially after the second application, is considerable, and rest must generally be given. They are both, therefore, inadmissible in training. Bunions should have two or three leeches applied to them every other day for a week, after which they may be left alone till the bites are well, and then they should be brushed with tincture of iodine every third day. This treatment will generally suffice, but not in very obstinate cases.

Boils.—The only remedy is either the application of some stimulating greasy application, such as a linseed poultice, or the division by means of the knife. Either of these remedies more or less speedily puts an end to the inactive condition, and then a healthy suppuration goes on to remove the cell, and by throwing up fresh granulations, as they are called, to restore what has been removed. Such is the nature and ordinary treatment of a boil; but in training it is almost impossible to bear the use of the knife if the boil is on any part which is subjected to much friction. In other situations it may be used; but if a boil occurs on the seat of the rower, as is so often the case, if the knife is used, at least a week or ten days must be lost before the patient can expose the raw surface to the friction of the thwart. Here, therefore, the best plan is to apply a plaster, spread on leather, and composed of equal parts of mercurial and opiate ointment. This stimulates and relaxes the inflamed vessels, and the opiate relieves the pain to a great degree; but even this is only a partial remedy, as without rest it is impossible entirely to relieve boils. To those who are known to be subject to boils I would recommend, as a prevention, the use of a wash of nitrate of silver of the strength of fifteen to twenty grains to the ounce. This should be painted over the part every night, and will, of course, turn it more or less black; but it seems to give tone to the vessels, and to prevent that low and congestive state which precedes the death of the cellular membrane; at all events it prevents the formation of boils.

Chapped Hands.—In cold weather rowers are sometimes terribly annoyed by their hands and arms becoming chapped, often to such a degree as to cause them to bleed; and pedestrians often suffer in the same way about the hands, wrists, arms, and behind the knees. For this state there is no remedy to be compared with glycerine, which should be freely smeared over the whole surface which is chapped, by means of a brush or feather. The application may be made night and morning.



THE YOUNG WORKMAN.



The Young Workman.

CARPENTERING.

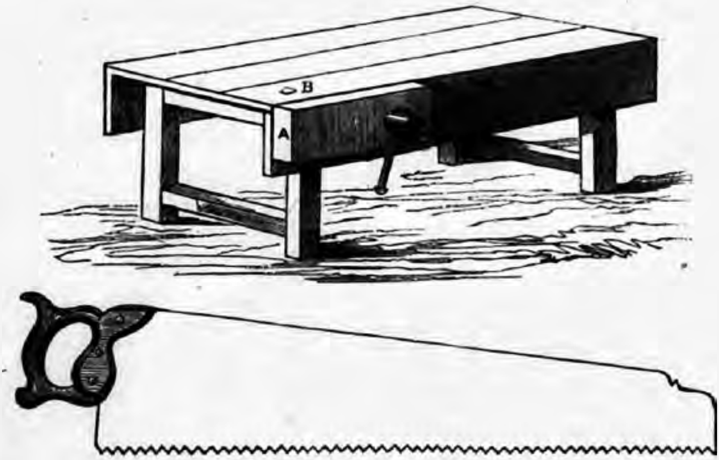
Carpentering is a useful and healthy employment, and every boy will do well to give some of his time to learn the use of the tools required in this branch of mechanical art.

Fig. 1 is a perspective view of a carpenter's working-bench. A is a "jaw" for holding wood when planing the edges; B is a square block of wood, or rest, called a stop or bench-dog, which can be shifted up or down to any required distance above the surface of the table, to keep the wood firm when being planed. An improved kind of bench-dog is made by Bailey & Co. (See Fig. 20.)

A very good size for a bench is 5 ft. long by 2 ft. 6 in. broad, and 2 ft. 6 in. above the ground, that is, 2 ft. 6 in. cubes. A second-hand bench can generally be obtained from a carpenter for about 10*s*.

Do not buy a box of tools, but go to some respectable maker and buy them separately.

In describing each tool and the way to use it, it will be best to begin with the hand-saw (Fig. 2), which is used for cutting wood from the plank: it should be about 20 in. long, with teeth about eight to the inch. This saw will cut cross-ways, as well as lengthways, of the wood. When buying it, say it is required for cutting soft wood. The price of this tool is 3*s*. 9*d*. Always mark out the wood that is to be cut, with pencil and rule. When cutting, look on both sides of the



FIGS. 1 AND 2.

saw at once; this will ensure a straight cut. The saw is held at an angle of about 45°. If it should bend or not work easily, put a little common tallow on the blade. On no account try to set or sharpen the saw, or the result will be more harm done than good. This can be done properly for about 3*d*. at a tool-shop.

The tenon-saw (Fig. 3) is made to cut across the grain of the wood, so as to leave the ends neat; it is also used for cutting "dovetails." It has ten to fifteen teeth to the inch. It has a stiff brass rib to hold the blade straight when cutting. A good length is about 12 in. Price about 6*s*.

FIG. 3.

FIG. 4.

Fig. 4 represents a smoothing-plane. This tool is used for smoothing the wood to a nice flat and even surface; it is also used for finishing up the ends of the wood. The size required is about 8 in. long by 2½ in. broad. When buying it, specify that it shall have double irons. In all probability it will have a pretty good edge when purchased, and will only require a rub on the hone to make it fit for use. To a boy who has a limited amount of pocket-money it is advisable not to buy a hone, but to obtain a good piece of writing slate, which makes a first-rate hone when used with a little oil.

To sharpen the iron, unscrew the pinching-screw, A, Fig. 5, and you can then take off the break-iron, B. Fig. 6 shows the position and the angle, and also the way to hold the iron when it is on the hone. Fig. 5 shows the irons when ready to be put into the stock. To disengage the irons from the stock, strike a couple of moderate blows on the stock at A, Fig. 4, with the mallet (Fig. 7); if this do not loosen them, tap the wedge on either side alternately, and, when sufficiently slack, it can be withdrawn by the fingers.

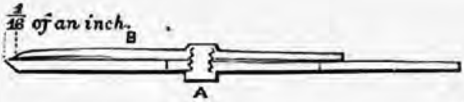


FIG. 5.

FIG. 6.

In putting the wedge into its place, one or two slight taps with the mallet will fix it; if much force be used, most likely the stock will split, or be otherwise distorted. The cutting edge of the iron should project through the base of the stock only sufficient to be noticeable when looking along the plane. The price of the plane will be about 3*s.* 6*d.* to 4*s.*, or perhaps less. A tool-maker will grind this for a penny. Do not buy a second-hand plane, or it will be found on inspection that all the cutting edge has been ground away, and the plane useless.

FIG. 7.

FIG. 8.

The joiner's hammer (Fig 8) is a tool which every boy knows when he sees it; it will, therefore, be unnecessary to give a lengthy description of it.

The face should be about three-quarters of an inch diameter. In holding the hammer, the hand should be very near the end of the handle. When driving in a nail, two or three light strokes will effectively start it, and it can then be driven home with greater force.

A two-feet rule (Fig. 9) is most handy for general use, marked off to inches and eighths. The price is 1*s.* 3*d.*, made of box-wood.

FIG. 9.

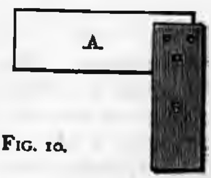


FIG. 10.

The set-square is represented in Fig. 10. This tool is for marking off a line at right angles to the edge of a plank, or any other place where a line is required at right angles. A 12-in. blade is the best size. Price 3*s*. 6*d*. The blade, A, is made of steel; the frame, B, of ebony-wood. There are three brass pins to hold the blade in its place.

The two chisels, Figs. 11 and 12, are required for ordinary carpentering: one,

FIG. 11.

FIG. 13.

FIG. 12.

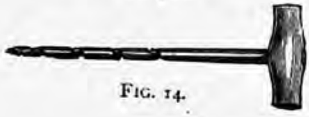


FIG. 14.

one-eighth of an inch broad, for cutting dovetails, the other about three-quarters of an inch. An edge is given to these in the same way as the plane. Price 6*d*. and 10*d*.

The screw-driver is for putting screws into wood. The breadth of the tool where it enters the screw's head should be three-eighths of an inch broad. This tool has not a sharp edge. Price 9*d*.

The marking-gauge, Fig. 13, is for marking parallel lines from the edge of a plank or other piece of wood. A is a pencil or scriber, B is a set-screw to adjust the gauge. Price, in pear-wood, about 8*d*.

The gimlet, Fig. 14, is a tool for boring holes, but, as it is very apt to split the wood when used near the edge, great care is necessary. It is generally best to use the brace and bit anywhere near the edge of the wood. The gimlet is more liable to split hard wood than soft. 3*d*. is about the price of a gimlet.

The brace and bits, Fig. 15, is another boring tool: it is used for boring holes from one-eighth of an inch to three-quarters of an inch in diameter. This tool cuts a very neat and clean hole. The bit, A, Fig. 15, fits into a square socket

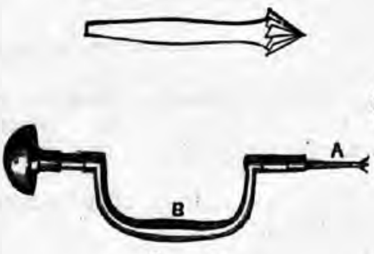


FIG. 15.

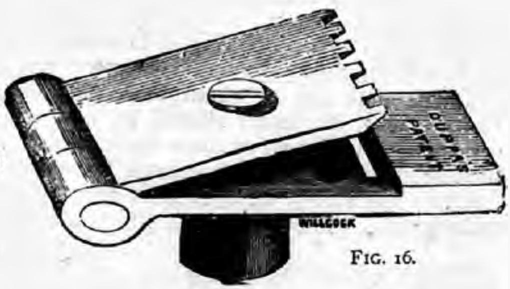


FIG. 16.

in the brace. The left hand is placed on the top of the brace, and the right hand on the crank, B, by which a circular motion is given to the bit. The top figure is a rose-bit, and is used for sinking the heads of nails or screws. The price of a brace as shown in the drawing is about 2*s*. 3*d*. Black bits, 4*d*. each; bright bits, 5*d*. each. The bright bits are recommended.

The "bench-dog," Fig. 16, is an improved arrangement of the bench-stop (B, Fig. 1). There is a screw for raising the stop. Price 3*s*. each.

The gouge is a very similar tool to the chisel; instead of cutting a flat surface, it cuts a semicircular groove. It is not a very easy tool to handle, but it is a very useful one.

There are many other tools than those described and illustrated, which an experienced carpenter would require. These few pages teach but the first lesson to the young carpenter in his apprenticeship. There is the Jack-plane, for bringing the rough wood to a level surface; the lock-saw, for cutting circular work, and various other planes and saws; the spoke-shave, &c.

Let all the materials you use in carpentry be good. Durable work cannot be made with green timber. The best work will be worthless if you do not get well-seasoned wood. For different purposes, different woods are chosen. Oak will stand all weathers without being much affected. Elm will endure in wet situations better than other woods. Ash is a very tough and also a very flexible wood: it is, perhaps, the best if wanted to stand a sudden strain. Pine or deal is more largely used in carpentry than any other wood, on account of its cheapness. For cabinet-work the beech is much used; for ornamental turning, box-wood, coromandel, and other hard woods are used.

How to make a Tool-box.

A handy and convenient size for a tool-box is 2 ft. long, 21 in. broad, and 10½ in. deep. The material required for this will be enumerated below.

12 ft. of ½-in. pine-wood 11 in. broad. The price of this will be *2d.* per foot
1 pair of hinges (or iron butts as they are called by the trade); price *2d.* per pair.
12 screws for ditto, ½ in. long; *1d.* per dozen.
1 pennyworth of brads. (See Fig. 17.)
1 pennyworth of glue.
1 lock and key (iron).

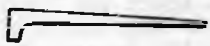


Fig. 17.

When buying the wood, ask for "insides." The first thing to be done is to cut the wood into proper lengths and dimensions. The pieces required will be

For the sides of the box,		2 pieces		24½ in. long.	
,,	two ends	,, 2	,,	21½	,,
,,	lid	,, 2	,,	24½	,,
,,	bottom	,, 2	,,	24	,,

These dimensions should be marked off on the plank before cutting with a rule and pencil. The two sides and the two ends should now be planed on both sides, and the top and bottom edges planed true and square. The breadth of the wood will now be 10½ in.

The best joint for a box is the "dovetail joint." Fig. 18 shows the side with the "dovetail" cut. Fig. 19 the end with the "points" cut. Fig. 20 shows the dovetail joint finished.

To make the dovetail joint, proceed as follows: On one of the sides of the box mark off lines with the square 2 ft. apart, also mark off lines 23 in. apart, call these lines *a* and *b* (Fig. 21). Mark on the line *a* points every inch and half-inch alternately; on the line *b* mark off a point seven eighths of an inch from *b*, and then points for every six-eighths of an inch.

Now draw lines from the points on line *a* to the points on line *b* (Fig. 22). Cut with a tenon-saw from *c* to *d*, and from *e* to *f*, treating each dovetail in the same way. With a chisel cut the piece out so as to form a dovetail, as in required at right angles. A 12-in. blade is the best size. Price 3*s.* 6*d.* The blade, A, is made of steel; the frame, B, of ebony-wood. There are three brass pins to hold the blade in its place.

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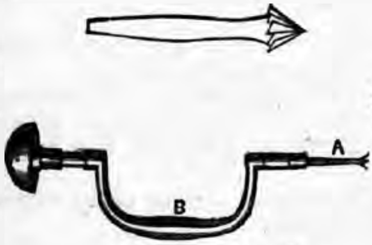
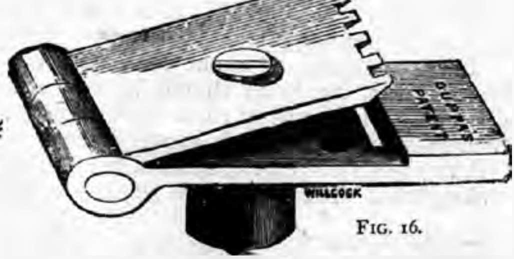


FIG. 15.



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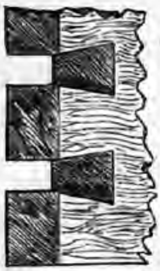


FIG. 18.

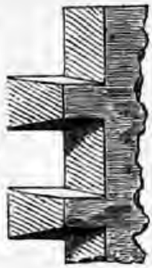


FIG. 19.

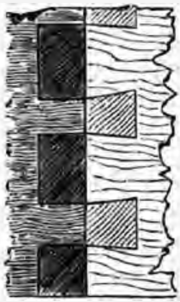


FIG. 20.

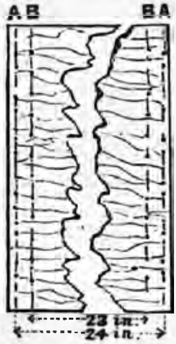


FIG. 21.

FIG. 22.

Fig. 18. The pins are now to be drawn to correspond with the dovetails, which can be done by placing the dovetails just made over the end of the short sides, or ends, and marking them with a pencil. When this is done, make lines 20 in. apart; cut the pins down to this line with the tenon-saw. In cutting the pins, cut outside the pencil lines. The space between can now be cut out with a chisel.

When all the pieces have been done in this manner they should be coated with thin glue, and then hammered well together. When dry, the projecting ends of the pins and dovetails may be trimmed off with a chisel. This is called the "carcase" of the box.

The bottom of the box is to be put in next. Plane up the two pieces 24 in. long by 11 in. broad, and fit them neatly in the "carcase." They should be nailed from outside the box (Fig. 23).

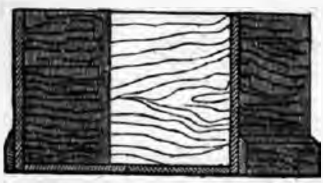


FIG. 23.

FIG. 24.

The lid pieces are planed up next, so as to fit *outside* the "carcase." Fig. 24 is the box when finished; A is a piece of wood 2 in. deep nailed on the lid to keep it square on the box; B B is a beading of wood nailed on the box to make a strong base, and also to protect the edges from chipping.

A DOG-KENNEL, AND HOW TO MAKE IT.

A dog-kennel, as everybody knows, may be almost any size and any shape—as of course the kennel that suits Master Pup, the terrier, will not suit Sir Growler, the Newfoundland. However, suppose Master Pup requires a new house: it must not be made too small or too large, for if made the former, poor doggy will get the cramp in his legs, or if it be made the latter, he will feel cold and uncomfortable, and will want a whole truss of straw to keep him warm.

Fig. 25 is about a nice roomy kennel for a terrier. If the kennel be required for a larger or smaller dog, the size can be altered to suit it, by increasing or reducing all the dimensions in proportion to the required size. It has a hole

FIG. 25.

1 in. in diameter over the doorway in front, and also one of the same size at the back: this will establish a draught, to carry off any bad air, which always accumulates at the highest point. If the kennel be made this size, ½-in. pine-wood will be sufficient, but, if made larger, 1-in. wood may be used.

Materials required:

38 ft. ½-in. pine-wood, 11 in. broad. 2*d.* per ft.
4 doz. 2-in. brads (Fig. 27.)
3 doz. 1 in. „ (Fig. 26.)
2 doz. ¾-in. screws.

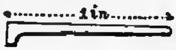


FIG. 26.

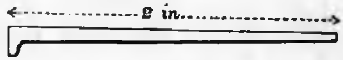


FIG. 27.

The floor of the kennel is the first thing to be made, because the whole after work is erected from it. Cut two pieces from the plank with the tenon-saw, 2 ft. 11½ in. long; plane this on one side and the edges. Also cut two pieces 20 in. long by 5½ in. broad; plane these up nicely on all sides. The two pieces for the bottom are now to be placed as in Fig. 28.

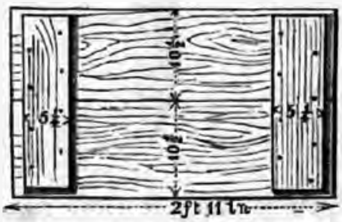


FIG. 28.

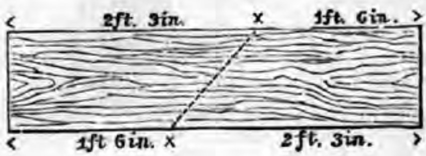


FIG. 29.

The pieces 20 in. by 5¼ in., are screwed on with ¾-in. screws; this holds the two bottom pieces firmly together. Cut a piece off the plank 3 ft. 9 in. long, and plane it up to 10½ in. broad; then cut it diagonally across, as Fig. 29. This forms the back of the kennel, and should be nailed on the bottom with

2-in. brads (Fig. 30). Make a hole in the wood with a brad-awl before putting in a nail.

The front is made in the same way, but requires a hole cut for the doorway before it is nailed on. The curve at the top is cut with the compass-saw. The edges of the doorway should be rounded off; this will protect Master Pup from cutting his ribs when he runs out in a hurry. For the sides, cut six pieces 18. in. long, plane these to 10½ in. broad. Also cut pieces 18 in. long and 5 in. broad, and plane them down to 4½ in. broad. The edges of these boards must all be square and straight, so as to fit neatly together. Nail on these boards as in Fig. 31.

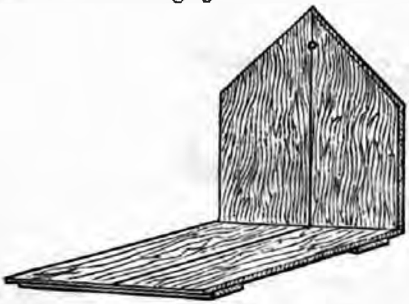


Fig. 30.

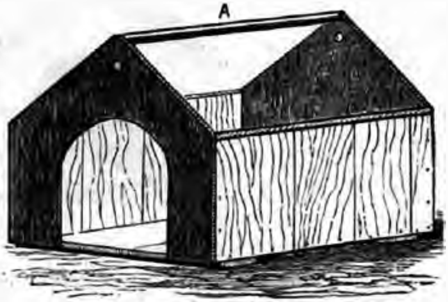


Fig. 31.

The holes to receive the nails should be made with a brad-awl. The cross bar, Fig. 31, A, running from the front to back, is 1 in. square, and is screwed on from the outside of the front and back. The top is now to be made. Cut eight pieces 18 in. long and plane them to 10½ in. broad. The surface that goes outside should be planed smooth. The top is put on as in Fig. 32; B is a piece of wood half an inch square nailed on after the top is on. A skilled carpenter would "mitre" the edges together, and thus dispense with this extra piece.

Fig. 32.

Fig. 33.

With a couple of coats of paint the kennel will be finished. The kennel should not be painted inside. Three pounds of paint will be required. If Master Pup is to be chained up it is advisable not to chain him to the kennel, or perhaps some fine day he may imagine himself a horse, and cut capers with his wheelless carriage at his tail.

Fig 33 is a peg to be driven into the ground to fasten the chain to; B is a staple to be driven into the peg.

PLAIN TURNING IN WOOD AND IVORY.

To those of our young readers who have a mechanical turn there are few, if any, of the various indoor amusements which can be compared with Turning, and there are none, we are convinced, from which such truly satisfactory results will follow.

Very little real instruction, however, can be imparted by any written directions, however clearly and concisely they may be given, unless they are accompanied by practical demonstration and the actual manipulation of the lathe by a practised performer. The endless variety of patterns and figures which are capable of being produced in the lathe does away with all monotony, and when once the rudiments of the art are acquired the pupil will find himself amply repaid for all the trouble he may have bestowed upon it. He must, however, possess taste in the arrangement of his patterns, in their proportions and in their designs: in the absence of these, all his labour will be fruitless, however great may be the proficiency to which he may attain in the actual working of his lathe.

The first step to be taken is to secure a good lathe; that is, as soon as the pupil finds, by working at the lathe of some professional turner, that he really likes it and can handle the ordinary tools in a tolerably workmanlike manner.

We will suppose that the beginner has obtained the advantage of watching a professional turner at work, and has learned practically the use of the different sized "gouges," and can turn some rude patterns, such as the leg of a chair, with a tolerable amount of finish and without chipping the wood or notching the tools. Let him then be taught and practise the use of the different sized chisels and the point-tools, and this learned properly and their manipulation well understood, the groundwork of plain turning may be said to be overcome. The next step we would recommend being taken is that of making a small urn or egg-cup. To do this, proceed as follows:

Having fixed the piece of wood in the chuck (the receptacle, whether of brass or wood, which screws on to the mandril of the lathe), commence turning it with a moderate sized gouge into the rough shape you require; then, with a small "side-tool," hollow out the inside of the requisite size, and finish off with sand-paper. When the inside is completed, turn down the outside to the desired shape, and finish off with sand-paper. After a little practice this will be found to be tolerably easy of accomplishment, and another step in advance may now be taken, viz., that of making an ordinary box. Having selected a piece of wood of the size you require, and fixed it, as before, in the chuck, "rough" it out to the shape you wish, and very carefully turn down the projection to receive the lid of the proper size, and, having *finished off* this part of the box, hollow it out by means of the side-tool, as before; then chuck the piece of wood intended for the lid, and proceed in precisely the same way, taking care to fit the two very nicely; and, having shut one within the other, finish them off together; then, in order to complete the bottom and top, chuck them the reverse way, removing them, of course, from the original chuck and fitting them to a fresh one.

Then, we would point out the absolute necessity of learning to "chuck" well, *i.e.*, to fix the wood or other material you are about to turn firmly and properly in the chuck. This is a most material and, indeed, indispensable ingredient in the art of turning, and more disappointment and annoyance proceeds from a neglect of this precaution than from any other cause.

The making of a set of chessmen affords most excellent practice to the beginner in more ways than one; it teaches the use of the gouges of various sizes, and of the point-tool and chisels, and, what is of equal importance, turning to measurement, for there must be sixteen pawns all exactly alike and of the same size, four castles, four bishops, two kings, and two queens, and the bases of the knights (the heads, of course, cannot be made in the lathe).

Turning in soft wood is but little practised by the amateur turner, as there is but small scope for the exercise of his ingenuity and taste, besides which the method of turning it is entirely different, the level of the rest upon which the tool is held being fixed far *above* the centre of the wood which is being turned; while in hard wood and ivory turning it is fixed as much below it, soft wood requiring to revolve *directly* against the edge of the tool, hard wood at an angle. Besides which, soft wood is not capable of being ornamented by means of the slide-rest and overhead motion, while hard wood and ivory are the best materials for receiving the most delicate patterns.

The best and, indeed, the only woods that will repay the trouble of turning are box-wood, crocus, and the African black-wood. Ebony should under all circumstances be avoided, for, although it is susceptible of taking the most beautiful polish, it is very treacherous, for after, perhaps, hours of trouble and work have been bestowed upon it, it will be found they have been entirely thrown away, a crack appearing and branching in various directions. No material with which we are acquainted can be compared with ivory, the only drawback being its cost; and, on this account, in hollowing it, in making a box, the inside, instead of being cut out in shavings, should always be taken out in rings, by means of a bent-tool and fine parting-tool; and thus much of the material is saved, which is always useful for making rims for pedestals, candlesticks, &c.

It will scarcely be believed by those unacquainted with the working of the lathe that there is no *regular* shape that is not capable of being produced by means of it, and it is perfectly marvellous what may be performed by common or hand turning. We remember seeing what we consider to have been the most wonderful piece of work ever produced. It was in the Exhibition in Hyde Park in 1851. It was the size and shape of an ordinary hen's egg, and the whole of the inside had been turned out through an opening at one end of only one-tenth of an inch in diameter! It was performed by a journeyman turner in an ordinary lathe. It should be added that the shell thus produced weighed less by some grains than an ordinary egg-shell of the same size.

Tedious as the operation is, nothing in the art of turning repays the trouble and time bestowed upon it more than constantly sharpening the tools and keeping a sharp edge continually upon them, for without this precaution an even surface on the work can never be produced.

Nothing gives so delightful a finish to the smooth surface of the wood as French polish, which may be applied in the lathe. Simple as it may appear, it is by no means an easy matter, and requires a great deal of practice. A piece of hard wood must be turned, and made as smooth as possible with sand-paper, then take a piece of flannel about four or five inches square, and double it, then apply it to the neck of the bottle of French polish, which must be inverted two or three times until a piece of the surface of the flannel, about the size of a shilling, is saturated with the polish, then apply a few drops of salad oil and rub it over it with the finger; the lathe should then be set in motion rather quickly, and as the work revolves the polish should be applied to it evenly and with a very slight pressure, which should be gradually increased as the polish hardens. A second and even a third coat may be given; but great care should be taken not to press too hard against the work, or the friction will burn it and cause dark dull streaks to appear on the face of it. This kind of polish should never be applied to ivory, the best way of polishing which is as follows:

Having finished the work with *very sharp* tools and the finest "glass-cloth" or sand-paper, mix about a couple of table-spoonsful of common whitening, reduced to a fine powder, with water, until it is of the consistency of cream, and thoroughly saturating a piece of flannel with it, apply it as described above to the work as it revolves, taking care to keep it perfectly wet. When the requisite polish is obtained, a soft brush with dry powdered whitening should be used, and then a piece of flannel soaked in a little salad oil, and, lastly, a silk handkerchief.

In making boxes of hard wood, it is better to rough them out and keep them in a dry place for some weeks before they are used, as sometimes the wood will crack if it happens to be at all damp, which is often the case if it be used directly it is purchased. If hard wood be purchased in any quantity, it is a good plan to glue pieces of brown paper over each end of the log: this will prevent its cracking. Oiling it is also a good plan.

Rhinoceros horn makes a most beautiful material *when turned* and polished; but the operation is most tedious, for, with every care, it dulls the edges of the tools directly they are applied to it, and the hone must be kept in constant use. After being turned and made perfectly smooth with the finest glass-cloth, it must be polished with a mixture of rotten-stone and oil while revolving in the lathe, as before described.

A few hours' occasional instruction at the hands of a professional turner will do more for a beginner than reading volumes of printed directions; at the same time we feel assured that the few hints we have given will be of essential service.

ORNAMENTAL TURNING.

We now come to the most difficult part of our subject, viz., Ornamental Turning—so called to distinguish it from Common or Hand Turning, as described in our previous article; for by it the most delicate and intricate patterns may be cut on hard wood and ivory with the most delightful accuracy and with mathematical truth, which could not by any possibility be produced without its aid; and as the apparatus necessary for its accomplishment is only an *addition* to the ordinary lathe, its different parts may be purchased by degrees as the learner gradually attains proficiency.

We will first, then, describe the lathe itself as shown in the annexed woodcut.

A A is a framework of wood, generally mahogany, very strongly and substantially made, on which the other parts of the lathe are put on and taken off as required. In some lathes the "bed" (the horizontal cross-piece at the top and front) is entirely of iron; but this we object to, for we have found by experience that there is much more vibration than there is if it be made only

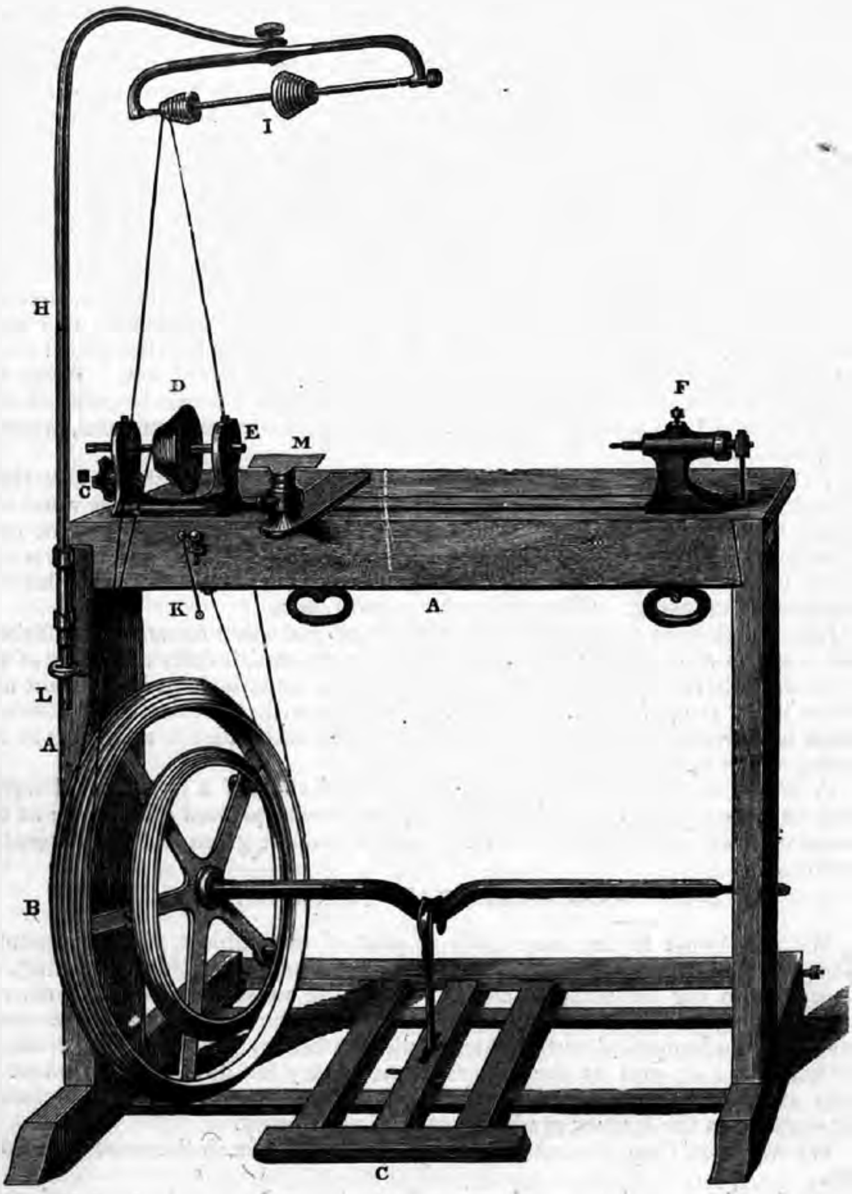


FIG. 1.

partly of that material: and for this reason we recommend that the lower part of it be made of the best mahogany, having two bars of planed cast iron *exactly* parallel to each other on its top, and half an inch thick, which can be easily added to any lathe having its "bed" formed entirely of wood, which is the case with all low-priced ones.

B is the driving-wheel, which is set in motion by the treadle, C. This should be of cast iron, and the heavier the better. The smaller wheel attached to it (as shown in the drawing) is used in metal turning only, as very much less speed is required than in turning wood or ivory.

D is the "pulley," as it is called, over which the catgut band from the driving-wheel passes and sets it in motion.

E is the mandril, having a screw at its end which fits *all* the chucks, and on which they are screwed as required. It should fit the "head" of the lathe with the most scrupulous accuracy, and should be hollow from end to end (*i.e.*, if the lathe has a screw-cutting apparatus belonging to it), as it enables the performer to chuck long pieces of thin wood, ivory, &c., and to turn their ends by passing them through it as well as through the chuck.

F is what is called the "back poppit," and is a movable contrivance attached to the lathe, having a piece of pointed steel, which is capable of being advanced or withdrawn by means of the screw at its rear. It is used when turning any long piece of wood, or other material, in order to keep it steady. It slides between the two iron bearers on the bed of the lathe as before described, and can be fixed at any spot upon them by its binding-screw, as shown in the drawing: the pointed piece of steel which is pressed against the material should be *exactly* opposite the centre of the end of the mandril.

G is a most ingenious and useful addition to the lathe, as it enables the turner to make screws, whether of the coarser or finer threads, with the most unerring accuracy. It is a plate of brass, three-eighths of an inch in thickness, attached to the end of the head of the lathe, immediately below the end of the mandril, which projects about two and a half inches; and moving on an eccentric, so that it is capable of the very finest adjustment, in order to fit a coarse or fine thread. It is in the shape shown in the engraving.

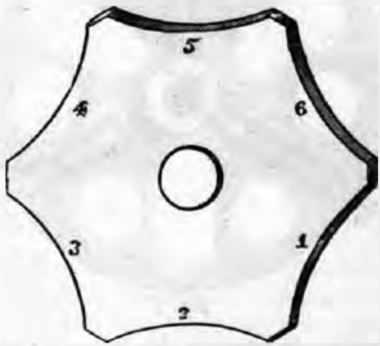


FIG. 2, SCREW-CUTTING APPARATUS.

Six segments of a circle are cut out from its edge. In No. 1 is cut a coarse thread; in No. 2, a finer one, and so on to No. 6, corresponding with and fitting the six different sized screw-tools. The end of the mandril has a steel cap fitted to it, which is kept in its place by a screw at one end, while the other meets the head of the lathe, and keeps the mandril from advancing when the lathe is at work. There are also six blocks of steel, an inch and a half in diameter and an inch thick, and round these are cut threads Nos. 1 and 6, as before described; these are called "screw guides," and are used in this way: when it is desired to cut a screw (whether coarse or fine), the number is selected, the screw at the end of the mandril must be taken out, the cap removed, and one of the guides put in its place (the guides have holes through them, fitting the end of the mandril), and fixed by the screw. The brass plate must then be moved up and down by means of the eccentric attached to it until the corresponding screw fits into the thread of the guide, and allows it to run freely and evenly upon it. The screw-tool must then be selected which fits the guide. And now, then, for the method of cutting the required screw. Advance the screw-guide on the screw in the edge of the brass plate below it about half its length, having previously, of course, turned the piece of wood or ivory on which the screw is to be cut, and attached it in its chuck to the mandril. Then place the screw-tool on the rest M, allowing its end to come in contact with the work, when it must be held perfectly steady. The large driving-wheel must then be moved with the treadle about half-way round, and reversed. It will be readily seen that the mandril as it revolves moves forwards and backwards by the motion thus given to it, and of course in exact proportion to the "pitch" of the thread employed; and after a few turns the screw is complete. The inside screw is cut in precisely a similar way, substistuting the inside screw-tool. For making "working" screws, *i.e.*, those which in boxes, &c., are intended to be opened and shut, this apparatus is invaluable, as the screws thus made fit most accurately. Where a joint is made, not intended to be disturbed, the screws may be cut well enough by hand; but when time is no object, we would advise all screws to be made by this apparatus. Care should be taken that the screw-tool be placed on the rest so that its side comes exactly against the "shoulder" of the work, where the bottom of the screw finishes. A groove should always be cut round the work at this spot, rather deeper than the intended thread, which glides nicely into it without leaving a ragged edge.

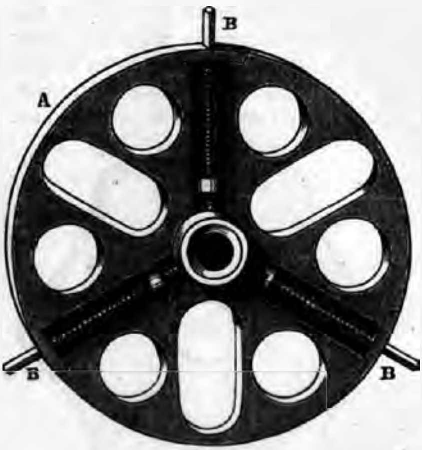


Fig. 3.

We will next attempt to describe the "universal chuck," so called from its being capable of holding in the lathe any sized piece of wood or ivory from half an inch up to four or five inches. This chuck is not *absolutely necessary*, although a very useful tool. It is a plate of brass, A, about half an inch thick, having a screw in its centre at the back to fit the nose of the mandril (which all chucks must do), and having three steel screws, B, B, B, passing through slots and converging to the centre, as shown in the engraving. The holes which appear in the plate are of no other use than that of lessening the weight of the chuck. It is as well to have ten or twelve concentric circles cut on the face of the plate, as it enables the turner to adjust his work in it with greater facility as regards the centre of the chuck. In order to fix the work in this chuck, the screws should be turned, with a key made to fit them, until the jaws, or "dogs," as they are called, are drawn sufficiently far from the centre to admit of its being inserted; they must then be screwed tight against it, and it is thus held quite firmly. Some of these chucks are made so that by turning one screw all three of these jaws move equally towards the centre; but this is practically a disadvantage, and for this reason: that it requires the work to be exactly circular, in order to grip it firmly, which is not the case if the screws act independently of each other. In the latter case the turner is able to chuck work of almost any shape, and this is a great consideration in preparing the material, particularly ivory, for the lathe, in which it is, of course, desirable to avoid cutting, as much as possible, to waste.

Another very useful tool is the "boring collar," which is attached to the lathe in the same way as the "back poppit," F. It is composed of a circular plate of cast iron, A, having eight circular holes bored through it, as shown in the drawing, varying in size from half an inch up to two inches, or even more, and slightly tapered.

FIG. 4.

It is for the purpose of supporting any long piece of work while boring it, in order to get rid of the vibration. It is used in this way: the "back poppit" must be taken from the bed of the lathe, and the "boring collar" put in its place, with its standard next to the mandril; the distance from which must, of course, be regulated by the length of the work required to be bored. One end of the work being fixed in the chuck, the "boring collar" must be pushed forward, and the plate turned round, until the hole in the plate, fitting the work is at the top, when it will be found to be exactly opposite the end of the mandril, and concentric with it; the plate must then be made fast by means of the nut in the centre, by the binding-screw beneath, and the boring collar itself fixed in its place. The lathe must then be worked in the ordinary way, and the end of the work can then be easily bored or hollowed as required without fear of its giving way.

We have, we trust, described the lathe itself sufficiently so far as common or hand turning is concerned; and we will now proceed to describe the various additions to it which are necessary for the accomplishment of Ornamental Turning.

THE OVERHEAD MOTION.

This is a bar of wrought iron, H (p. 398), fitting movably into two stout rings of the same material, attached to the left-hand bearer of the lathe, as shown in the drawing, and having a screw, L, beneath it, and working in a third ring to enable it to be raised or depressed about three inches at pleasure by means of a screw, for the purpose of tightening or loosening the band which passes over the pulley, hereafter described. The upper end of this bar is bent, as shown in the engraving, and carries a frame and spindle, I, on which are two pulleys about three inches in diameter.

In common or hand turning the work revolves in the lathe, and the tools are held against it; but in ornamental turning it is just the reverse, for while the tools revolve, the work remains stationary. The band connecting the driving-wheel with the pulley is removed, and a long band connecting the driving-wheel with the small pulleys on the overhead motion is substituted, and a second band, connecting the other pulley on the spindle with the wheels on different parts of the apparatus connected with the slide-rest (presently described), causes the different tools to revolve.

The above description will, we trust, be sufficiently clear to enable our young readers at once to comprehend this part of the apparatus; and we will, therefore, at once proceed to describe the slide-rest, an indispensable adjunct to the lathe, and without which no attempt can be made in this branch of our subject.

THE SLIDE-REST,

so called from the cradle connected with it, which carries several slides, in which the various tools are fixed. When in use it is attached to the lathe by removing the rest, M, described in Fig. 1, and placing the slide-rest in its place. We will now attempt to describe it as correctly as we can.

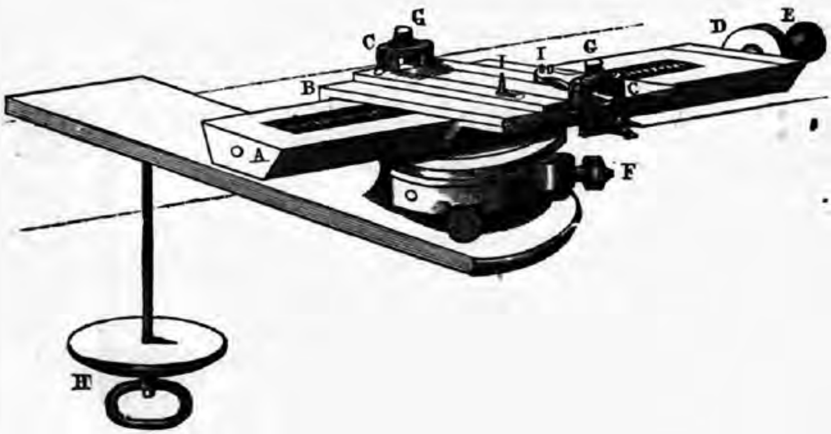
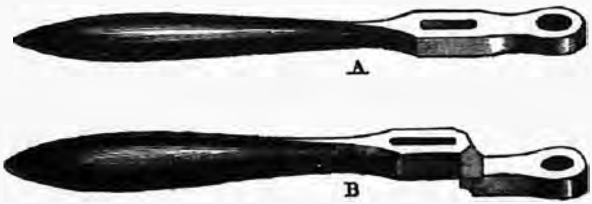


FIG. 5.

A is a piece of cast iron, most accurately planed and finished, of the shape shown in the engraving, having a slot cut through it nearly its entire length, through which a flat threaded screw works and carries the slide B, which, by means of this screw, can be moved from one end of A to the other, so that the tool can be brought to bear on any part of the work; and as the small wheel, D, attached to the end of the screw is graduated with twenty divisions, and the "pitch" of the screw is twenty turns to the inch, it will be seen at once that the very finest adjustments may be arrived at. The upper part of the rest is fastened to the lower part by means of a stout standard fixed to it *exactly* at right angles, which falls into a receptable made for it, and the upper part can be secured at any angle with the lower by means of the binding-screw, F, and can be raised or depressed by turning a ring of brass working on a screw which is placed between them. E is a key which turns the screw carrying the cradle, B; C is the slide which fits into the cradle, B, and which carries the "eccentric cutting-frame." the "universal cutting-frame," and the "vertical cutting-frame," all of which will be described in their turn. G G are two binding-screws, which keep them firmly in their places. H is the binding-screw for attaching it to the lathe; and I I are two small standards, one attached to the slide C, and the other to the cradle B, by means of which and the two levers, A and B, Figs. 6 and 7, they are advanced or withdrawn to and from the work, by placing the hole at



FIGS. 6 AND 7.

the end of the lever over the standard on the slide, and the slot over that on the cradle, the straight one, A, being used for the tool-slide (Fig. 8), and the drill-slide (Fig. 9) and the bent one, B, for the slides carrying the eccentric cutting-frame, universal cutting-frame, and vertical cutting-frame.

THE TOOL-SLIDE.

This slide is used almost exclusively with what are called the slide-rest tools, which need no further description than that they are straight tools about two and a quarter inches long, with round, square, pointed, or grooved ends, according to the pattern required to be produced. They fit into the boss C on the slide A, and are kept in their place by the binding-screw D. B is the standard before described, E being a small stud or handle for withdrawing the slide. F and G are two screws, F regulating the depth of the cut in the work, and G, by being turned slowly, allowing the tool to advance gradually to it, thus diminishing the risk of the very delicate points of the tools being broken, and

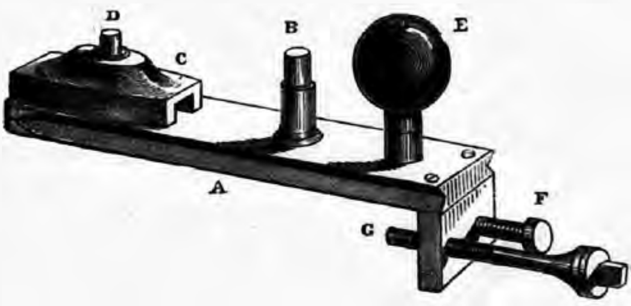


FIG. 8.

avoiding the chance of a ragged gash or scratch being made on the work, which would be the case if the tools were pushed suddenly against it. These screws, it will be observed, are attached to all the slides used in the slide-rest.

The slide (Fig. 8), although it enables the turner to produce very beautiful patterns in connection with the eccentric chuck, hereafter described, is comparatively very little used for ornamental purposes, excepting as it is indispensably necessary in ensuring a perfectly true and even surface on the wood or ivory, preparatory to the introduction upon it of the various and innumerable patterns which are capable of being produced by the other tools. The method of using this slide will be described and treated of in the concluding remarks and instructions of this article.

THE DRILLING-FRAME, OR DRILL-SLIDE.

This instrument is one of the most useful of all these slides, as by its use such a great variety of patterns may be produced. It fits, like all the other slides, in the cradle, B, on the slide-rest. A is the slide itself; B, the spindle, having a steel wheel at its lower end (by which motion is given to it by passing

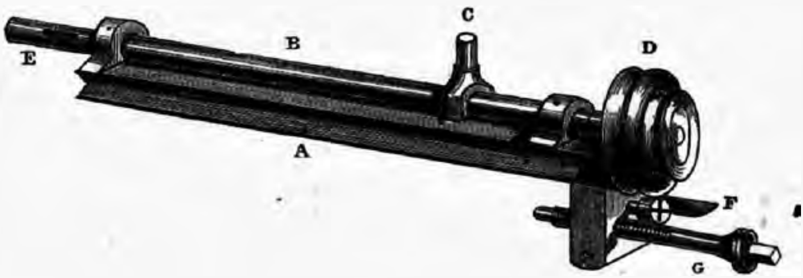


FIG. 9.

the band from the overhead motion over it), and a receptacle, E, into which the various tools are inserted. C is the standard before described; G, the regulating-screws, and F a small piece of steel attached to the slide, which (the head of the screw being graduated) enables the turner to alter the depth of the cut by equal degrees.

THE ECCENTRIC CUTTING-FRAME.

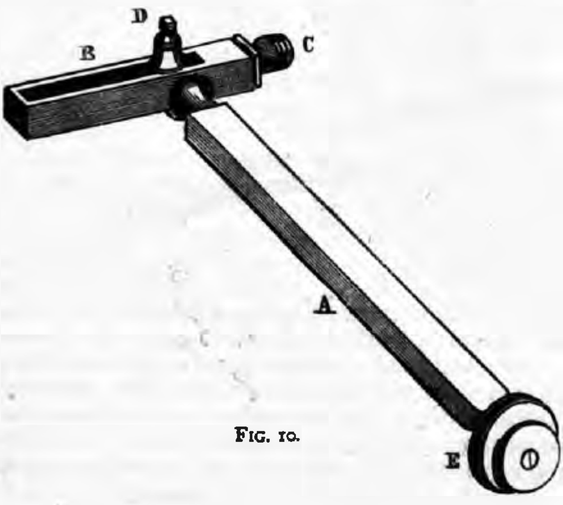


FIG. 10.

This instrument, as its name implies, is used in cutting eccentric patterns on the prepared surface of wood or ivory, and the diversity of work which may be accomplished by it is almost incalculable.

A is a steel shaft, which also fits into the slide on the cradle, B, of the slide-rest, having a spindle working through its entire length, which, like the drilling-frame, has a steel wheel, E, at its lower end, moved in the same way. At the upper end is a steel frame, B, having a four-threaded steel screw working through its entire length, with a graduated head, C. D is a binding-screw connected with a socket, which holds the various tools, of six of which we here give drawings, which may be made, of course, of any shape that may be desired. This instrument enables the turner to describe circles of any size within its compass, by simply turning the screw, C, at the end of the frame, which moves the socket nearer to or farther from the centre.

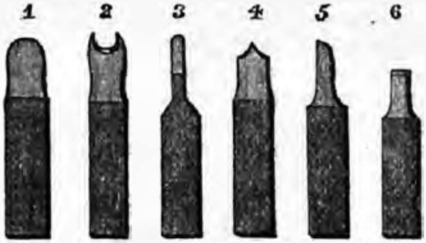


FIG. 11.

THE VERTICAL CUTTING-FRAME.

FIG. 12.

This tool, like the two preceding ones, is attached to the slide in the cradle, B, on the slide-rest by its shaft, A. B is the end of a steel spindle, passing through its upper end, and at exactly right angles with the shaft, having a slot and binding-screw for holding one of the small tools (see Fig. 11), at one end, and a similar small steel wheel to that in Fig. 10 at the other, and worked in exactly the same way. This tool, as its name signifies, only cuts vertically.

We now come to a far more complicated but most useful tool, called

THE UNIVERSAL CUTTING-FRAME,

which, like all the preceding ones, fits into the slide of the slide-rest, and is worked by means of the overhead motion. As its name implies, its action is universal, *i.e.*, it enables the turner to make cuts in his work at any angle and direction.

A is its shaft, having a spindle passing through its entire length, attached to the apparatus to be presently described at its upper end, and a finely-graduated index, C, with a binding-screw, F, at the other. This index has its zero or starting-point on its upper side, and the degrees marked upon it extend to its right and left. The instrument, as shown in the engraving, is set at this point, and the cut made by it in this position would be exactly horizontal. B is the small wheel similar to that in Fig. 12. H is the end of the small spindle, having a slot cut through it, and a binding-screw for the purpose of holding any of the small tools in Fig. 11. E is the head of the instrument, and below it is the binding-screw for the purpose of holding the small frame, D, which carries the two small additional or guide-wheels. It is obvious that if the band from the overhead motion came direct from it to the small wheel B in the position in the drawing, it could not act, as that wheel is in an horizontal one; but, with the aid of the additional or guide-wheels on the frame D, the band can be brought to bear upon it at any angle. We will suppose, then, that a cut is required to be made at fifteen degrees from zero on the right: the binding-screw, F, must be loosened, and the instrument turned in its shaft until the mark on the small fixed stud is exactly opposite that number on the index, when the binding-screw, F, must be tightened and the cut made. If a corresponding cut is required, all that is necessary is to again loosen the binding-screw, F, turn the instrument in its shaft until the same number on the other

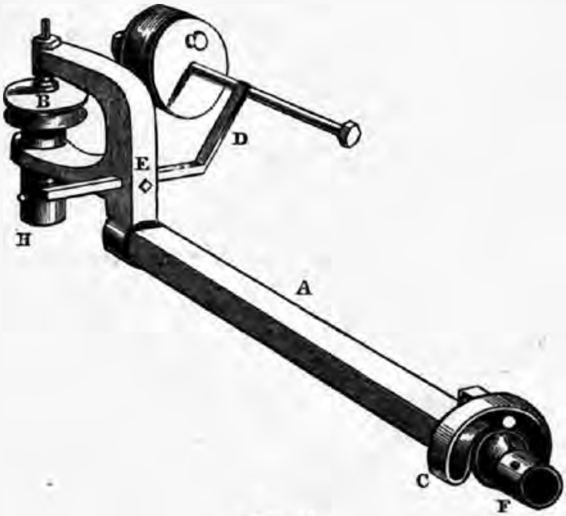


FIG. 13.

side of the index is opposite the mark on the small stud, when the cut made will be exactly in a corresponding direction on the other side. The frame, D, is made to shift from one side to the other, so as to accommodate it to the shape or position of the work; and this is done by simply loosening the binding-screw at E, withdrawing the frame, and putting it through the same hole on the other side, and again tightening the screw; the small brass additional or guide-wheels on the frame must then be transferred to the other end of the bar on which they work, or they will not be opposite the small driving-wheel on the spindle, and would not, therefore, be "in gear" with it.

This brief description, with the drawing before him, will, we think, be amply sufficient to enable the pupil to comprehend the great use of this instrument. All further knowledge of it can only be acquired by practice on the instrument itself.

We next proceed to give a description of

THE ECCENTRIC CHUCK.

Fig. 14 being the front part of it, showing the cog-wheel, B, on which the common chuck carrying the work is screwed, with its ratchet and spring, C and D; and Fig. 15 showing the back of the chuck, with the screw, F, by which it is attached to the mandril of the lathe, E being the head of the screw, to be hereafter described. This chuck is nothing more than a slide for moving the work in an eccentric position, or "out of the centre," which enables the turner

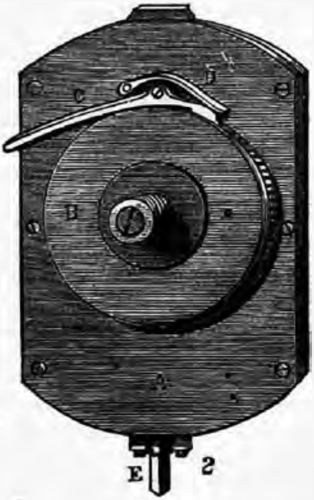


FIG. 14.

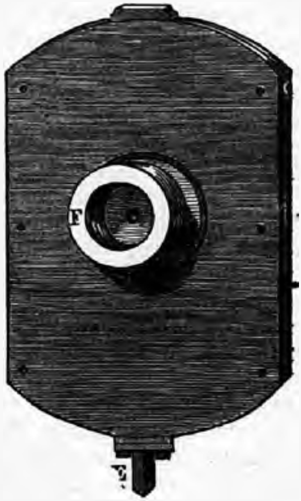


FIG. 15.

to operate upon the surface of it at any given point. We here give an engraving of the chuck with the slide thrown out. A is the brass slide; B is the cogged wheel on which the common chuck is fixed, which is graduated round its edge

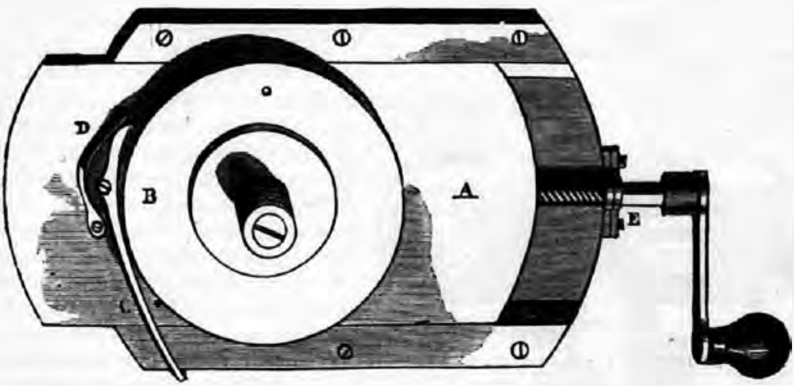


FIG. 16.

with ninety-six divisions or cogs, into which the ratchet, C, having a powerful spring, D, works, and holds it in any position. It will be seen, therefore, that a lateral or a circular movement, or both, can be given to the work attached to it, and thus any part of it so placed that the tool in the slide-rest can be brought to bear upon it. A slot the whole length of the chuck is cut both in the slide, A, and in the brass plate below it, and a steel block is firmly brazed to the lower part of the slide A, through which the screw, E, works. The slide A can thus be moved any distance from the centre by turning this screw. When the slide A is screwed "home," it is exactly concentric with the mandril of the lathe. It may be well to remark here that any work intended to be ornamented by the aid of this chuck in conjunction with the slide-rest should always be turned upon it in this position in the plain lathe, and "faced" by means of the slide-rest tools in the slide (Fig. 8) without moving it from, or disturbing it in, the chuck. Attention to hints like this, trifling as they may appear until put in practice, will often save the turner much time, much annoyance, and, what is perhaps of more importance, much temper; for it frequently, indeed nearly always, happens that, after much labour devoted to the preparation of a piece of work to receive eccentric patterns, &c., and it is found necessary to remove it from one chuck to another, or to move it in its own chuck from the lathe (even although you immediately replace it), a great want of accuracy will be discovered, which will take probably hours to set to rights. Let it be a golden rule therefore *never, after a piece of work is in a sufficient state of forwardness to receive the pattern intended to be placed upon it, allow it to be removed from the mandril or moved in its chuck.*

An instrument not in anything like general use amongst amateur turners, although it enables them to place ornamental patterns on work of certain peculiar shapes and forms, which they could not perform without its aid, is deserving of a description here; and we can assure our young friends that, when they have attained a certain amount of proficiency in this delightful amusement, it will be well worth their attention, and a most useful addition to their stock of ornamental apparatus. It is a very simple, though very ingenious, piece of mechanism, and we will now attempt to describe it. It is called

The Dome Chuck,

and is so named from its enabling the turner to ornament the sides of a dome or half-sphere on its convex surface, which will be noticed in the instructions hereafter given.

A is a stout piece of brass or gun metal, about half an inch thick and four and a half inches long, with a nozzle at one end cut at right angles to fit the mandril of the lathe; and at the other is a graduated nut, B, attached to a screw, which passes along a slot (longer than appears by the engraving) and through a block on the lower side of the slide, which can thus be moved to or from the centre. To an arm extending from this slide is fixed the graduated wheel (ninety-six divisions), E, which is moved round by the endless screw, D, by means of a key, and G is a screw of the same size as that cut on the nose of the mandril, which receives the chuck containing the work, C being a binding-screw to fix the slide in its place. The slide referred to is composed

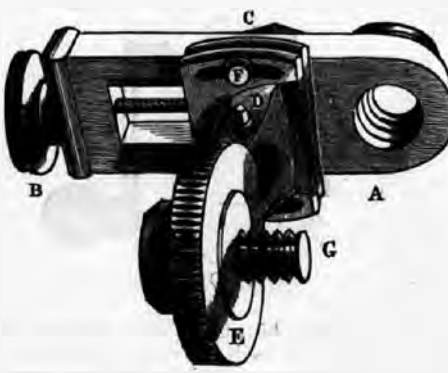


Fig. 17.

of two plates of brass, and the slot and binding-screw, F, admits of the upper one being turned on the other by its centre, which, giving a different position to the work, enables an elliptical shape to be operated upon. It must not be imagined that anything can be done with the chuck without the assistance of the slide-rest and overhead motion. It merely holds the work in its proper position, and regulates its adjustment and the requisite movements as the work proceeds.

We now come to a description of the very ingenious and *indispensable* instrument for sharpening the small tools used in this branch of turning (shown in Fig. 11), on which the accuracy and uniformity of the work very materially depends, and without which it would be impossible to preserve that exactness in the angles of the tools, which is so essential to good work, and to produce and retain the necessary polish upon them.

It is composed almost entirely of brass, the upper part, G, being attached to the lower one, C, by a hinge, and having graduations on its upper surface, commencing at its centre and extending right and left. From just above the hinge is an index, moving on a pin just below the binding-screw, B, and extending to the graduations on the brass plate, and upon it are two sockets, A A, into which the holder containing the tool to be sharpened is placed, and held tight by the binding-screw, B. F is a semicircular piece of steel, also graduated, fastened to the lower plate and passing through the upper one, which is kept in its place by the binding-screw, D. At each end of the lower plate is a small stud or foot. It will be seen that by this arrangement the index carrying the tool can be placed at any angle by moving it to the right or left, and any degree of bevil can be obtained by moving the upper plate, G, up or down the perpendicular index, F. When in use, *i.e.*, when a tool is being sharpened, the two studs or feet and the tool itself form a tripod upon any even surface on which they may be placed.

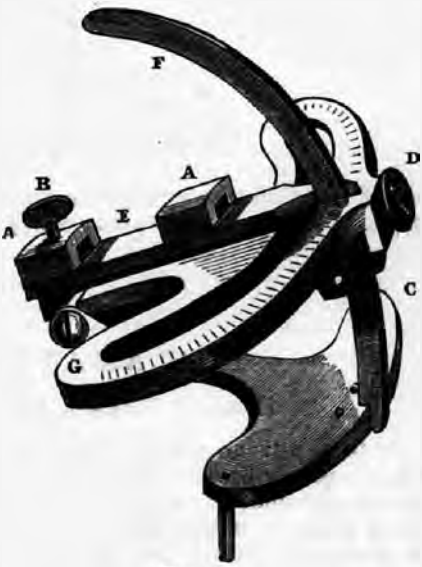


FIG. 18.

In order to sharpen a tool, proceed as follows (all these tools, if procured from Messrs. Holtzappfel and Co., of Charing Cross, bear a number): first ascertain the number engraved upon it, and then move the index to the corresponding number on the plate, having of course fixed the tool in the sockets; then, being prepared with a piece of perfectly smooth and even sheet of brass, place upon it a small quantity of crocus powder (to be had at Messrs. Holtzappfel and Co.'s) and a little salad oil; then let the two feet of the instrument and the bevil of the tool rest on this plate, the tool being placed, of course, on the crocus: by simply moving the tool round and round and to the right and left, the keenest edge will be obtained, and at the same time the most exquisite polish. If a tool requires *grinding*, fine emery powder must first be used, to be followed by oil-stone powder, finishing off with crocus.

No one but those who have had experience can form any idea of the difference in appearance between work when finished with a blunt tool and with a sharp one; and the time and labour spent in getting up a brilliant polish on the tool is compensated for tenfold by the beauty and lustre of the work it produces.

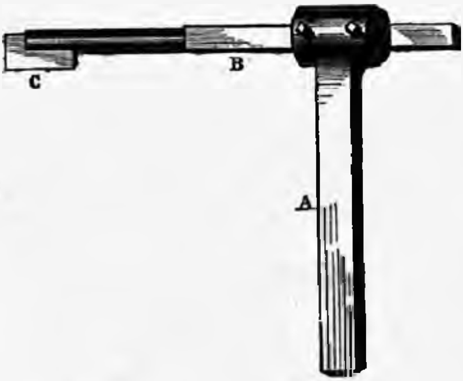


FIG. 19.

This (Fig. 19) will be found to be a most useful instrument when perfect truth in the boring the inside of a cylinder, &c., is required.

A is a steel shaft, fitting into the slide which carries the eccentric cutting-frame, &c., in the slide-rest, with a slot cut through its head *exactly* at right angles, to admit of the tool B being inserted, which is kept firmly in its place by two binding-screws, as shown in the engraving. C is a movable cutter, having a sharp bevilled edge on its end and side. By the aid of the slide-rest it moves in an exact straight line, and therefore cuts the inside of a tube, cylinder, &c., with perfect accuracy.

THE AMATEUR ENGINEER.

HOW TO MAKE A HORIZONTAL STEAM-ENGINE.

In these advanced days of science and civilization I doubt whether any boy could possibly be ignorant of the fact that steam is simply water in a state of vapour, produced at a temperature of 212°, and upwards, "Fahrenheit." In these pages it is not my intention to enter into a detailed account of the discovery, or rather the invention, of the steam-engine (on which subject volumes have been and still might easily be filled), which may be traced as far back as B.C. 130 years, when Hiero of Alexandria invented a species of engine, which has been so extensively modified and altered that it is now almost a difficulty to ascertain which was the precise form devised by the inventor. Small glass and metal constructions, which are frequently called "Hiero's engines," may be purchased at many opticians', and are used for diffusing perfumes. Neither do I intend writing a long dry essay on the properties and quality of steam. I shall only write sufficient to enable the reader to become somewhat acquainted with the properties and power of this great motive agent, and to understand what he is about before attempting the construction of a model engine. I shall only attempt to supply, in generally intelligible language, an explanation of the facts and principles on which the structure of the steam-engine depends.

The first thing necessary for the production of steam is a "Boiler," *i.e.*, a vessel sufficiently strong to be capable of resisting a certain pressure, and furnished with a valve (called a safety-valve) for relieving the boiler of the superabundant pressure, which valve is regulated by a weight placed on a lever, or else by means of a strong spiral spring.

Boilers are now usually made in the style known as "Cornish," that is, longitudinal, with one or more tubes or flues running through them, containing the fire; or else vertical or upright, with a number of tubes inside, conveying the heat from the furnace below to the chimney on the top of the boiler.

A most striking peculiarity of steam is that it increases most enormously in bulk compared with the water from which it is generated. One cubic inch of water will produce one cubic foot of steam, and as a cubic foot contains 1,728 cubic inches, it follows that the space occupied by the steam would be over 1,700 times greater than that required for the water.

I fancy I can hear some of my readers say, "If that is the case, what an immense boiler would be required!" Very true, but the difficulty is solved thus: steam is remarkably elastic and compressible, so much so that hundreds of cubic feet can be packed into the space originally occupied by one foot, provided that the vessel containing it is sufficiently strong to resist the great increase of pressure. This is called "high pressure." For instance, a boiler capable of containing only three cubic feet of steam, the pressure of which is 20 lbs. to the square inch, has another three feet of the same pressure added, then the pressure on the boiler would be doubled, or, as a "pressure gauge" would show, would equal 40 lbs. to a square inch, and so on till the boiler is burst by undue pressure. This clearly shows that it is absolutely necessary to provide ample means of escape for the steam generated in boilers, as most frightful accidents are constantly taking place from the neglect of this condition.

We will now proceed to the machanism required for developing the force of steam, so as to render it available for any purpose to which we may feel inclined to apply it.

There are several different classes of engines, viz.: locomotives, marine, screw, paddle, and trunk; vertical, horizontal, oscillating, beam, and Cornish. These different styles are mostly modifications of the arrangements of the horizontal and vertical engines. Locomotives and the ordinary arrangements of horizontal and vertical engines are what are termed "high pressure," whilst marine engines are "low pressure condensing," and the beam and Cornish engines frequently high and low pressure condensing combined.

Before going further, I think it advisable to describe as shortly as practicable what is meant by "condensing." The exhausted steam which has done its duty in the cylinder is conducted into a vessel in which a quantity of cold water is continuously injected in the form of a jet; this has the effect of turning the steam again into water, which is afterwards partly made use of for feeding the boiler, and, as the water is warm, there is necessarily a saving of fuel.* This

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* This vessel is immersed in a tank of cold water and is supplemented with a pump, by means of which the water supplied by the injection and the condensed steam are constantly being pumped out. This is called the air-pump.

The water surrounding the condenser, unless it were changed, would in time become warm, and fail to effect the condensation. This is remedied by the application of a pump and waste-pipe to the cold cistern in which the condenser is submerged; the pump continually supplies cold water, which, by its comparative weight, has a tendency to sink to the bottom, and the waste-pipe, placed near the surface, lets the warm water escape, which, by its comparative lightness, ascends. Thus, by these arrangements, the method of condensation becomes complete.—*Dr. Lardner on the Steam-Engine.*

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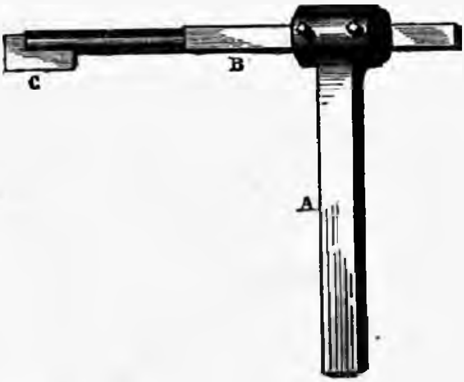

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THE AMATEUR ENGINEER.

How to Make a Horizontal Steam-Engine.

In these advanced days of science and civilization I doubt whether any boy could possibly be ignorant of the fact that steam is simply water in a state of vapour, produced at a temperature of 212°, and upwards, "Fahrenheit." In these pages it is not my intention to enter into a detailed account of the discovery, or rather the invention, of the steam-engine (on which subject volumes have been and still might easily be filled), which may be traced as far back as B.C. 130 years, when Hiero of Alexandria invented a species of engine, which has been so extensively modified and altered that it is now almost a difficulty to ascertain which was the precise form devised by the inventor. Small glass and metal constructions, which are frequently called "Hiero's engines," may be purchased at many opticians', and are used for diffusing perfumes. Neither do I intend writing a long dry essay on the properties and quality of steam. I shall only write sufficient to enable the reader to become somewhat acquainted with the properties and power of this great motive agent, and to understand what he is about before attempting the construction of a model engine. I shall only attempt to supply, in generally intelligible language, an explanation of the facts and principles on which the structure of the steam-engine depends.

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class of engine is not always available, on account of the large quantity of water required for condensing the steam.

I shall direct your attention in the following pages to the Horizontal and Oscillating engines. For the benefit of such of my readers as may not be acquainted with the names of the various parts of the steam-engine, I will enumerate them and explain their various uses.

The engine first claiming attention is that known as the "Horizontal." This is one of the simplest forms of engine, and is most generally used. Figs. 1 and 2 show an elevation and plan of a horizontal engine, drawn to 3-in. scale, or a quarter the size which it is intended to be built. The various parts are distinguished by letters corresponding with the following list:

A. *Bed-plate.* This is a frame or plate, made of cast iron, to which the cylinder, plummer-blocks, guide, &c., are firmly bolted. (In our model I should advise it being made of brass, as it is more easily worked.)

B. *Cylinder.* A description of this important part of an engine will be given hereafter.

C. *Cylinder-covers.* These are discs of cast metal, bolted to flanges cast on the ends of the cylinder; one is made with a projection, called a *stuffing-box*, through which the piston-rod works. The stuffing-box is a recess turned on a boss cast on the cover for the purpose of receiving some "packing," such as hemp, or tow, or gasket, well soaked in tallow, which is pressed tightly against the piston-rod by means of the

D. *Gland*, which is usually made of brass or gun-metal, although in many large engines it is made of cast iron, "bushed," or lined with brass. It is tightened down to the packing by means of screws or studs and nuts.

E. *Steam-jacket.* A cast iron case or box bolted to, and sometimes cast on, the cylinder face, in which the slide-valve works, and into which the steam is admitted before it enters the cylinder.

F. *Piston* (see Figs. 14 and 15). A solid disc or plug, fitting the interior of the cylinder with sufficient accuracy to prevent the steam from passing from one side to the other.

G. *Piston-rod.* A round rod, usually made of steel, firmly screwed or keyed in the centre of the piston, and passing through the stuffing-box and gland, through which it must move so closely as not to allow any steam to escape.

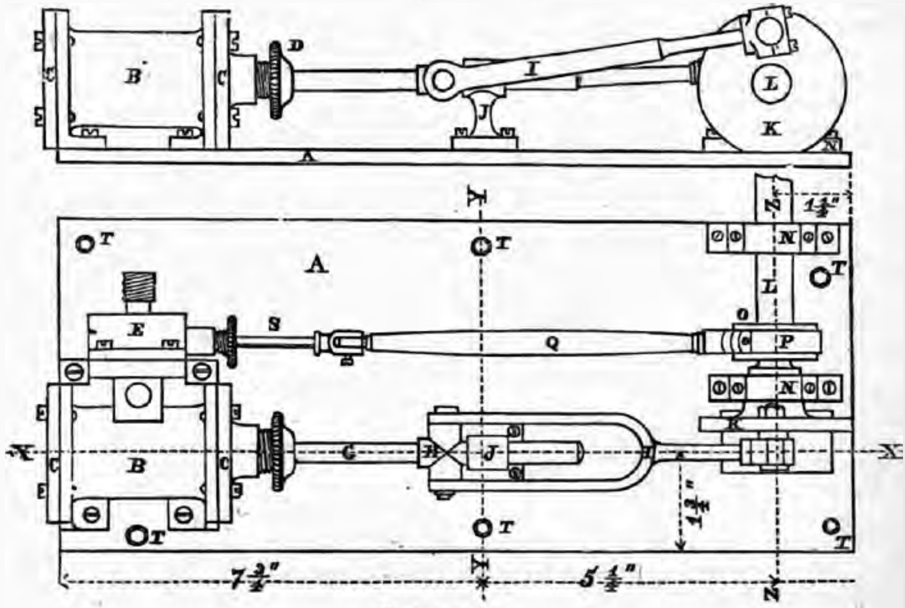
H. *Cross-head.* A species of boss or crossbar, fixed on the piston-rod, to which the connecting-rod is jointed.

I. *Fork Connecting-rod.* A rod somewhat similar in shape to a tuning-fork, forged out of wrought iron, connected at one end with the cross-head, and at the other end with the crank disc-pin. The ends of the connecting-rods that are used for practical purposes are fitted with gun-metal bearings, termed brasses, to prevent undue friction.

J. *Guide.* This is a block or bracket to keep the piston-rod in a straight line with the centre of the shaft, and to prevent it from getting buckled or bent.

K. *Disc.* A circular metal plate fixed to the end of the shaft, and carrying a pin to which the connecting-rod is attached. The disc is usually cast heavier on the side opposite to the crank-pin, to carry the connecting-rod over the "centres."

L. *Fly-wheel Shaft.* This is a stout wrought iron shaft, to which the disc is keyed. It carries the disc, eccentric, fly-wheel, and *pulley* (M) for transmitting motion to whatever machinery the engine is intended to work. (In the engraving the fly-wheel is omitted for want of space. Its use is that, by



FIGS. 1 AND 2.

means of its impetus, it carries the crank over the "centres" or dead points.)

N. *Pedestals* or *Plummer-blocks.* Cast iron blocks fitted with brasses, on which the shaft revolves. These blocks are provided with caps, and bolts and nuts, for tightening down the brasses as they may be worn away. This is called "taking up the wear."

O. *Eccentric.* A circular plate of metal keyed on the shaft at a point at some certain distance from its true centre, giving by this means a reciprocating motion, similar to that of the crank or disc itself.

P. *Eccentric Straps.* Rings of metal, usually made in halves and bolted together, in which the eccentric revolves. A groove is generally turned in the rim of the eccentric sheave, to keep the straps in their places.

Q. *Eccentric-rod.* An iron rod fixed to the eccentric straps at one end, and connected with the valve-spindle at the other end.

R. *Slide-valve.* (Figs. 14 and 16.) An iron or brass block, working over the "ports" of the cylinder-face, to regulate the admission of steam. The centre is hollowed out to allow the exit of the exhaust steam. The valve must be "faced" to ensure a perfect fit against the cylinder-face.

S. The *Valve-spindle* is a short steel rod, working through a stuffing-box and gland on the steam-jacket, connecting the eccentric-rod with the slide-valve.

T. *Holding-down Bolts* are used for bolting the bed-plate down to its proper foundation.

Having now described the various component parts of the engine, I shall go on to show how any boy possessed of a moderate amount of intelligence and perseverance may, with the aid of a few tools and a few shillings, construct for himself a working model of a horizontal steam-engine.

For the benefit of my readers who do not possess the necessary tools, I will commence by giving a list of those required, with the approximate prices, and information as to their various uses. If, however, they can be borrowed, so much the better.

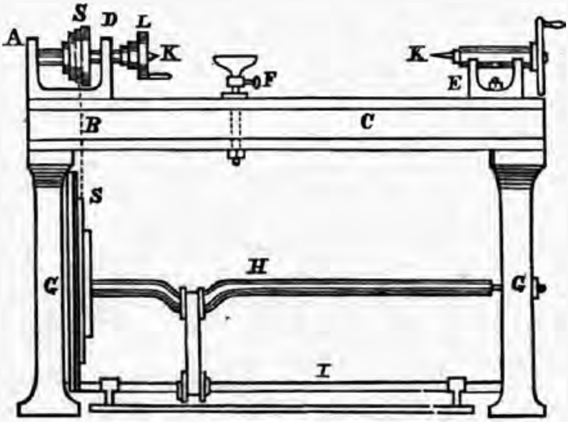


FIG. 3.

The first and foremost among tools is the lathe (Fig. 3). This is a machine for turning metal or wood by causing the material to revolve on "centres," and to be cut by a tool, either held by the hand of the operator or else fixed in a "slide-rest." In the ordinary form of foot-lathe shown in the engraving, the tool is held in the hand. The spindle, A, is called the mandril, and is caused to revolve by means of speed pulleys, S S, which are connected by a stout cord or gut. C is the bed to which the fast headstock, D, the loose headstock, or poppet-head, E, and rest, F, are secured by means of bolts. G G are the standards or gantries, to which the bed, C, is firmly bolted. The speed pulleys, S S, which act also as a fly-wheel, are made to revolve by the crank, H, on pressure being applied to the treadle, I. The work to be turned is fixed between the points or "centres," K K, and is made to revolve with the mandril by means of a stud or pin fixed in the face-plate, L, which forces round a clamp or carrier fastened on to the work. The price of a lathe varies according to size. They may be bought from £2 to £100. The amateur who does not possess one, or who cannot afford to purchase one, can always get his turning done by a turner for a very moderate sum.

A 3-in. bench-vice (Fig. 4) will be found quite large enough. It is used for holding or gripping any piece of work that is to be fitted, chipped, or filed. Fig. 4 *a* shows a vice and portable vice-bench. A vice similar to Fig. 4 *a*, without bench, new, is 15*s.*; secondhand, about 9*s.*

Files: one each 8-in. bastard, smooth half-round, smooth flat, taper square, and one 6-in. round smooth, will be found ample. These will cost about 3*s.* The rough or bastard are used for reducing work to a proper form, when it is finished and polished with the smooth files.

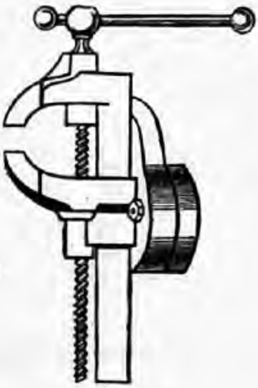


FIG. 4.

FIG. 4 *a*.

Centre-punch. This is used for marking the centres of holes, &c., and in "lining." Price 6*d.*

Callipers. One pair of inside and one pair of outside (Fig. 5) will be required. Their use is to measure accurately the diameter of holes and rods. Price from 10*d.* to 2*s.* 6*d.* per pair, according to size

FIG. 5.

FIG. 5 *a*.

FIG. 6.

A carrier (Fig. 5 *a*) is a species of clamp, used for causing work to revolve in the lathe; the screw is used for pressing the work close against the sides of the carrier. Price from 2*s.* upwards.

Compasses or dividers (Fig. 6) are for marking circles and measuring distances. Price from 1*s.* per pair.

A 2-ft. rule is absolutely necessary. Its use is obvious. Price from 10*d.*

A scriber is a piece of steel wire sharpened to a point, and is used for marking lines, &c.

Steel straight-edge is used for testing surfaces as to whether they are sufficiently flat or not. Price, 12 in. long, 2*s.*

Square (Fig. 7) is used for squaring up a surface that must be at perfectly right angles with another surface. This is called the "engineer's square," in contradistinction to that used by the carpenter. Price 2*s.* Fig. 7 *a* represents a shifting square, by means of which the blade may be lengthened or shortened at pleasure. These, however, are more expensive, costing 7*s.* 6*d.*

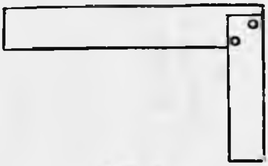


FIG. 7.

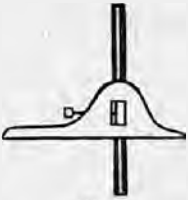


FIG. 7 *a.*

Pliers. These are too well known to need any comment. Price per pair, from 6*d.*

FIG. 8.

FIG. 10.

FIG. 9.

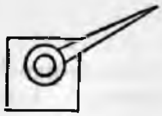


FIG. 11.

Archimedian drill-stock and drills (Fig. 8). These will be found very useful for drilling small holes. Price with six drills, from 4*s.*, according to size.

Screw-plate and taps (Fig. 9). The plate is used for cutting outside or male threads, and the taps for making corresponding inside or female screws. Price of plate and taps for making six different sized screws, 3*s.* 6*d.*

Hack-saw for cutting metal will be found extremely useful. Price for a useful size, 2*s.* 9*d.* (Fig. 10.)

Scribing-block (Fig. 11) is required for marking off the centre of the cylinder, crank-shaft, guide, &c., when erecting the engine. This can very easily be made with a square block of hard wood, with a piece of flat steel, sharpened to a point at one end, screwed to it.

Clamps. Pieces of lead hammered to fit the jaws of the vice, to protect finished work from being marked by the teeth cut in the jaws of the vice. These can easily be made by the amateur himself.

Hammer of moderate size, with shaft, will cost about 1*s.* 3*d.*

Surface-plate. This is used for testing the faces of valves and other pieces of work that require a "dead true" bearing surface. For the amateur's purpose I should propose the use of a piece of hard wood, such as oak or birch. about 7 in. by 5 in., planed dead true on one face, and the edges squared up.

Milling tools are used for cutting a rough surface on the edge of a screw-head, for facility in fastening them up tight in their proper places. (Fig. 12).

A grindstone (Fig. 13) will be found very useful, although not essential.

We shall complete our outfit by the addition of a small oil-feeder, price 8*d.*.

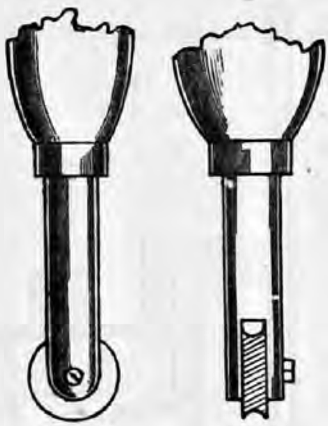


FIG. 12.

FIG. 13.

and a few sheets of fine emery-cloth, which costs 1*d.* per sheet, or 1*s.* 9*d.* per quire of 24 sheets.

The first thing to set about before commencing the engine is to make a working drawing, full size if practicable, with all the details, &c. This being done, patterns of the various parts which are to be cast should be made. It should be remembered that in pattern-making the parts which are bedded most deeply in the sand ought to be slightly tapered, to allow of their being easily withdrawn; allowance should also be made for turning and fitting, and also for contraction of metal, which is about three thirty-seconds of an inch to the foot. It is advisable to make as much of the brass-work as possible out of metal in sheet and stick—which latter may be purchased either circular, square, or flat—in order to save pattern-making. In an engineering establishment pattern-making is a very heavy item.

Having treated of the drawings and patterns, I will now proceed to give directions for making a small horizontal engine. (The engravings are all made to scale, the details being 6-in. scale, or half size, so that in making the drawing the dimensions can for the most part be taken from them.)

The bed-plate, A, is to be $14\frac{1}{4}$ in. long, and 6 in. wide, and $\frac{3}{16}$ in. thick, with a slot 2 in. by $1\frac{1}{4}$ in., to enable the disc and pin to work clear. The simplest way of making the bed-plate will be to procure a piece of iron plate $\frac{3}{16}$ in. thick, and cut it to the foregoing dimensions.

Fig. 15 is a section of the cylinder. It is $2\frac{7}{8}$ in. between the faces of the flanges, to which the covers are secured by nuts and bolts or screws. The covers are $2\frac{1}{2}$ in. diameter, with a shoulder on one side $\frac{1}{8}$ in. thick, and $1\frac{1}{8}$ in. diameter. The thickness of the covers to be $\frac{1}{4}$ in. The bore of the cylinder is $1\frac{1}{8}$ in. and thickness of metal $\frac{1}{8}$ in. all round, making altogether an external diameter of $1\frac{3}{8}$ in. The top cover is provided with a stuffing-box, into which the gland fits. This stuffing-box is partially filled with hemp soaked in tallow, on which the gland is screwed down tightly to prevent any escape of steam. The piston (Fig. 15) is a flat disc or plug of brass $1\frac{1}{8}$ in. diameter and $\frac{1}{8}$ in. thick, accurately turned to fit the bore of the cylinder; two small grooves must be turned in its edge, in which is wound a small piece of

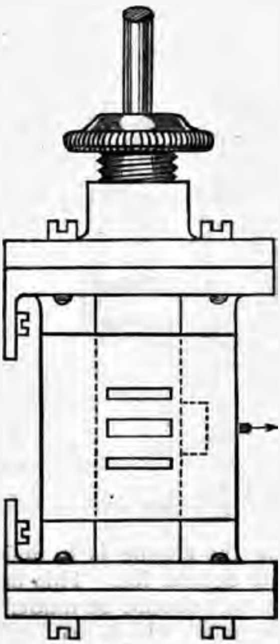


FIG. 14.

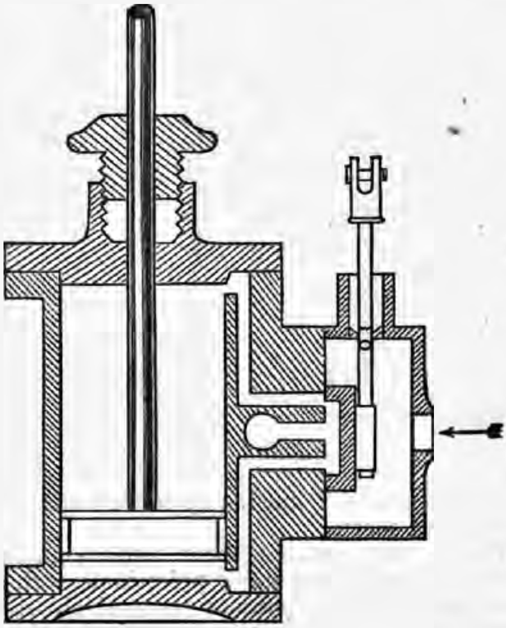


FIG. 15.

cotton-wick or hemp soaked in tallow, to make it steam-tight. Fig. 14 is a plan of the cylinder, showing the steam-ports.

It will not be considered a digression, I trust, to give here just a short explanation of the cylinder and its appendages. The slide-valve (Figs. 15 and 16), being moved by means of the eccentric to the lower end of the jacket, uncovers the port or passage A; the steam then enters the cylinder above the piston, and, driving that downwards, the steam beneath makes its escape by the port B into the recess in the slide-valve, and finds exit through the exhaust-port C into the open air. For the greater facility in the escape of steam, the exhaust-port is always made larger than either of the other ports.

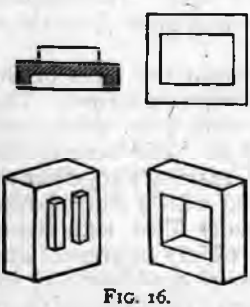


FIG. 16.

The slide-valve may be made out of a block of brass 1 in. square and $\frac{5}{16}$ in. thick. The width of the recess *must* be the same as the length and width of the ports on the cylinder-face. In Fig. 16 a perspective view of the back of the valve is shown; the two projections are intended to receive the end of the valve-spindle between them. The piston-rod is to be 7 in. long and $\frac{1}{4}$ in. diameter: a piece of drawn steel wire will be found most suitable for the purpose. One end is to be screwed into the piston. The steam-jacket is simply a rectangular case of brass $1\frac{1}{2}$ in. long, 1 in. wide, and $\frac{3}{4}$ in. deep, internal measurement. It is fitted with a stuffing-box for the valve-spindle, similar to that for the piston-rod. A flange,

$\frac{1}{8}$ in. thick, is formed on the two sides, through which screws pass to hold it down to the cylinder face. These flanges are to be made the same size across as the cylinder-face. If the covers and jacket are well fitted, a thin layer of red lead ought to be ample to render the joints steam-tight. The lugs on the cylinder, which hold it down to the bed-plate, must be exactly at right angles with the face, else the jacket will not be plumb when it is bolted on.

The plummer-blocks or pedestals (Fig. 17) may be made either of cast iron or brass. Their thickness must be half an inch, and they should be in two pieces, viz., the block and cap. The simplest plan will be to cast the

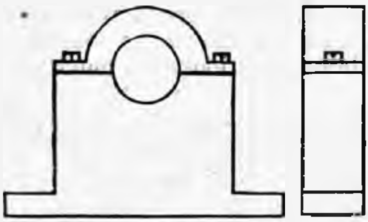


FIG. 17.

two parts together solid, then bore the hole for the shaft, saw the pedestal across through the shaft-centre, and secure the cap thus made with screws. The centre of the holes must exactly coincide with the centre of the cylinder, viz., $1\frac{1}{4}$ in.

The shaft and disc (Fig. 18) are now to be attended to. The shaft will be best turned out of steel, $\frac{5}{8}$ in. diameter finished size, and may be made any length convenient, providing it be not less than 4 in. The crank-pin is $\frac{3}{8}$ in. diameter at the part on which the connecting-rod cross-head works. The end which fits into the disc is $\frac{1}{4}$ in. diameter. The disc itself is a circular iron plate, turned, $2\frac{3}{4}$ in. diameter and $\frac{1}{4}$ in. thick; the hole for the end of the shaft $\frac{1}{2}$ in., and that for the crank-pin $\frac{1}{4}$ in. The distance between the centres of these holes must be exactly half the stroke of the engine, viz., 1 in. The simplest plan for securing the crank-disc on the shaft will be to turn down the end of the shaft for a distance of three-eighths of an inch to half an inch diameter, drive the disc on to the shaft, and rivet the end neatly over. The same will apply to the crank-pin. The guide (Fig. 19) is a bracket, having a hole drilled through it the same size as the piston-rod. Its centre must coincide with the centres of the cylinder and plummer-blocks, *i.e.*, $1\frac{1}{4}$ in. Fig. 20 is the piston-rod cross-head.

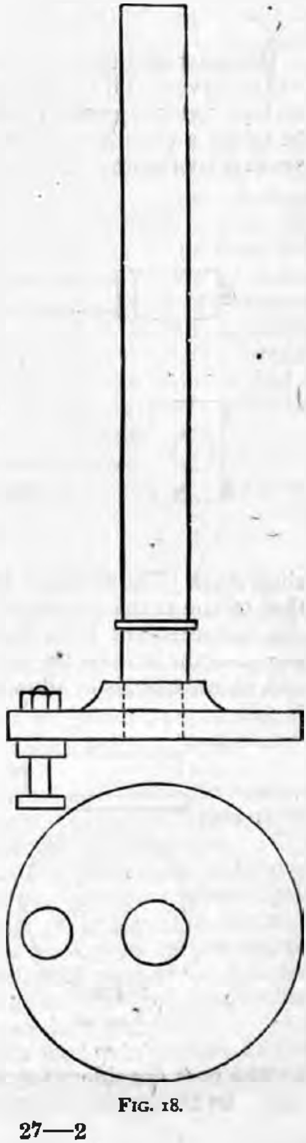


FIG. 18.

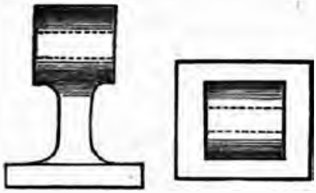


FIG. 19.

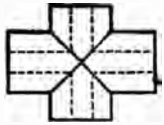


FIG. 20.

We must next turn our attention to the connecting-rod (Fig. 21). My readers will observe that it is constructed in the shape of a fork, and, for that reason, this style of rod is termed a fork connecting-rod. The proper way of making it will be to get a piece of iron forged down to as near the size as possible, and then finish it by turning and filing. Avoid brass, as it looks too much like the toy-

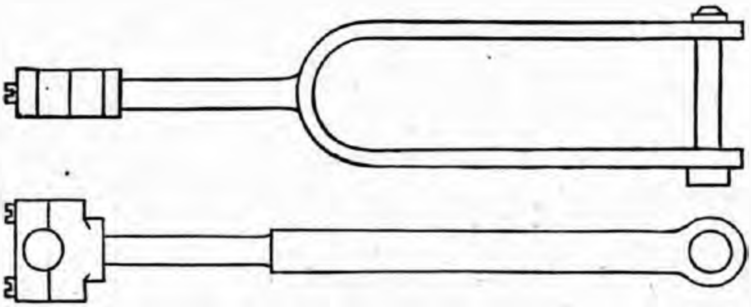


FIG. 21.

shop style. The distance between the centre of the piston cross-head-pin and that of the crank-pin should be 6 in. The arms are to be $3\frac{3}{4}$ in. long, taking the measurement from the top of the radius of the inside of the fork to the centre of the hole for the cross-head-pin. The object of this kind of connecting-rod, in our case, is to allow the rod to work clear of the guide for the piston-rod.

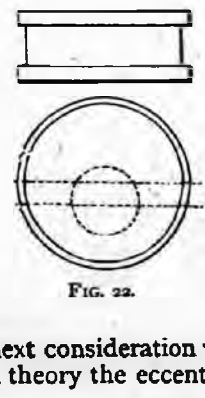


FIG. 22.

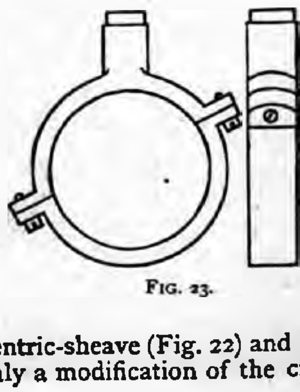


FIG. 23.

The next consideration will be the eccentric-sheave (Fig. 22) and strap (Fig. 23). In theory the eccentric is really only a modification of the crank, and, like the crank, always imparts twice the motion of its own throw. The eccentric is used for working the slide-valve, regulating the admission of steam into the ports on the cylinder face. Now, supposing we wish to give a valve a travel of four inches, we should first find the geometrical or real centre of the sheave, from that we should mark off two inches, which would be the centre for the hole for the shaft. This is a very nice operation and requires a great deal of care, else the eccentric may give the valve either too much or not sufficient travel. The travel of the slide-valve, as a general rule, is twice the width of one of the steam-ports, so that if the width of one of the steam-ports be taken for the throw of the eccentric, the required travel of the slide-valve will be found. If the slide-valve were placed exactly in the centre of the cylinder-face, it would be found to extend slightly beyond the edges of the ports in the forward direction: this is termed the "lap" of the valve, its object being to ensure the perfect covering of the steam-ports when the valve is in a central position. The eccentric is keyed on to the shaft, similar to the fly-wheel. When the right position of the eccentric on the shaft has been found, it is a good plan to make a centre punch-mark on the sheave, as also on the shaft. For the eccentric we shall require a piece of brass or wrought iron 2 in. diameter and $\frac{1}{2}$ in. thick; a groove $\frac{1}{4}$ in. wide and $\frac{1}{8}$ in. deep must be turned in its periphery to hold the strap; a hole must then be bored for the shaft at a proper distance from the real centre of the sheave. The strap is very simple, and should be readily understood on reference to the woodcut, it being simply a ring, made in halves, with lugs or ears to bolt them together, and a boss to take the eccentric-rod. The width of the strap must be the same as that of the groove in the sheave, and its internal diameter should correspond with the external diameter of the groove.

FIG. 24.

Fig. 24 represents the valve-spindle: one of the ends is filed to a flat on opposite sides, leaving shoulders which butt against projections on the back of the valve, and between which the flat end is placed. Another method would be to cast a small boss on the back of the valve, and screw the spindle into it. I am almost inclined to think that the latter plan is the more preferable. The other end of the spindle is fitted with a joint for connecting it with the eccentric-rod. The length of the spindle is $2\frac{3}{4}$ in. from the end to the centre of the pin in the joint, and its diameter about $\frac{3}{16}$ in.

A few words as regards the fly-wheel. I should advise that it be made as large as convenient (in order to carry the disc over the dead centres), the moving force or inertia of which maintains continuous rotary motion.

The next process will be to erect the engine. The first thing to be done will be to line or mark out the bed-plate. X X is the centre-line of the cylinder and piston-rod, &c.; Y Y, centre-line through sole of guide; Z Z, centre of shaft and plummer-blocks. Centre-lines must also be scribed on the cylinder and pedestals themselves. Particular attention must be paid to the fact that the cross centre-lines must be at exactly right angles with the longitudinal lines. First fix the cylinder, then the bearings, and then the guide.

Setting the slide-valve is by far the most difficult part in erecting; and, as I suppose few of my readers could do it properly themselves, I should advise them to secure the services of some mechanic, who would quickly do it for a small trifle.

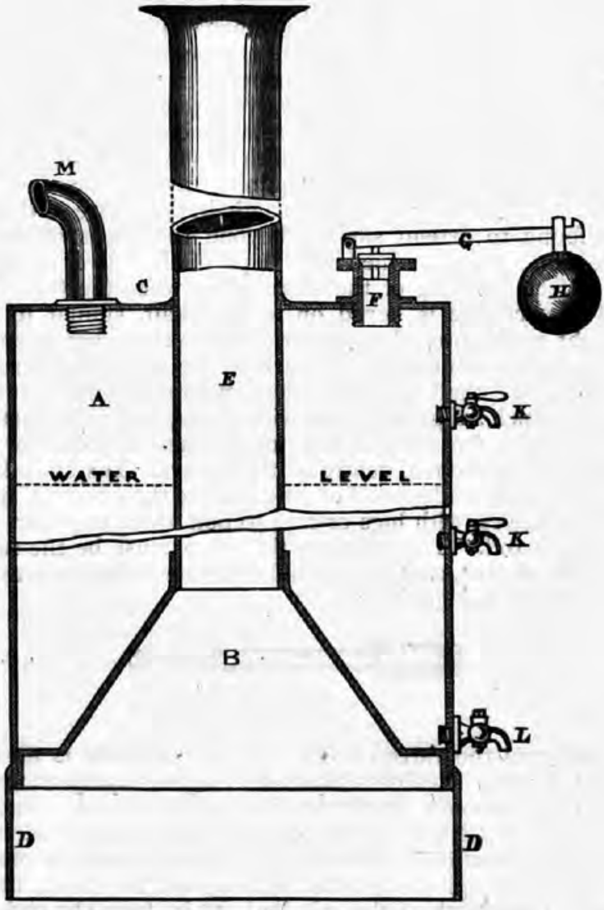


FIG. 25.

BOILER.

Lastly, but not least, the boiler (Fig. 25), requires our consideration. The easiest way that I can suggest of making it is to procure a piece of copper or brass tube, 8 in. external diameter and 16 in. long; this will form the shell, A. B is the fire-box, and should be made out of a piece of sheet copper, brazed up with a piece of 2-in. brass pipe, E, fixed into the top of it, terminating in a bell or trumpet-shaped mouth; the length of this pipe may be about 20 in., and it will form the chimney. C is a brass plate, ⅛ in. thick, soldered into one end of the boiler, having through the centre of it a hole to allow the chimney to pass through; this should be soldered in the first of all. The fire-box must next be fixed in, and the chimney soldered or brazed into it, after being passed through the hole in the top, a small bit of solder being run round the joint to make it tight. D is a short piece of brass tube, 8 in. internal diameter and 2½ in. long, soldered round the bottom of the boiler to form the lamp space. The safety-valve, F, lever, G, and weight, H, can easily be made on reference to the illustration, which is drawn to scale. K K are gauge-cocks, to try the quantity of water in the boiler; the top one should be screwed at 2½ in. below the top of the boiler, and the lower one 8 in. from the bottom of the water space in the boiler. L is a blow-off cock, fixed quite at the bottom of the water space, for the purpose of emptying the boiler. The gauge-cocks K K are so arranged that when the boiler has its proper quantity of water in it, steam will issue from the upper and water from the lower cock. M is the steam-pipe leading to the engine. To fill the boiler, unscrew the safety-valve, and pour in the water by means of a funnel until it reaches to about 3½ in. from the top. The steam can be got up by means of either a spirit-lamp or gas-jets; the latter are preferable on account of the much larger amount of heat which is given off. The steam-pipe may be ¼ in. or ⅜ in. diameter.

Oscillating Engine.

For the benefit of my readers who might not be able to make the foregoing engine, I append directions how to make the simplest kind of engine that can

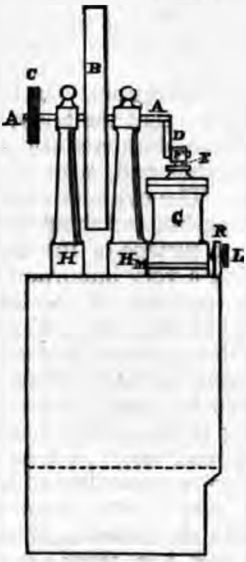


Fig. 26.

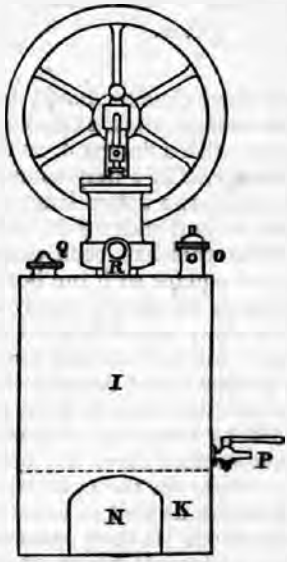


Fig. 27.

possibly be made. It is a simple modification of the high pressure engine, usually known as "direct-acting," in which the cylinders (a single one in our case) oscillate; at the same time it is the weakest. As an oscillating this is but one of a class, as many of our largest marine engines are built on the oscillating principle, the recommendation being the small compass in which they can be stowed.

The term "oscillating" is obtained from the fact that the engine while working rocks or vibrates from side to side, which motion is imperative, on account of its possessing no connecting-rod. This will be seen better on reference to the drawings Figs. 26 and 27, which represent a front and side elevation of a single-acting engine. A represents the crank-shaft, to which are attached the fly-wheel, B, a driving pulley, C, and the crank, D, which communicates with the piston-rod, E, by means of the cross-head, F. G is the cylinder; H, the standards or supports for the shaft, A; I, the boiler; K, space under boiler for spirit-lamp or gas-jet; L, set-screw for keeping the cylinder close against the boss, M; N, an opening in the fire-box, to admit air necessary for the proper combustion of the gas or spirit-lamp flame; O, a safety-valve; P, the blow-off cock, for drawing the water out of the boiler; Q, an inlet or plug for feeding the boiler; and R, a small bracket for carrying the set-screw, L.*

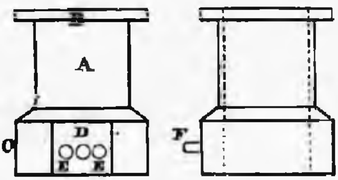


FIG. 28.

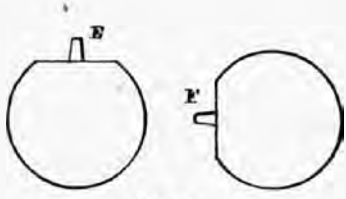


FIG. 29.

Of course the cylinder should be our first consideration. On reference to the detail drawings (Figs. 28 and 29), it will be seen that the body, A, is to be $\frac{7}{8}$ in. diameter, with a flange, B, on the top end, $1\frac{1}{4}$ in. diameter and $\frac{1}{8}$ in. thick, while the flange, C (if I may so call it), on the other end, is to be $\frac{1}{2}$ in. deep and $1\frac{1}{4}$ diameter, the entire length being $1\frac{1}{2}$ in. The cylinder is to be bored out from end to end with a $\frac{3}{4}$-in. half-round boring-bit, and should be perfectly smooth. After this has been done, turn the top surface of the flange B *perfectly* true and square with the bore. This being a very important item, care should be taken to have it nicely done. Then one side of the lower flange must be filed away perfectly level and parallel with the bore. Exactly in the centre of this, drill a small hole and screw in a short piece of fine steel wire, F. This must project about one-eighth of an inch from the flat surface. On either side of this pin, drill an $\frac{1}{8}$-in. hole, E E, through to the bore. The cylinder will be completed by soldering or brazing (soldering is the easiest, but brazing is the strongest method) into the bottom of it an end made of $\frac{1}{8}$-in. brass. If a pattern be made for the cylinder-cover (Fig. 30), a great deal of trouble will be saved, as well as time and trouble, which latter is no small consideration. It may, however, be made in the following manner: procure a piece of brass, $1\frac{3}{8}$ in. diameter and $\frac{1}{4}$ in. thick; in the centre of this solder a smaller piece, $\frac{5}{8}$ in. diameter and $\frac{3}{8}$ in. thick. A hole must now be bored the exact size of our piston-rod, viz., $\frac{1}{8}$ in.; drive the metal disc on a mandril and turn it up to the size shown in the drawing, with a shoulder accurately fitting the inside of the cylinder and $\frac{1}{16}$ in. thick.


FIG. 30.

* The plan and elevation are drawn to 3-in. scale, or quarter size, and the details to 6-in. scale, or half size. Fig. 34 showing steam-ports in standard is engraved full size.

Our attention is now claimed by the piston and piston-rod (Fig. 31). For the piston procure a piece of brass, ⅞ in. diameter and ⅜ in. thick, and turn it on a mandril down to ¾ in. by ¼ in., with a groove about ⅛ in. square on the edge, to hold a small piece of lamp-cotton or tow, soaked in oil, to make it steam-tight. The piston-rod may be made out of a piece of *drawn* steel wire, ⅛ in. in diameter and about 1¾ in. long; one end must be screwed, so as to fit into the piston, which must be tapped to receive it.

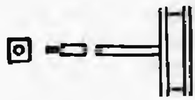


FIG. 31.

You will now want four small bolts and nuts, or four set-screws, for fastening the cover on with. They had better be bought at some tool-maker's or optician's shop, and as they only cost twopence each, it will never answer the amateur's purpose to make them. Suppose we use screws: they must be ⅜ in. long from under the head to the point, and the diameter slightly under ⅛ in.; across the head there must be a nick for a screwdriver. Four clearing-holes must now be drilled in the cover, for the screws to pass through; and four holes, a shade smaller, in the top flange, which must be tapped to receive the screws.

The piston-rod will not be complete without a cross-head or cap to connect it with the crank-pin. This will easily be made from a small block of brass about ¼ in. square and ⅛ in. thick, with an ⅛-in. hole through the centre of the face for the crank-pin to work in; on one of the sides a small hole is to be drilled to receive the free end of the piston-rod, which should be screwed into the cross-head.

A lug or bracket to hold the set-screw, L, to keep the cylinder close up to the face of the steam-boss, must now be made. Take a piece of brass and file it to ⅝ in. long, ⅜ in. wide, and ⅛ in. thick; round off the top thus:  This will be soldered endways on the top of the boiler. The set-screw is tapped into this, and its point rests in a centre punch-mark on the cylinder. The screw is to be ⅛ in. diameter and ⅝ in. long, with a milled head for convenience in tightening it up. A screw similar to those used for the cylinder will answer equally well.

The standards (Fig. 32) should be made now. It will be found that the easiest way of making these will be in the form of two pillars or columns, which can easily be turned out of a piece of brass or iron rod ⅜ in. square. The base should be $\frac{9}{16}$ in. square, with a smaller end or stud projecting, ⅜ in. diameter and ¼ in. long (these are to be fastened into the top of the boiler); the square part must extend ⅜ in. up the pillar, when it may be turned down to a short distance from the head, which must be ⅜ in. square. These columns must each be 2⅞ in. from the under side of the shoulder to the centre of the hole for the crank-shaft. Care must be taken to make the faces of the square part exactly at right angles with the hole in the head. Now divide one of the faces of one of these pillars into two equal parts by means of a centre-line running through the middle of the column (Fig. 34). At a distance of ⅜ in. from the shoulder drill a small hole, A, which will just admit of the insertion of the pin F, which was fixed in the cylinder-face. Then draw another line at right angles $\frac{1}{16}$ in. above this hole, and on this line ⅛ in. from the centre mark two holes, right and left respectively, each of which is to be drilled as far as the centre

FIG. 33.

FIG. 32.

of the pillar. Then from the bottom end of the pillar drill an $\frac{1}{8}$-in. hole straight up till it meets the hole C, and another hole at D, meeting the hole B: by this means a passage is formed between the face of the pillar and the boiler, by means of which the steam will enter the cylinder and another communication between the cylinder and the outer air. A small piece of pipe should be screwed into the hole D, to carry away the exhaust steam.

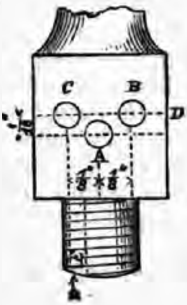


FIG. 34. (Full size.)

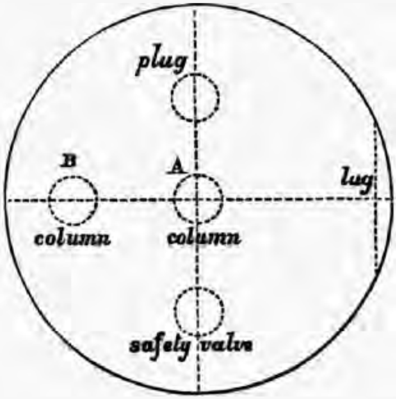


FIG. 35.

FIG. 36.

The bed-plate (Fig. 35) is in reality only the top of the boiler. It is a circular plate of brass, $3\frac{1}{2}$ in. in diameter and $\frac{1}{8}$ in. thick, turned or filed quite flat on one side, which I will call the face. A line must now be "scribed," or marked, on this face exactly through the centre from one side of the plate to the other (see Fig. 35). In the centre drill a $\frac{3}{8}$-in. tapping-hole, A, and another of the same size at B, $1\frac{1}{8}$ in. between centre of A; again, at a distance of $1\frac{3}{8}$ in. from the centre, on the far side from B, solder on the bracket, R, containing the set-screw, L; holes should also be drilled at D and E for the plug and safety-valve. The pillars may now be fixed in their places—or "erected," as the technical term is—either by being screwed or soldered in. Great care must be taken that they stand quite upright, and that the two holes in the heads are exactly parallel and opposite one another. The ultimate efficiency of the engine will principally depend upon attention to minute details like these. The crank and shaft (Fig. 36) is very easily made. It is simply a piece of steel wire, the same size as the holes in the heads of the columns, bent into the form as shown in the sketch. Care should be taken that the crank, R, is exactly at right angles with the shaft, T, and the pin, S, must be *parallel* with T. The distance between the centres of S and T is three-eighths of an inch, thus giving our piston a stroke or travel of three-fourths of an inch.

The fly-wheel had better be bought. It can be procured at any castings shop in Clerkenwell for about sixpence or eightpence: a 4-in. clock-wheel will do. Having secured one with a tolerably heavy rim, bore a hole through the centre of it, so that the crank-shaft will fit tightly into it. It will be very much improved in appearance by being turned up bright all over.

The engine proper is now complete, but it yet lacks the boiler for generating the motive power, steam. Take a piece of brass pipe $3\frac{1}{2}$ in. internal diameter and 5 in. long; in one end solder or braze the bed-plate. Brazing is by far the best: it will well repay the young mechanic to send it to a gasfitter's to be done. Then, $3\frac{1}{2}$ in. from the top, fix in the bottom, which must also be a circular plate, $3\frac{1}{2}$ in. diameter and $\frac{1}{8}$ in. thick: this will allow $1\frac{1}{4}$ in. for lamp space. A doorway, N, fig. 27, must now be cut to give the admission of air to the lamp. This doorway must, of course, be regulated by the size of the lamp which it is proposed to use. The most important consideration respecting the lamp is that the flame should all but touch the bottom of the boiler. A small tap, P, for the purpose of emptying the boiler, should be fixed close to the bottom; a small plug, Q, is also to be provided on the top of the boiler, for the purpose of feeding it. A safety-valve, O, will be found very essential. I should advise my readers to purchase this, as a very effective one can be bought for eighteenpence; but in case they would prefer making it for themselves, I will give directions for its manufacture. First obtain a piece of brass tube $\frac{3}{8}$ in. outside diameter, and stop one end by soldering in a piece of brass. Then turn up a small piston (without a groove) to fit the pipe, and in the centre of this screw a short piece of $\frac{1}{16}$-in. steel wire, which is to pass through a hole in the top; a short piece of spiral brass spring is now to be placed between the piston and the cap, having one of its ends soldered to the piston and the other to the cap, to prevent the piston falling into the boiler. The whole may now be soldered into the top of the boiler. Now, at a distance of two-thirds the length of the spring from the top, drill two or three small holes in the pipe to allow the steam to escape, and, lo! your valve is complete. Its action is as follows: when the steam exceeds a certain pressure it will drive the piston above the holes, where it will make its escape: were it not for this there would be a great liability of the boiler bursting.

The capacity of the boiler is about a little over half a pint; but it must not be fed more than two-thirds full. Steam ought to be got up from cold water, with a good spirit-lamp, in about ten minutes; but hot water is half the bargain. The engine should not be allowed to work for more than half an hour at a stretch, as by that time the water would all be evaporated, and there would be danger of burning the bottom of the boiler out. If nicely fitted, this engine will work at such a speed as to appear like a little cloud of steam.

This is called a single-acting engine, because the steam is brought to bear on one side of the piston only. Although this plan answers very well in a model, yet in a large engine it would not be practicable, on account of the difficulty in getting over the dead centres.

I hope my readers who attempt it will be able to construct this simple style of engine for themselves. If they are unable to do so, the engines can be purchased at the philosophical toy-shops at prices varying from four to twenty-one shillings, according to the finish and size.

Some of the dimensions of this engine are taken from an article which appeared in the "Boys' Journal," Vol. III.

Since writing the above, it has occurred to me that by making the pin, F, on the cylinder-face long enough to go through the standard, a nut might be screwed on it from the opposite side of the column, to keep the cylinder up to the face on which the steam-ports are, and so obviate the use of the lug and set-screw on the opposite side. A disc might also be used instead of the crank, which would certainly give a more finished appearance. I almost incline to the idea that these last methods are preferable.

Should my readers be successful in making either of these models, and should feel inclined for further trials of their skill, I can recommend a little book, containing directions for several models, entitled "The Model Dockyard Handy Book," published at a shilling, by Mr. Bell, of 31 Fleet Street, who will also be happy to supply anything connected with models of any description.

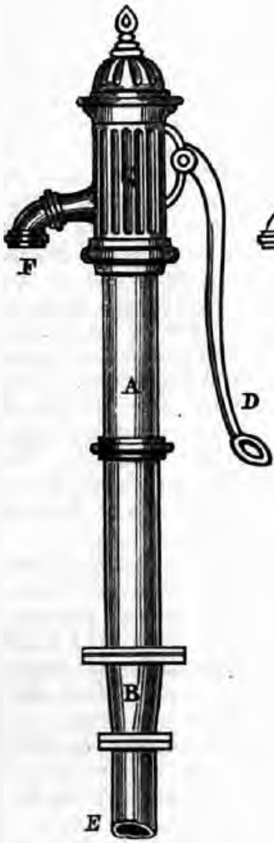


FIG. 37.

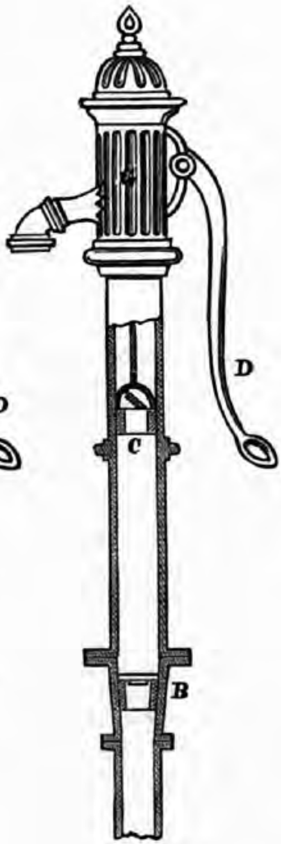


FIG. 38.

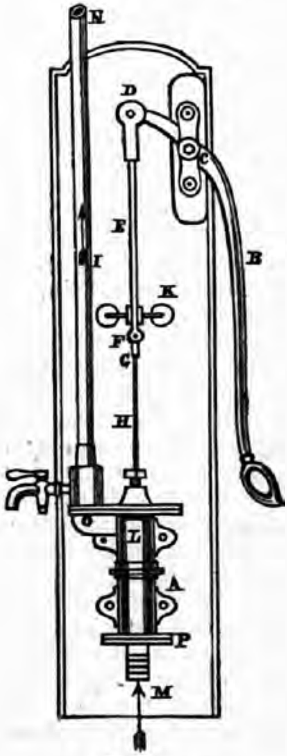


FIG. 39.

PUMPS.

I very much doubt whether any boy is ignorant of the very common and simple philosophical experiment, viz., if one end of a straw or tube of any description (it matters not what, so long as its sides are air-tight) be dipped into a vessel containing water, or any other fluid, and the other end be sucked by the mouth, the liquid will rise through the tube into the mouth. The action of the common squirt or garden syringe is familiar to every boy. What boy is there that does not possess one of those leaden squirts, costing about fourpence, which are held in such terror by their respected parents, because they will be always squirting water all over the place? Well, this squirt consists simply of a cylinder or tube, ending in a smaller tube, called the suction-pipe, the interior being closely fitted with a piston or sucker. On dipping the end of the small pipe into water and lifting up the piston by means of the wire handle, the liquid is drawn into the barrel by means of atmospheric pressure, and is then ejected in a continuous stream by the descent of the piston. This syringe is in reality a pump, but on a very primitive scale.

Pumps, then, are pieces of machinery by means of which water is drawn from various depths to the surface of the earth, or to any required height.

Pumps ordinarily are of two classes, viz., the common suction, or lifting, and the force-pump. The first of these two machines consists of a long tube, A, called the barrel. (Fig. 37 shows an elevation or outside, and Fig. 38 a sectional or inside view of a lift-pump.) At B is a valve, opening upwards, enclosed in what is called the valve-box. This valve is always closed when the pump is not in action. The piston or, as its correct name is, the bucket, C, has an opening in it, which is also furnished with a valve, opening upwards.

A few words may now be not out of place respecting the action or the working of the pump. Supposing the bucket, C, is down to B, then on lowering the arm or lever, D, a vacuum is formed between C and B. Then, on lifting D, the valve closes, on account of the water being forced upon it consequent on the descent of the bucket; at the same time the valve in the bucket opens, and the water, which was unable to descend, now passes through and above the valve. Then, on lifting up the bucket, by means of the arm or lever D, this water is raised to the space G, and is discharged by the spout, F, while another body of water rushes up through the valve B to take the place of what has just been discharged. After working a few strokes of the handle, the space from the bucket to the spout is filled with water, whence it is discharged in a continuous stream on continuing to work the handle.

Of course all my readers are acquainted with the ordinary house or force-pump. Still, however familiar this style of pump may be to us, there are many who would be somewhat puzzled if they were called upon to explain its principle. I will therefore at once proceed to describe the mechanical construction of this kind of pump, the theory being almost identical with the pump already described.

Fig. 39 is an illustration of a house pump which not only lifts water from a certain depth, but will also force it a considerable height into a tank or cistern, &c. A is the barrel. The handle, B, works upon a pin or stud at C, which is called the fulcrum, and the short arm of B is connected by a joint, D, to the connecting-rod, E, which has a joint at F, working on the cross-head G, to which the end of the bucket-rod, H, is secured. As it is absolutely necessary that the bucket-rod work up and down in a perfectly straight line, a guide is provided at K. L is the position of the bucket (which, of course, cannot be seen), being inside the barrel, A; M, the suction-pipe; and N, the delivery to the tank, &c. The connecting-rod resembles two prongs of a fork, and, on that account, is frequently called a fork connecting-rod. There is a difference between the bucket of a force-pump and that of a lift-pump: in the former case the bucket is solid, as no water is required to pass through it.

In explanation of the *modus operandi* of the force-pump, suppose the piston, L, to be at the bottom of the barrel, A, and then to be raised by means of the handle, B; the tendency to form a vacuum in the barrel will draw the water up through the suction-pipe, M, through the foot or suction-valve at P (which is similar to that of the lift-pump), by means of atmospheric pressure. Again, on lowering the bucket, the lower valve will be closed, and the water, not finding a passage through the pipe from which it came, is forced into the pipe

N, opening on its way the upper or delivery-valve, which is enclosed in the valve-box, O; therefore it is assumed that the water is raised to the barrel by atmospheric pressure, and is then ejected or discharged by the force acting on the bucket or piston, as applied by means of the lever B.

There is, so to speak, a species of condition attached to this pump, which is, that the bucket, in theory, must not rise more than thirty-two feet above the surface of the water; but in practice twenty-eight feet is usually found to be the maximum.

When the well is more than thirty feet deep (unless a deep-well pump be used), it is necessary to have detached barrels, which are placed down the well within from fifteen to twenty feet of the water; "rising main-pipes" are then placed between the detached barrel in the well and the pump-head at the surface, which must be large enough to allow the bucket to pass freely down to the detached working barrel. This is a very good arrangement of pumps for wells not exceeding seventy feet in depth.

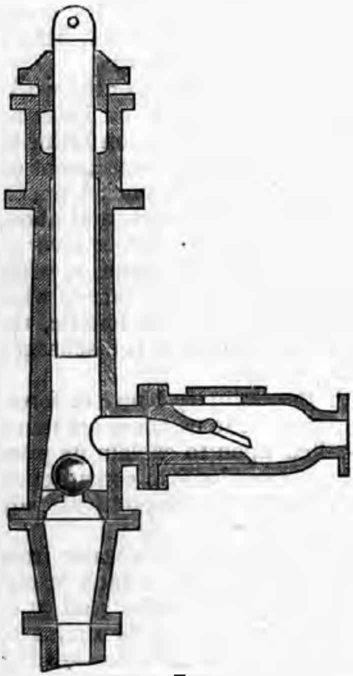


FIG. 40.

It is obvious that the height to which the water is thrown will depend upon the amount of power applied to the lever, or pump-brake, as it is sometimes called. In small pumps employed for domestic or household purposes, the strength of a man as the motive power is ordinarily exerted; but in raising water from great depths, such as from the bottoms of mines, &c., a steam-engine becomes absolutely necessary. In steam-pumps the arrangement is usually what is known among practical men as the bucket and plunger principle, or else double-acting, *i.e.*, throwing a stream of water both in the up and down stroke. A feed-pump, with a plunger in lieu of a bucket, for feeding steam-boilers, is shown by Fig. 40. This is usually worked off an eccentric fixed on the engine-shaft.

THE FIRE-ENGINE.

One of the most useful modifications of the force-pump is the machine known familiarly enough to us as the fire-engine. It is in reality only an arrangement of two or more force-pumps (the number varying proportionately according to the size of the engine), mounted on a carriage or framing, and whose buckets are worked by a long rod passing through the ends of a lever with equal arms, each lever having a common fulcrum. The engine is fitted with one or more suction-pipes common to both pumps, and possessing one or more delivery-pipes (the number varying with the size of the pumps), which discharge the jet of water through the hoses which are attached to them. An air-vessel is indispensable for this class of pumping machinery, in order to keep up the continuous stream of water so necessary for its efficient working.

Fig. 41 is a diagram which will be found amply sufficient to give the reader a general idea of the action of one of the most invaluable inventions—socially speaking—in hydraulic machinery. I will give a brief description of the diagram. A, buckets; B, barrels; C, fulcrum of lever, D; E, air-vessel; F, suction-pipe; G, delivery-pipe or hose; H, suction-valves; I, delivery-valves.

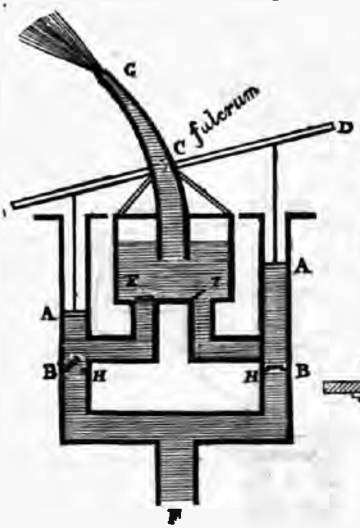


FIG. 41.

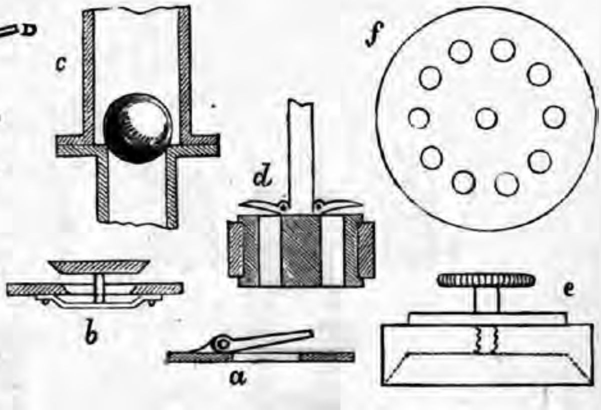


FIG. 42.

A great improvement has taken place within the last few years in the manufacture of this class of machinery, steam power being now very extensively used in lieu of the hard labour involved by manual power. Soon the hand fire-engines will be things of the past, and only to be seen in small towns or factories. In the steam fire-engines steam is frequently got up while proceeding from the engine station to the fire, and may be got up from cold water in very little over ten minutes.

Fig. 42 shows some of the various forms of valves used in pumps. *a* is called the flap; *b*, rising and falling; *c*, ball-clack; *d*, clack; *e*, circular India-rubber valve for air-pumps, &c.

The Centrifugal Pump.

This is a very powerful and ingenious machine, and was invented by the late Mr. Appold. Its capabilities were very severely tested at the Great Exhibition of 1851, where it obtained the council medal, a silver medal in 1855 at Paris, and prize medal at the International Exhibition of 1862. It is now used in most places where large quantities of water or other fluids are required to be raised to a moderate height. It is also most admirably adapted for drainage purposes, several very large pumps having been recently erected for that purpose, both here and abroad. The speed at which each pump is driven varies with the lift and also with each size of pump. On referring to Fig. 43 (showing a front and side elevation), it will be seen that the pump-case and water-passages are cast in one piece, so that by taking off the cover, C, and the blank flange, D, all the working parts may be removed in a few minutes. The principle of this pump is as follows: a hollow fan or disc, E (somewhat similar to a small water-wheel), revolves at a high speed inside the case. This

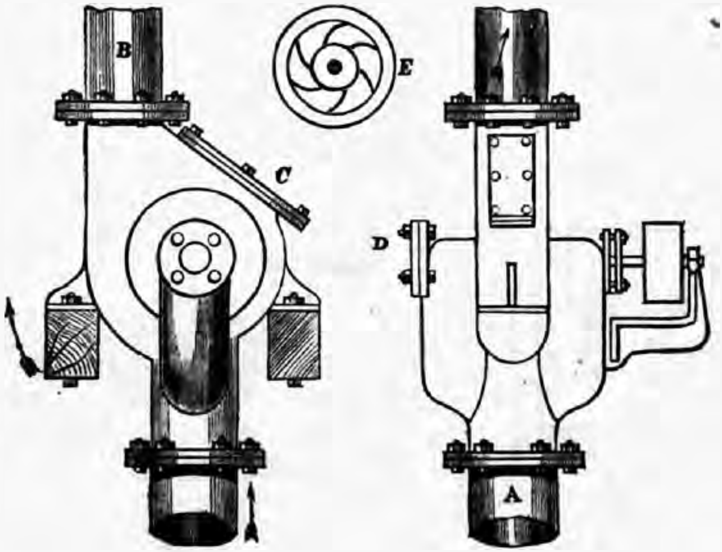


FIG. 43.

has the effect of sucking up the water into the top part of the case, whence it is discharged in a considerable stream. This pump will pass anything that is small enough to go through, there being no small valves; in fact, there is only the foot-valve, which is a large flap-valve. A quantity of nut-galls have been thrown into a medium size pump all at once, when it was running at a high speed, and they passed out of the delivery-pipe without a single one being broken.

THE HYDRAULIC RAM OR WATER-ENGINE.

In building a house, or buying a farm, the first consideration is a good supply of water. This may be obtained with comparative ease by aid of this engine.

There are numbers of important places, such as private estates, mansions, railway stations, public institutions, and the like, where, instead of depending on servants—who invariably dislike the job—for pumping a supply of water for the establishment, and in many cases going to great expense in sinking wells and providing pumping-gear, it is quite practicable, by simply making use of a small stream in the immediate vicinity, to obtain an abundant and constant supply, sufficient for the house, garden, or stables, &c. The height to which this machine will raise the water is proportionate to the fall that can be obtained in the length of injection-pipe leading from the stream to the ram; but it may be taken as a rule that the water will be driven up twelve times the height of the head; *e.g.*, a fall of three feet in the induction-pipe will maintain a percussive action on the ram sufficient to force the water in moderate quantities to the height of thirty-six feet, and so on. Many of these engines have been in operation for several years with great success, and have invariably given great satisfaction. They will raise from 1,000 to 3,000 gallons per day of twenty-four hours from 50 ft. to 250 ft. high, according to size.

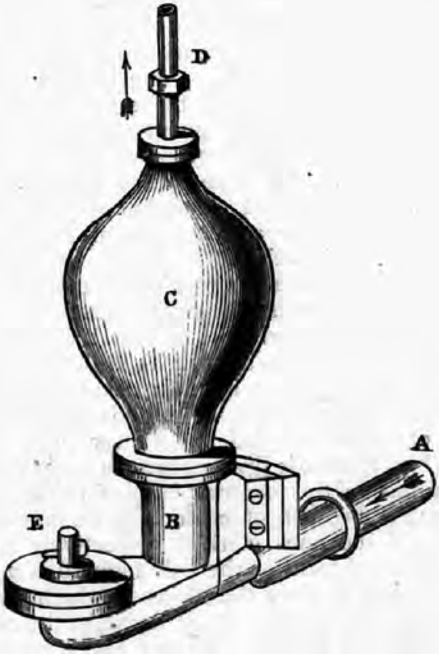


FIG. 44.

The essential parts of the machine are as follows: the water enters by the incline injection-pipe, A, and acquires sufficient impetus to force a portion through a valve in valve-box, B; (the surplus running to waste through the overflow or relief-valve, E, into the air-vessel, C.) The condensed air in the upper part of C causes the water to rise in the delivery-pipe, D, as long as the effect of the water on A E continues.

SHIP-BUILDING AND RIGGING.

To cut out a model of a ship from a block of wood may seem at first sight an easy affair. To one who knows how to do it the task is, of course, not difficult, though for its proper execution a considerable amount of care and nicety is required. A rough specimen of a ship—one that will float, at all events—may be hewn out of a block by any one having an accurate eye and a ready hand; but little good can be done by guess-work, which such sort of work must necessarily be, and certainly no preconceived design can be executed by its aid. It is the object of this article to furnish the means by which not only can a model be cut out of a block of wood, but be also actually built, dockyard fashion, in exact accordance with the design which we will suppose the amateur to have formed for himself.

The modeller, having decided in his own mind upon the form of the vessel he intends to build or cut out, must then draw out the design on paper. He must fix not only the character and class of vessel, as ship, brig, schooner, or whatnot; he must also settle with himself as to the "lines" upon which she shall be constructed; that is to say, he must decide upon the precise shape she shall have. Let us suppose that he intends to make a schooner yacht. The side elevation, or, as it is called, the "sheer plan," is drawn as in the annexed engraving (Fig. 1), and is divided into as many divisions as it is proposed to have variations in the external form of the hull. The line at the place where the greatest breadth of beam is to be is marked with *, and is called the "dead flat;" the lines marked respectively A, B, C, D, show the places at which the external form of the hull forward is meant to be altered; the lines marked 1, 2, 3, 4, 5, show the places at which the external shape of the hull aft is to be modified. The second figure in the engraving shows the design of half the deck, and has the divisions also marked upon it. At the bottom of the plate is a drawing showing the form of the ship's side and bottom, from the deck to the keel, and this drawing is part of the design which must be decided on beforehand. The outermost form corresponds with the plan of the half-deck sketched out above; and the other forms show the intended shape at the lower sections. The drawing is, in fact, a drawing of half the vessel bottom upwards.

Upon a copy (on paper or wood) of the sheer plan are drawn horizontal lines parallel with the keel, the number of them agreeing with the number of different water-lines or shapes in the design. On another piece of paper are drawn a similar set of parallel lines; a perpendicular line being drawn upon the bottom one, is taken to represent the centre of the transverse section of the ship. The object now is to get an elevation of the forms of the bow and stern. On the topmost of this set of lines (see figures at top and bottom of the engraving) mark off, to the left of the central perpendicular, the half-breadths of each of the forward divisions, as given in the half-breadth section at the bottom of the engraving; and on to the top line, to the right of the central line, the half-breadths of the after divisions. On the line corresponding to the number or letter of the half-breadth plan mark off the distance between the centre and the outer edge of each line of form as there displayed, and

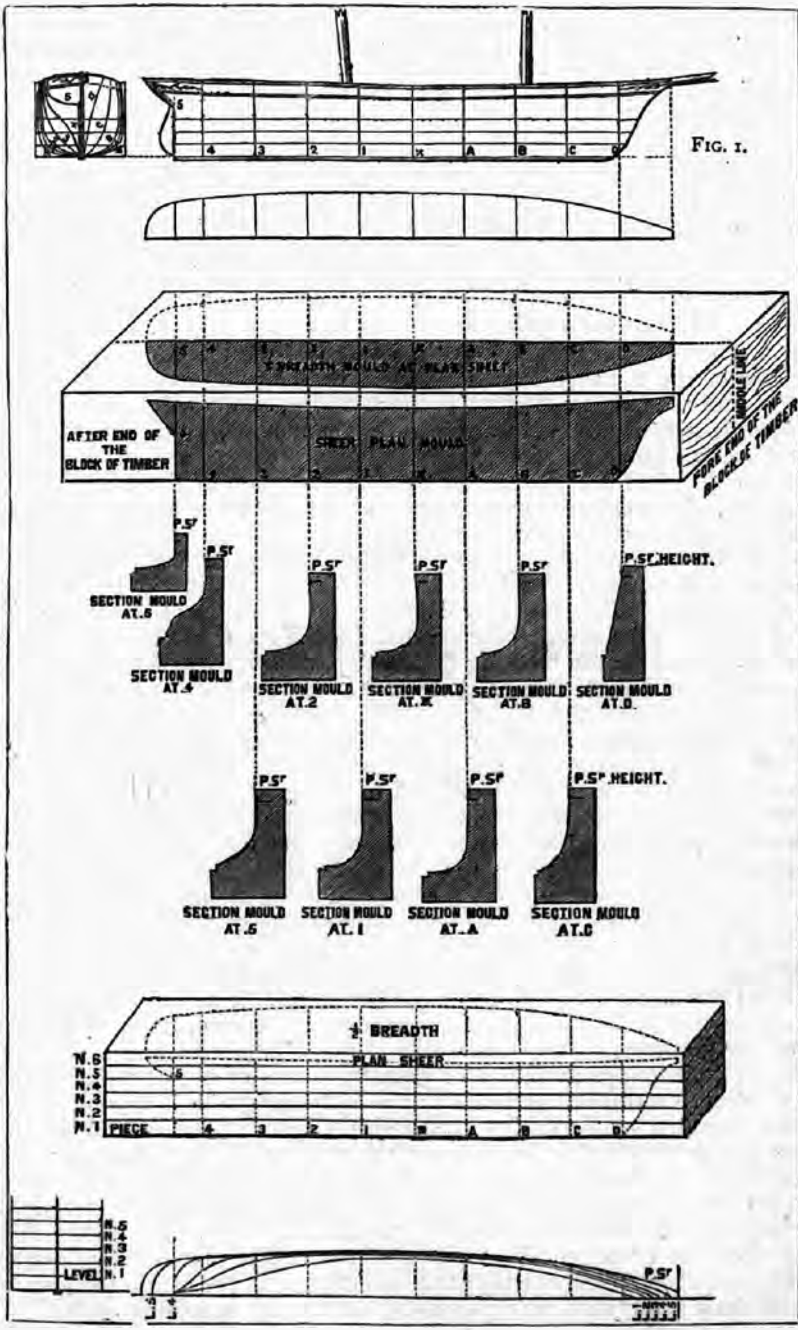

AFTER END OF THE BLOCK OF TIMBER
SHEER PLAN MOULD
FORE END OF THE BLOCK OF TIMBER
MIDDLE LINE
P.S^T HEIGHT.
SECTION MOULD AT 6
SECTION MOULD AT 4
SECTION MOULD AT 2
SECTION MOULD AT X
SECTION MOULD AT B
SECTION MOULD AT D.
P.S^T HEIGHT.
SECTION MOULD AT 5
SECTION MOULD AT 1
SECTION MOULD AT A
SECTION MOULD AT C
½ BREADTH
PLAN SHEER
N.6
N.5
N.4
N.3
N.2
N.1
PIECE
LEVEL
P.S^T

Fig. 1.

connect the mark on the top line with these individual distinguishing marks, and the stem for the bow, and the stern-post for the stern, and then the design will be complete. Carefully ascertain these lines, and having done so, cut out moulds in wood (see the figures in the middle of the engraving) to assist in shaping the model, or rather to enable you to know that you have shaped it according to design.

We will now suppose that an oblong piece of wood, perfectly rectangular, is the block from which the model is to be cut or built. Upon the top surface draw the whole plan of the deck, merely turning over the half-deck plan, which has been already prepared, and repeating it. Mark the divisions shown on the sheer plan on each side of the block, and, after cutting away by means of plane knife all such part of the block as is not comprehended in the area of the deck, mark the sheer plan with the divisions on either side of the block; strike a centre-line for the keel on the bottom of the piece, and a centre-line on either of the transverse sections, to mark stem and stern. Cut out the remainder of the model according to the divisions, taking care not to cut more deeply or less deeply than is warranted by the moulds, which should be constantly used to gauge the work.

If the object be merely to cut out a block execution of the design, all that is required, after due care taken to have all the distances and measurements properly ascertained, is to cut out in strict accordance with the moulds as prepared from the design, and to affix keel, false keel, stem, cutwater, and stern-post. If, however, the object be *to build* a model, it may be attained in one of two ways. The first is by following the above-mentioned rules, and, having arrived at the stage where the shape of the vessel has been ascertained, to cut out planks for the building of the ship, by simply sawing through the horizontal lines at each transverse division, and then cutting away the inside portion till it assumes the thickness and consistency of the required planks. These planks, having already the bend and curve required, can then be fastened together again, and secured *inside* by iron or copper bands running across them. They may also be affixed to beams or crutches running across and between the sides. This, however, is a lazy way of building, and one not to be encouraged; the block system is better than it. But the plan most deserving of encouragement is that by which, the design of sides, bow, and stern having been agreed upon and expressed in the manner described above, the execution is done by a regular legitimate system of ship-building—a plan requiring, no doubt, much skill and tact, and not suitable, perhaps, to quite small models; but one which is not only better adapted to the construction of models of the larger sort, but also more commendable and more interesting.

Lay down the keel, with uprights inserted in it, at each of the spots indicated by the division-lines in the sheer plan. Fix also a stem and a stern-post. Secure by dovetailing, rabbiting, or even by means of needle-points, to each of the uprights a transverse beam of the same length as is shown to be the breadth intended by the design for the ship's beam at the several divisions. Connect these with each other and with the stem and stern by means of slight battens or veneers fastened on with needle-points, taking care that each needle-point is sent well home, and that each cross-beam and the connecting-batten are close together. Instead of making moulds in the manner directed above, make stout ribs broad enough to allow of two sets of planks being fastened into them in accordance with the same directions; fix these into the keel, and connect them firmly with the cross-beams and their connecting-batten. You have then the skeleton or frame of the ship. Upon it fasten by such means as are available the previously prepared planks or thin pieces of wood, taking care that each plank is well secured and strictly in accordance with the mould of the ship, as shown by the design. Hot water will be found a ready means of making the wood bend: steep the wood in the water till it becomes pliable, and fasten it on while warm. Particular care must be taken to fix the leading head-planks into the stem, and they should be connected by means of rivets, which may be of wire only, running through the stem and clenched on either side. It will be better to build the stern in separate pieces, apart from the side timbers, which in that case will end at the stern-frame. Too great care cannot be taken in cutting the planks to the exact size required. Any carelessness in this respect may cause difficulty in fitting on the timbers, especially below. In addition to the support derived from the frame, there should be connecting-girders of wood, or, better still, of tin plate cut into strips, running up and down the inner face of the timbers, to which they should be bolted. If these directions be carefully attended to there will be no difficulty in actually building the hull. That having been done, a false keel, which is as well if made of lead, must be fitted, together with a cutwater, carved in accordance with the design, and a rudder-post. Each of these parts must be carefully and securely fixed with the stoutest material the parts will bear, and then the model will be complete so far as shipwright work can make her so. She must now be caulked, and the readiest mode of doing this, in all but extremely large models, is as follows: Stop the seams externally with soft wax and white lead, or with a strong infusion of shellac in naphtha—the former is better—and over the whole of the inner surface pour molten tar. The tar will find its way into all the crevices and will pay itself over all the seams, rendering the craft water-tight.

Decks can be laid down in planks, or in one or two whole pieces. The latter plan is better, as not only will it be found difficult to caulk the deck seams enough to make them water-tight, but the cross-beams of the frame on which the planks must be nailed will not, unless they be bulky and in the way, bear the insertion of so many fastenings. Holes must be cut in the deck for the masts, and before the deck is laid a bed should be prepared in the hold on the top of the keel, in which the foot of the mast may rest. In the case of the model cut out in one piece from the block, the interior may be hollowed out with a sharp chisel or gouge, care being taken not to pierce the sides. A pocket-knife will serve the purpose in the event of a chisel being wanting; but the work will take longer and will not be so cleanly done. A passage must also be cut in the deck and after-timber for the rudder-head to come through.

The bulwarks may consist only of brass or iron stanchions, with chain or rope connecting them, just sufficient to keep the crew from falling overboard; or they may consist of timber-built defences against the ingress of the sea. If the latter, gangways must be cut in them on either side.

Deck furnishings will consist of skylights, covered companion, and gratings, with covers for the hatchways. The capstan should be set up forward, just abaft and clear of the bowsprit. On the fore and after quarters should be fitted davits, or curved irons having the bend outwards, from which should be suspended the quarter boats. The long boat will be inboard between the fore-mast and the main-mast; and sometimes from davits hanging over the stern a small dingy is suspended. On either side, immediately below the gangway, wooden steps should be fastened at short intervals down to the water's edge, to allow of the feet resting when the visitor has to get on board by means of the man-ropes.

At the foot of each mast, and enclosing it within its square, should be four sets of belaying-pins let into bulks of wood, which should be firmly connected with each other. At all convenient places inside the bulwarks belaying-pin-racks should also be set up.

Masts, Spars, and Rigging.

The sizes and shapes of these will, of course, depend upon the character of the vessel to be fitted, whether ship, barque, brig, brigantine, or schooner. Annexed are tables showing the dimensions usually assigned to the masts and spars of the vessels mentioned. (See pp. 439, 440.)

From these tables some idea can be formed as to the size of the masts and spars to be fitted in the miniature copies of ship, barque, &c.

The annexed engraving shows better than could be described verbally the whole of the standing rigging and some of the running gear of a Full-rigged Ship. The gear connected with the sails, some of which only is given here, may be briefly described as follows:

Spanker, on the mizzen-mast. The *gaff* is secured to either side of the taffrail by two *vangs*. The *topping-lift*, No. 19, running from the throat of the gaff to the end of the boom, is for the purpose of lifting the boom. The *sheet* is the rope between the two vangs, and holds the boom in its place. The *tack* fastens the inner lower corner of the spanker to the boom. From the top outer corner of the sail a rope runs through a block on the mast and so down to the deck, and is called the *down-haul*, being used to assist in taking in the sail.

From the outer edge of the sail, about half-way down, and again one yet lower down, run ropes across the sail through blocks on the mast, which are called *brails*, their use being to aid in brailing up or taking in the spanker. The *out-haul* is fast to the outer lower corner of the sail, and running through a sheave in the end of the boom, enables the sail to be pulled out.

Try-sail, sometimes fitted on to the main-mast, resembles a spanker in every respect except that it has no boom.

SQUARE SAILS AND YARDS.

The *halyards*, running through fixed blocks on the masts, serve to hoist the yards. *Lifts*, No. 11, are of chain or rope, and are fast to either yard-arm; they run through blocks on the top above, and so reach the deck: they keep the yard in its place, and are used for topping it up or down. *Braces*, No. 14, are fast to the ends of the yard, and meeting in a block secured to the opposite mast, come down upon deck, and are used to pull the yard nearer, or otherwise, to the ship. *Foot-lines* are lines secured to the yards, and are for the sailors to stand on when reefing, or lying out on the yard. *Stirrups* are stout lines made fast to the yard and holding the foot-lines at intervals. *Bunt-lines* (there are four on each side of the lower sails) are lines fast to the bottom of the sail and running up in two triangles to the yard; they run through a block about half-way down it, and through a block on the mast: they are used to trip up the sail when furling. *Leech-lines* (these and the bunt-lines are on the fore side of the sail) are single lines running from either side of the sail, about two-thirds down, through a block on each end of the yard, and so down to the

(Continued on p. 442.)

TABLES SHOWING THE USUAL DIMENSIONS OF MASTS AND SPARS.

SHIP OF 600 TONS.

Names of the Masts and Yards.	Dimensions of Ship: Length, 125 ft.; Breadth, 28 ft. 6 in.								
	Masts or Booms.					Yards.			
	Extreme Length.		Headed Length.		Diameter.	Extreme Length.		Arm.		Diameter.
	Ft.	In.	Ft.	In.	In.	Ft.	In.	Ft.	In.	In.
Main-mast and yard	69	0	10	6	22½	60	0	3	0	14½
Top-mast and yard	41	0	6	6	13½	48	0	3	6	12
Topgallant-mast and yard	22	0	—		8	36	0	2	0	8
Royal-mast and yard	16	6	—		5½	24	6	1	3	6½
Fore-mast and yard	66	6	9	6	22	57	0	3	0	14
Top-mast and yard	39	0	6	0	13	45	0	3	6	11
Topgallant-mast and yard	21	0	—		8	33	0	1	9	7½
Royal-mast and yard	15	0	—		5½	23	0	1	0	6
Mizzen-mast and yard	61	0	8	6	17	47	0	5	0	10
Top-mast and yard	31	0	4	6	9	34	0	3	0	8
Topgallant-mast and yard	17	0	—		6½	25	0	1	6	5½
Royal-mast and yard	10	0	—		4	19	0	1	0	4½
Bowsprit	45	0	—		23	—		—		—
Jib-boom	40	0	—		11½	—		—		—
Flying jib-boom	42	0	—		8½	—		—		—
Driver-boom	42	0	—		12	—		—		—
Gaff	32	0	4	6	8	—		—		—

BRIG OF 200 TONS.

Names of the Masts and Yards.	Masts or Booms.					Yards.				
	Extreme Length.		Headed Length.		Diameter.	Extreme Length.		Arm.		Diameter.
	Ft.	In.	Ft.	In.	In.	Ft.	In.	Ft.	In.	In.
Main-mast and yard	56	0	8	0	17½	40	0	2	9	10
Top-mast and yard	31	0	4	6	10	32	0	2	0	8
Topgallant-mast and yard	15	0	—		6	24	0	1	6	6
Royal-mast and yard	10	0	—		4	18	0	1	0	4
Fore-mast and yard	54	0	8	0	16	40	0	2	9	10
Top-mast and yard	31	0	4	6	10	32	0	2	0	8
Topgallant-mast and yard	15	0	—		6	24	0	1	6	6
Royal-mast and yard	10	0	—		4	18	0	1	0	4
Bowsprit	34	0	—		17	—		—		—
Jib-boom	32	0	—		8½	—		—		—
Main-boom	36	0	—		10	—		—		—
Gaff	28	0	—		7½	—		—		—
Housing of fore-mast	13	6	—		—	—		—		—
,, main-mast	13	0	—		—	—		—		—

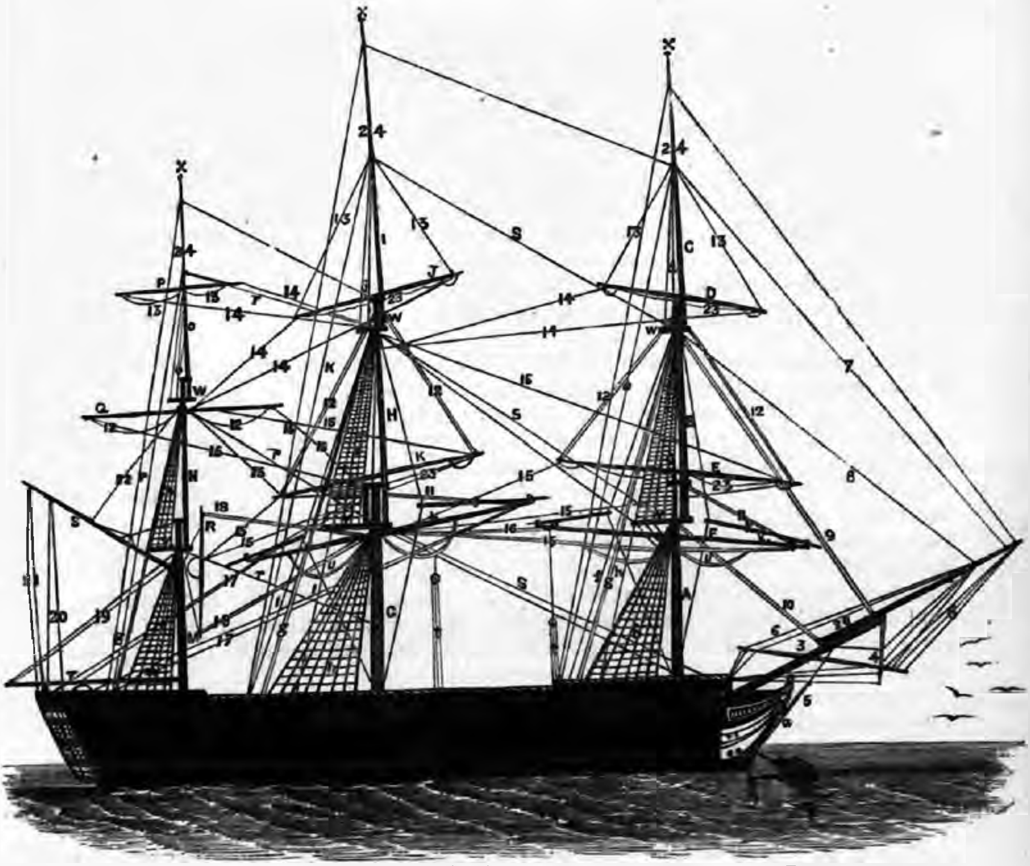
TABLES SHOWING THE USUAL DIMENSIONS OF MASTS AND SPARS—(continued).

BARQUE OF 300 TONS.

Names of the Masts and Yards.	Dimensions of Ship: Length, 100 ft.; Breadth, 27 ft.					
	Masts or Booms.			Yards.		
	Extreme Length.	Headed Length.	Diameter.	Extreme Length.	Arm.	Diameter.
	Ft. In.	Ft. In.	In.	Ft. In.	Ft. In.	In.
Main-mast and yard	62 0	9 0	18½	50 0	3 0	12
Top-mast and yard	34 0	5 0	12	40 0	3 0	9½
Topgallant-mast and yard	17 6	—	7	30 0	2 0	6¼
Royal-mast and yard	12 0	Pole. 6 0	—	21 0	1 6	4½
Fore-mast and yard	60 0	9 0	18½	50 0	3 0	12
Top-mast and yard	34 0	5 0	12	40 0	3 0	9½
Topgallant-mast and yard	17 6	—	7	30 0	2 0	6½
Royal-mast and yard	12 0	Pole. 6 0	—	21 0	1 6	4½
Mizzen-mast	60 0	8 0	13	—	—	—
Top-mast	47 0	—	8	—	—	—
Pole	10 0	7 0	—	—	—	—
Bowsprit	34 0	—	19	—	—	—
Jib-boom	34 0	—	10½	—	—	—
Flying jib-boom	38 0	—	6¼	—	—	—
Mizzen-boom	36 0	—	8	—	—	—
Gaff	30 0	5 0	7½	—	—	—
Main-gaff	18 0	—	8	—	—	—

SCHOONER OF 143 TONS.

Names of the Masts and Yards.	Masts or Booms.			Yards.		
	Extreme Length.	Headed Length.	Diameter.	Extreme Length.	Arm.	Diameter.
	Ft. In.	Ft. In.	In.	Ft. In.	Ft. In.	In.
Main-mast	58 0	7 0	13	—	—	—
Top-mast and pole	33 0	8 0	7¾	—	—	—
Fore-mast and yard	57 0	7 0	13	41 0	2 0	8
Topmast and yard	18 0	—	7¼	32 0	1 10	7¼
Topgallant-mast and yard	11 0	—	—	22 0	1 6	5¼
Bowsprit	27 0	—	12½	—	—	—
Jib-boom	32 0	—	7¾	—	—	—
Pole	6 0	—	—	—	—	—
Main-boom	40 0	—	10	—	—	—
Gaff	28 0	—	7½	—	—	—
Fore-boom	24 0	—	6¼	—	—	—
Gaff	21 0	—	6	—	—	—



A The foremast
B Foretop-mast
C Foretop-gallant-mast
D Foretop-gallant-yard
E Foretop-sail-yard
F Fore-yard
G Mainmast
H Maintopmast
I Maintop-gallant-mast
J Maintop-gallant-yard
K Maintop-sail-yard
L Mainyard
M Mizzen-mast
N Mizzentop-mast
O Mizntp.-gallant-mast
P Mizntp.-gallant-yard
Q Mizntp.-sail-yard
R Cross-jack-yard
S The gaff
T The spanker-boom
U The forechain, or channels
V The main ditto
W The mizzen ditto
X The quarter galleries
Y The chain or channel wales
Z Main channel wales

---

a Cutwater and figure-head
b Fore-shrouds and ratlines
c Ditto topmast ditto
d Top-gallant shrouds
e Top-gallant backstay
f Top-mast backstay
g g g Topsail ties
h Main shrouds, &c., or main rigging
i Ditto topmast ditto
j Ditto top-gallant ditto
k Ditto ditto backstay
l Ditto topmast ditto
m Mizzen shrouds
n Ditto topmast ditto
o Ditto top-gallant ditto
p Ditto ditto backstay
q Ditto topmast ditto
r r r Mizzen, mizzen-top, and mizzen-top-gallant-stays
s s s Main ditto ditto
t t Stay tackles
u u Fore and main-yard tackles
v v v Fore, main, and mizzentops(round tops)
w w w Fore, main, and mizzen cross-trees
x x x Fore, main, and mizzen trucks
y y Stun-sail, or studding-sail booms, on the fore and main yards

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1 The jib-boom
2 Bowsprit
3 Spritsail-yard
4 Dolphin-strikers
5 Bobstays
6 Jib-boom, guys, and stays
7 Foretop-gallant-stay
8 Jib-stay
9 Foretop-mast-stay
10 Forestay
11 11 11 Lifts of the fore, main, and mizzen yards
12 12 12 Ditto ditto topsail yards
13 13 13 Ditto ditto top-gallant-yards
14 14 Fore, main, and mizntp.-gallant-braces
15 15 Ditto ditto ditto topsail-braces
16 16 Fore-braces
17 17 Main-braces
18 18 Cross-jack-yard-braces
19 Topping-lift
20 Vangs
21 Signal halyards
22 Peak or gaff halyards
23 Foot-ropes
24 Fore, main, and mizzen royals

deck: they are used for the same purpose as the bunt-lines. *Clew-garnets* on the upper square sails are called clew-lines) are lines made fast to the corners of the lower sails, on the *after* side, and run to a block on the yard and mast, and so to the deck: they serve, in conjunction with the bunt-lines and leech-lines, to clew up the sail.

Bow-lines are sets of lines (each having an earring) on either side of the sail. *Bow-line bridles* are lines passed through the earrings, and serve to keep the sail bowed when the wind is full. The *main-tack* and *fore-tack* are lines which secure the lower corners of the main and fore-sails on the windward side. The *sheets* secure the corners on the leeward side. Sheets and tacks are convertible terms, according to the side on which the wind is; they are applicable only to the lower sails; on all other sails these lines are called *port* and *starboard-sheets.*

All the lines enumerated above are to be secured to belaying-pins at the foot of the mast, or at the inner top side of the bulwarks.

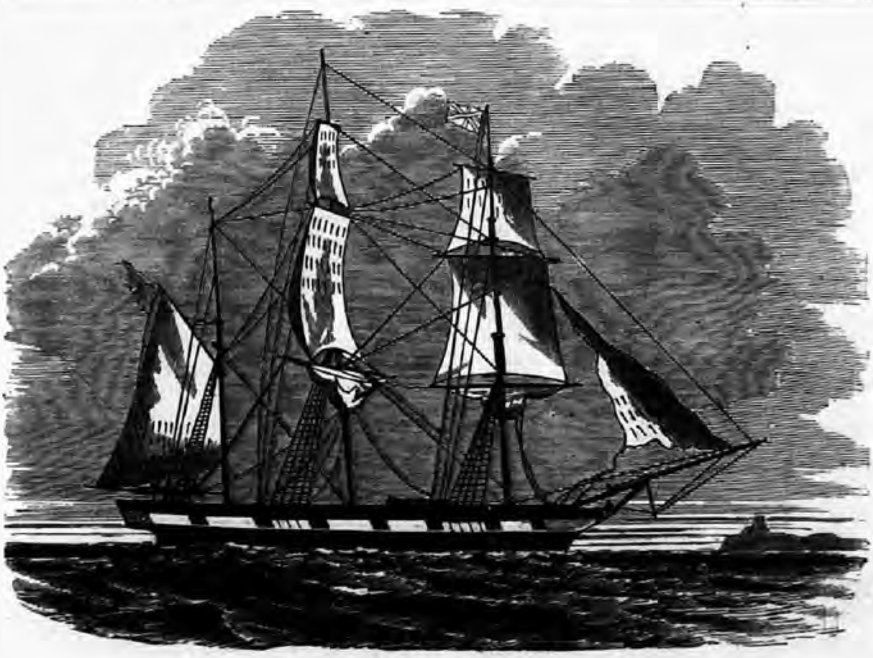
Studding-sails, or, as they were anciently called, "wind-wooers," are sails set on booms that are run out through hoops rigged to the several yard-arms. They are bent into a small spar to which halyards are fastened, and the halyards are passed through a block on the boom. They have also a sheet on the inside and a tack on the outside. They have also a *tripping-line*, which is fast to the outer lower corner of the sail, and joins the tack. The other end of it is rove through a block on the inner upper end of the yard, and so to the deck. It serves to trip up the sail when taking it in. On such an occasion, the tack is let go and runs through the boom, a haul is taken on the tripping-line, and the halyards are let go; the sail is then let down to the top, and secured *there.*

Stay-sails are a kind of large jib. There are commonly two between the fore-mast and the main-mast. These are the main-top-mast stay-sail and the main-topgallant stay-sail. The fore-stay-sail runs to the head of the vessel inside the standing-jib.

A BARQUE is in all respects rigged like a ship, excepting that the mizzen-mast is schooner-rigged, as shown in the annexed drawing.

It may be as well to follow out the plan suggested by the model which was taken for the purpose of showing the construction of the hull, and to describe particularly the way in which a schooner, such as the model hull, is to be rigged. The size of masts and spars may be ascertained by reference to the tables already given; but it must be observed that the bowsprit, instead of being stepped at an angle, as in ships, is generally placed horizontally, and consists of two pieces only, joined by a cap not unlike the top-mast caps of schooners, except that it has no hounds, or halyard-hooks.

SCHOONERS are rigged in two fashions, and are called, according to the rig adopted, Top-sail Schooners, or Fore-and-aft Schooners. It is intended in this place to describe particularly only the rig of a fore-and-aft schooner, because such a rig will be found more suitable to craft of the model size, looks better, and is moreover that most commonly adopted for schooner yachts and pleasure craft. Top-sail schooners are used for the fruit trade and as colliers, and sometimes, but seldom, as yachts. In general terms they may be thus described: they have two masts, whereof the main-mast has not any square sails on it, but is furnished with a spanker and gaff-top-sail, like any other schooner, while the fore-mast has, in addition to a try-sail, a fore-yard, a top-sail-yard, a topgallant-yard, and sometimes a royal. The fore-yard does not, however,



BARQUE.

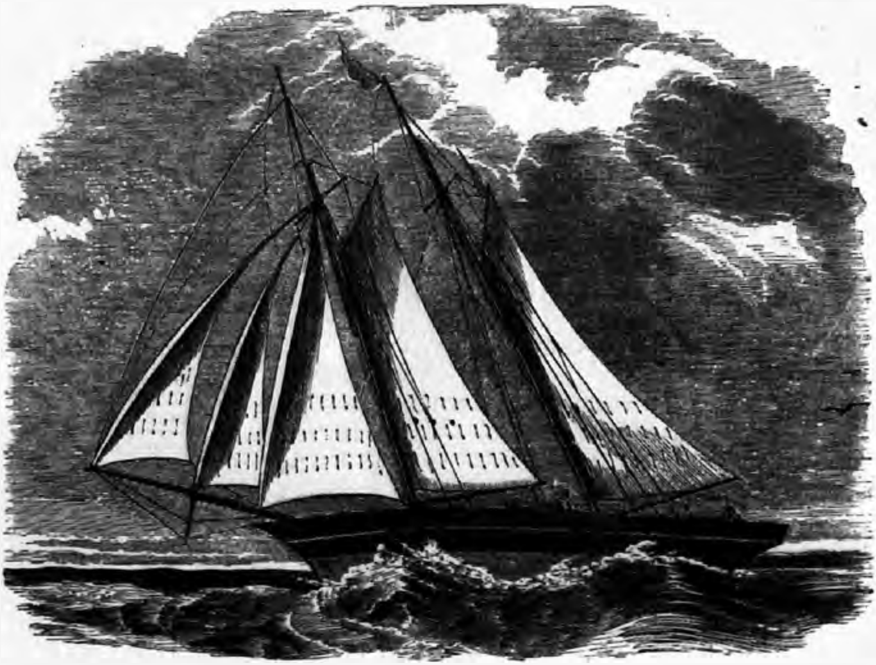
carry a sail, and is only used for the purpose of making a home for the lower part of the top-sail. If it should be wished to rig a model as a top-sail schooner, all that will be necessary will be to rig the main-mast according to the directions given below, and taking heed to what has been said as to the quantity of square sails allowed to rig the top-sail, topgallant, and royal-yards in the same way as was directed for like sails in a ship.

Fore-and-aft schooners have both masts rigged alike (see annexed figure), with the exception of a boom which belongs to the spanker, but is not allowed to the fore-sail. If she be meant for a yacht, or if she be deep, and long, and rather narrow than broad in the beam, the lower masts should be of considerable height. No exact dimensions can be given: the matter must be left to the taste and judgment of the owner; but see table above. The lower masts having been stepped in such a way that the middle line of the deck is divided between the stem and stern into—say three—equal spaces, it is necessary to fit and run up the top-masts, and set up their standing rigging.

There are not any tops in these schooners; but the top-mast is rigged in two caps, which secure the end of it firmly in a double grip, as shown in Fig. 1.

The caps are best made out of lead or bone, which can easily be worked with a pen-knife; wood is not so strong, and it is very liable to break when the mast-holes are being cut.

Dead eyes, or fixed blocks shaped thus—  being fastened into the outside of the bulwarks, parallel with the main and fore-masts, the shrouds, which are passed over and across the lower cap, are led down to and secured in them, and the ratlines must be fastened across the shrouds.



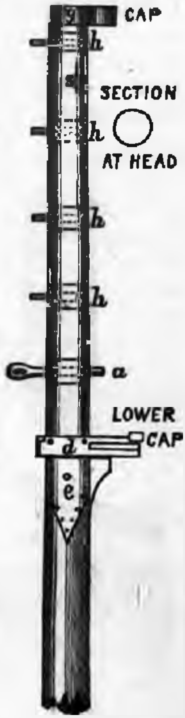
SCHOONER.

The small puttock-shrouds for the top-masts are secured, through the ends of crosstrees, to a necklace of iron under the lower cap. They are, however, very slight. The main-stay is a rope leading to the head of the fore-mast; and there is a sort of back-stay which leads to the foot of the fore-mast. The fore-stay runs from the head of the fore-mast to the head of the vessel, and serves as a medium for carrying the fore-stay-sail where one is carried. The gear for the sails is the same as already described under the head of spanker and try-sail gear. Through the eyes, shown in the figure (Fig. 2), as secured to the mast-head, are passed the peak and throat-halyards, for hauling up or lowering the peak. Through a block half-way down the peak, and another at the throat of the gaff, are run the peak and throat-brails; and through a block on the mast, about two-thirds down, run the foot-brails. Brails are used for the purpose of taking in the sail; they are all fast to belaying-pins at the foot of the mast. Two or three sets of reef-points are on both main and fore-sail. Out-hauls and down-hauls are also provided, as in the case of a spanker.

FIG. 2.

The fore and main-gaff-top-sails have each one set of halyards, no reef, and a single rope-sheet running through a block on the mast and communicating with the deck.

On the mast-head are placed five hoops: the lower hoop, *a*, is made with a wide collar, to receive the shoulder of an iron outrigger, with an eye formed for the throat-halyards; this hoop is put on from two feet to two feet six



inches above the under side of the lower cap. The upper hoop is placed six inches below the upper cap, and three others are spaced at equal distances between the upper and lower hoops. These hoops, *h h h*, have all eye-bolts drove through them from the after side of the mast, and clenched on the fore side for the peak-halyards; their eyes lie horizontally; they are placed on the head for the upper and lower ones to be in the middle line on the after side of the mast, and the two between these an inch and a half on each side of the middle line. A hoop is also driven on the heel of the mast, about six inches above the shoulder of the tenon. There is a sheeve, *s*, in the mast-head for the top-rope; *g*, is the iron cap; *d*, the lower cap; *e*, the hounds-piece. The after side of the mast is coppered in the wear of the gaff and boom.

HEAD SAILS.

Fore-stay-sail, standing jib, and flying jib: these run on their respective stays, of which the first runs to the lower mast-head, and the other two to the top-mast-head, where their halyard-blocks must be placed. The down-haul blocks must be fastened to the outer lower corner of each, and the down-haul itself, being secured to the top of the sail and rove through its block, is to be belayed to a pin inboard. The jib-halyards and sheets, the only other gear on the head sails, are to be fitted as described under the head "sails of ships."

KNOTS AND SPLICES.

The mode of forming ropes and cables is shown in Fig. 1. A number of fibres, *a*, are spun right-handed (with the sun, or from left to right) into the *yarn*, *b*. A number of yarns, varying according to the size and quality of the strand required (ropes made of small fine yarn are the strongest and best) are then twisted, *left*-handed, into the *strand*, *c*. Three strands laid together, *right*-handed, form the *rope*, *d*. (At *e* is the vacant space caused by the strand *c* being "unlaid" to show its structure.) This three-strand right-handed rope is the rope used for general purposes and for the "running rigging" of ships. For "standing rigging"—shrouds and stays—it is customary to use right-handed rope, composed of four strands laid round a fifth smaller strand, called the *heart*, which passes straight up the middle. Left-handed rope is sometimes met with, but not often. Ropes are built up in this way for the sake of getting the twist right and left alternately, which is the only way of preventing them from untwisting under strain. Without the twist the fibres would fall to pieces.

Three ropes like *d*, laid together left-handed, form the *cable*, *f*, the largest kind of rope. All left-handed rope is called *cable-laid*; but, strictly speaking, only nine-stranded rope like *f* should be so called. Formerly, ordinary right-handed rope was called *hawser-laid*, but that term is obsolete or has come to mean the same as "cable-laid."

There are many kinds of cord, such as window-sash lines, &c., which are not "laid," but "plaited," and are therefore in no sense *rope*. These cannot be spliced or made into the more complicated knots. Miniature rope, called ***humber-line***, is about the smallest genuine laid rope, and is good for practising knots upon. The smallest rope so called by sailors is inch-rope, *i.e.*, 1 in. in

FIG. 1.

FIG. 2.

FIG. 3.


FIG. 4.


FIG. 5.


FIG. 6.

FIG. 7.

FIG. 8.


FIG. 9.

FIG. 10.

circumference, not diameter. Rope exposed to the wet should be made of yarns soaked in tar. This makes the neatest knots and splices, the fibres sticking together better, but it makes the fingers in a sad mess. Untarred rope is nearly as good for practising on.

String is composed of two or three yarns laid either way.

Spun-yarn is a kind of soft string, made by twisting, right-handed, two or three yarns from old rope.

Worming is filling up the channels between the strands of a rope, either to improve its appearance or to fit it for serving or parcelling (*a*, Fig. 2).

Parcelling is covering the rope with strips of old canvas soaked in tar to keep out the wet. Follow the "lay" of the strands from left to right (*d*, Fig. 2); then cover over or *serve* the parcelling with spun-yarn (*b*, Fig. 2), going against the lay, or from right to left. "Service" is also put on without parcelling, over a plain rope or over worming.

Marling is used instead of service to keep parcelling in its place. It is a kind of "chain-stitch" as known to ladies (*c*, Fig. 2). Work it towards you.

Any bend or loop in a rope is called a *bight*, as *a* or *b* in Fig. 3. The *standing part* is that which is not bent about in forming the knot; the base, in fact, upon which the *end*—the part being manipulated—is worked. If you seize one of the bends of a coil of rope, and draw it out without finding the ends, you have hold of the "bight" of it.

The plain OVERHAND KNOT (Fig. 4) is the simplest of all. It is made at the end of a rope, to prevent it passing through a hole (as in sewing) or to prevent the strands from separating too far.

The FIGURE OF EIGHT KNOT (Fig. 5) is better than the overhand, as it does not "jam" under strain and is easy to undo.

The BOAT KNOT or MARLINGSPIKE HITCH (Fig. 6) is simply an overhand knot, with the end held by a piece of wood instead of being taken through the bight. On withdrawing this the knot falls to pieces.

The BOWLINE is the best of all knots. It forms a loop which neither jams nor slips, and is easy to undo. Two ropes may be joined by a bowline at the end of each. It may be thrown over or made fast round a post, it forms a sling for a cask, and fifty other things. Having formed a bight as in Fig. 7, hold the crossing *b* in the right finger and thumb; with the left hand take the bight at *a*, and draw it over the end as in Fig. 8: being twisted by this operation, it tends to take the shape shown in Fig. 9; let it do so, but still keep the crossing in order between the finger and thumb; now draw out the end a little, and work it in as in Fig. 10; adjust the loop to the size required, and pull it tight.

A RUNNING BOWLINE is begun as in Fig. 11, taking *c* as the crossing and *d* as the bight described above. Fig. 12 shows it finished,—the best slip-knot known, free from any risk of jamming.

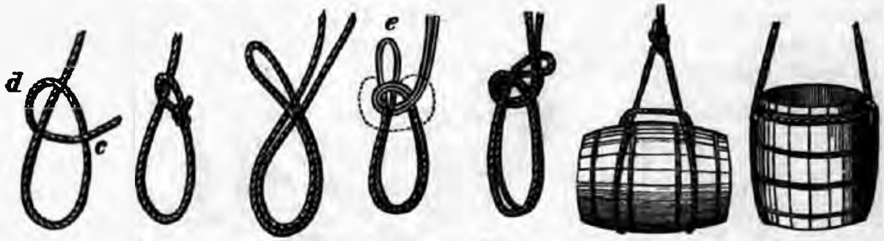


FIG. 11. FIG. 12. FIG. 13. FIG. 14. FIG. 15. FIG. 16. FIG. 17.

One merit of the bowline is that it can be made on a rope with one end fixed and out of reach; but it can even be made in the middle of a rope when there is no time to look for the ends. This is a *bowline on a bight*. When a sailor hears the cry, "Man overboard!" he seizes a bight in the first coil of rope he meets with, forms a bowline on it, and throws it to the drowning man in less time than it takes to describe it, because he is not detained looking for the end. Figs. 13 and 14, corresponding to 7 and 9, show that it is commenced as a common bowline, only with a double instead of a single rope; but instead of treating the looped end, *e*, like the end in Fig. 10, open it out and pass it round or behind the whole thing (see the dotted lines); then draw tight again, as in Fig. 15.

A BOWLINE WITH FOUR BIGHTS is made with *two* double ropes. It has four large loops, instead of the two in Fig. 15, and may be used, for instance, to support the different parts of a man's body while being drawn out of the water insensible.

Figs. 16 and 17 show two ways of slinging a cask, &c., in the loop of a single bowline. In Fig. 17 the rope must be arranged before the bowline is made.

Fig. 18 is a simple running knot, but inferior to the bowline. It is often used for tying up parcels, when an overhand knot at *a* is made to prevent the end slipping through.

The HANGMAN'S KNOT is useful for the same and other purposes, and does not jam so much, besides being more ornamental. Form bights as in Fig. 19; work the end round and round, as many times as you like, towards the loop *a*, Fig. 20; pass it through *a*; pull *b* so as to nip the end tightly in *a* (Fig. 21). When made with care this is a pretty knot.

FIG. 18.

FIG. 19.

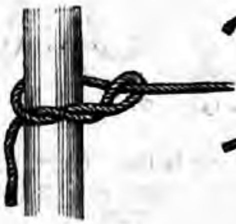
FIG. 20.


FIG. 21.

A rope may be secured to a post or spar by a bowline, as to the cask in Fig. 16, or by

The CLOVE HITCH or BUILDER'S KNOT, Figs. 22 and 23, which holds very tight, especially if the end is "seized" or "stoppered" down with spun-yarn, or secured to the standing part by a "half-hitch," as at *a* in the latter figure. You can form this knot either by twisting the end of the rope round the post, in the manner shown in Fig. 23, or by forming a double-loop as in Fig. 22, and passing the post or spar through the opening *a*, and then drawing tight. In either case the result is the same.

FIG. 24.



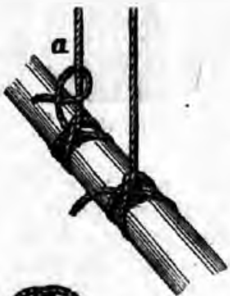


FIG. 23.

FIG. 22.

FIG. 25.

FIG. 26.


FIG. 27.

The TIMBER HITCH (Fig. 24) holds tight while the strain is on, but not otherwise. It is useful in a hurry, and easily made.

The ROLLING HITCH (Fig. 25) holds so securely that a weight may be suspended by it from a perpendicular pole, or the pole may be slung by it in the same position. At *a* it is shown drawn tight. In Fig. 26 an extra turn is taken, which adds to the strength. There is also another more complicated form of the rolling hitch.

In all these figures the knot is drawn loose to show the structure.

The CAT'S-PAW (Fig. 27) is used for hitching the bight or any part of a rope to a hook, &c. Form two bights, twist them in opposite directions, and pass the hook through the loops. A weight may now be hung to either part of the rope. There are several cat's-paws, but this is the commonest.

The SHEEPSHANK or DOGSHANK (Fig. 28) explains itself. It is used for shortening ropes when it is undesirable to cut them to the length required. It comes apart again when the strain is removed.

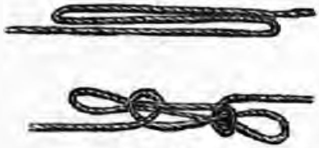


FIG. 28.

FIG. 29.

FIG. 30.

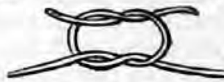


FIG. 31.

FIG. 32.

FIG. 33.

FIG. 34.

FIG. 35.

FIG. 36.

FIG. 37.

A BLACKWALL HITCH (Fig. 29), simple as it is, is a safe way of hanging a weight from a hook. The greater the weight the tighter the end is jammed against the hook, though there is no knot in it.

The neatest join for two ropes is the REEF KNOT, or RIGHT or TRUE knot. Twist the ends as in Fig. 30, then make an overhand knot as in Fig. 31. If the latter is twisted in the right direction, the ends will lie close as in Fig. 32; if not, they will stick out sideways. When this happens the knot is useless, and is called a "granny knot," or false knot. Neat as the true reef knot is, it is only suited for small ropes with no great strain on them: under much strain it jams and is difficult to undo. To join large ropes, hold one in the left hand as at *a* in Fig. 33; then work the other through in the direction of the arrow. This is the COMMON or SHEET BEND, or WEAVER'S KNOT. The reef knot is that used to join the ends of each pair of "reef points" in reefing a sail. Of course joining the two ends of a rope together is the same as joining two separate ropes. The weaver's knot is easy to undo, especially if made as in Fig. 34.

Fig. 35 is a CARRICK BEND, for joining two cables for towing ships, &c.; but a bowline bend is more general.

A permanent junction between two ropes should always be made by *splicing*. Fig. 36 shows the commencement of a

SHORT SPLICE.—Open out or unlay the strands, and "crutch" or inter-lock the ends (tightly, not loosely as in the drawing); take any strand, *a*, pass it over the opposing strand next before it, *f*, and stick it in between that and the next, *e* (which must be lifted up by a pointed piece of wood or iron called a *marlingspike*). Pass it under *e* and up between *e* and *d*. Treat all six strands in a similar manner. If great strength is required, pass them all a second time. When the ends reappear, untwist each into yarns; cut out half of each yarn; twist up the yarns again; then pass the six *reduced* strands once more, and cut off the ends. This is to *taper the splice*, to make it more sightly (Fig. 37). If the description seems obscure, try it as you read: the principle is to embed or burrow each strand of A into the substance of B, and *vice versâ*. Splicing large rope is very hard work.

An EYE SPLICE (Fig. 38) is easily made by any one who has mastered the short splice, the difference being that you have only the strands of *one* rope to work in amongst the strands of its own "standing part." Both these splices should be parcelled and served if exposed to wet.

Fig. 39.

Fig. 38.

Fig. 40.

The LONG SPLICE is stronger and more elegant than the short splice, and must be used if the rope has to run through pulleys, &c., as it does not increase its thickness. Unlay a much greater length of each rope than is shown in Fig. 36; inter-lock or "crutch" the strands as before. Now untwist *a* still further—for several whole turns along its own rope A, which will then consist, so to speak, of two strands and a vacancy. Into the vacant space left by the removal of *a* lay the corresponding strand, *f*, of the opposite rope (Fig. 36); twist *f* tighter as you lay it in A, for part of its length is now composed of two strands of its own, *b* and *c*, and one of its neighbour's, *f*. At the point where the untwisting of *a* ceases—and where, of course, the laying in of *f* ceases also —join *a* and *f*; cut off all but a few inches of each; untwist them, and cut off about one-fourth of the yarns from each. Tie the reduced strands with an overhand knot (as in Fig. 39), which must be coaxed into the vacant place as neatly as possible; beyond the knot reduce *a* and *f* by another fourth; pass the end of *a* over *f* and the end of *f* over *a*, and each under the *two* next strands (Fig. 40): when you have well stretched the rope, cut off the ends where they appear. Sometimes the two are reduced by half before knotting; sometimes the extreme end is reduced to a fourth, and "stuck" once more. In the same way work one of A's strands—say *b*—into the rope B, untwisting *d* to make room for it, and joining them like *a* and *f*. You will now have *e* and *c* to dispose of. Reduce them, and tie their ends together like the others, but at the original point of junction, without laying them into either rope: your three pair of strands will now be united at three different points in the rope, some distance apart, and there will be no material increase of thickness.

A GROMMET—(see engraving in the article on Sailing)—is a rope ring made by unlaying one strand from a rope. Form a bight of the required size at one end, and work the loose end twice round it, following the natural crevices of the strand. You will now have a solid three-strand rope in the form of a ring, and a pair of ends to join. Join them by an overhand knot, first tapering them, and "stick" the ends just as in a long splice.

Sailors have many ornamental knots for finishing the ends of ropes, to prevent the strands from separating: amongst others are the Matthew Walker, the Single Wall, the Single Wall Crowned, the Double Wall, the Double Wall Double Crowned, the Single Diamond, the Double Diamond, the Stopper Knot, and others, which space does not admit of our describing. All the knots and splices in common use we have given, and the reader may be sure that few pieces of stray information repay the trouble of learning—*and practising*—better than a knowledge of the Art of Cordage.

GARDENING.

Tools that must be had.

1 pair of soft leather gloves,	1 draw-hoe,
1 spade,	1 dibble,
1 small hand-fork,	1 rake,
1 trowel,	1 small pair of shears,
1 Dutch hoe,	1 3-foot rod,
1 gallon water-pot,	1 pair pruning-scissors,
1 garden line,	1 garden-knife,
1 peck rubbish-basket,	1 wooden basket for seeds, &c.,
1 hammer,	1 wooden mallet,

and an apron with a pocket in front, for carrying bass or any small article. If the tools can be kept in a sheltered spot near the garden during the summer months, it would be an advantage; in the winter, when not required, they should be taken indoors, and, after being cleaned, the parts liable to rust should be oiled with a brush and marked, for sake of distinction, with the initials. It would be well to be provided with a good deal box, divided into compartments, for containing the small tools and other sundries, as flower-sticks, labels, pegs, bass, string, nails, shreds, tallies, and seeds, which should be properly arranged, so as to allow of ready access to them in the busy season.

Having had a plot of ground allotted to you, the next thing is to consider how you shall form your garden; and the gratification of your taste must be determined by the space at your disposal.

The edgings on each side of your main walks should be of such a kind that, in case of heavy rain, they would prevent the soil being washed into the walks. Box edgings are not desirable, as, from frequent raking and brushing, they are apt to decay; thus gaps are left here and there, which can only be properly replaced by planting the whole afresh. Bricks or burrs are to be discarded. A rustic edge formed of round pieces of wood, cut in equal lengths, and fastened in close together with a mallet, is good and easily repaired. Ivy and all kinds of growing edges harbour slugs, snails, and other varieties of destructive vermin. If you can afford it, buy some of the ornamental tile-bordering for flower-gardens; it can be had at the principal potteries. With care it will last for years.

If you have sufficient space for flower-beds, let them be of the oval and circle shape. A raised bed or mound in the centre of the garden for growing flowers would be a relief to the flat surface. The size and number of the beds must accord with the extent of your garden. With flower-beds you can better harmonize the colours by massing them; that is, supposing you to have a piece of ground each side of the centre plot, these portions could be devoted to the culture of the chrysanthemum, herbaceous plants, &c. If you have not this advantage, it would be better to dispense with beds, and plant on the mixed system, practising as much method as possible in the arrangements of colour, height, season of flowering, &c., so as to have few blank spots throughout the year. If you design beds, there will be no need to employ the same labour and materials in making the walks that encircle the beds as in the case of the divisions. A slight coat of gravel to distinguish them would suffice, as it is possible that in the following season you may alter your plan. This can be more readily accomplished if the walks are not made for permanent use. The edgings round the beds could be made of a very hardy plant, viz., *Cerastemum tomentosum*, which can be propagated in the spring by division, and planted two inches apart. It will increase and spread very fast. Do not let it flower, but keep it evenly clipped with the shears both in width and height. You need not afterwards disturb it, except for the purpose of reducing it.

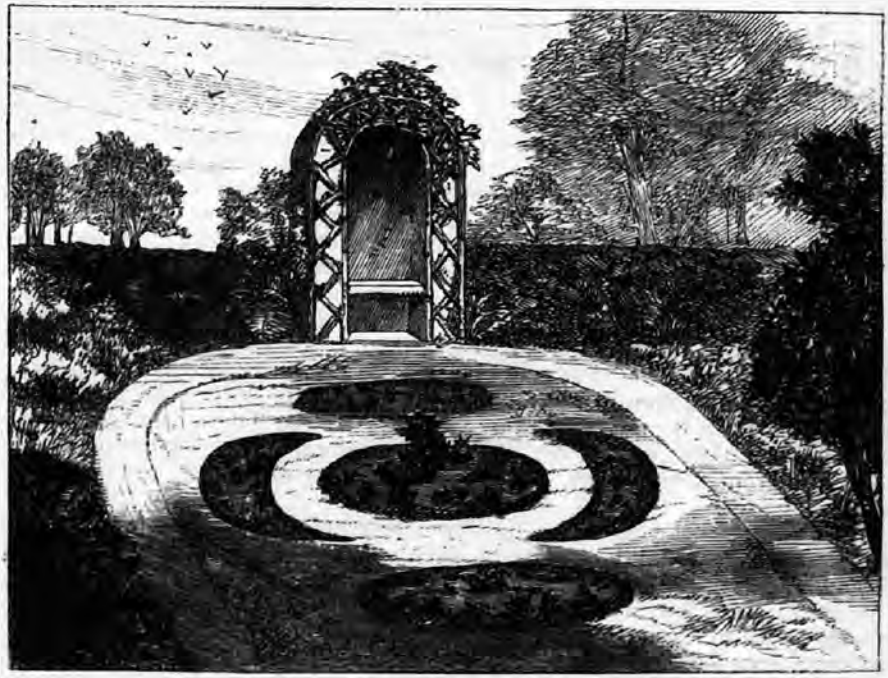
Should there be a fence, wall, or similar shelter in the rear of your garden, you might construct a rustic arbour; in the absence of such an advantage, you could form a back with little difficulty of upright stakes well secured in the ground; the sides the same; but the roof should be willow or ash stakes, if you can procure them, as they bend to any shape. If the ends of the stakes which are inserted in the ground could be dipped in tar previously, it would preserve them for a greater length of time. In splicing the stakes, notch the parts where you tie them together; the same with the stiff rods used as cross supports to the upright. Having erected the arbour, you should make a seat inside, where in the hot days of summer you might read and study. The flooring can be made of small stones, collected at your convenience, and may be formed into some device.

You have now to consider what species of climbing plant you will select for covering the arbour. Hops are very pretty and rpaid in growth; but they often become so infested in the autumn with green fly, as to make them very unpleasant to handle. As annuals, nasturtiums, *Convolvulus major*, and scarlet runner are suitable. For permanent growth, the white clematis planted on one side and an Ayrshire rose on the other would have a pleasing effect. The latter is very thorny, but its flowers are very fragrant; and, after it has covered the intended space, you can bud choice varieties on it with success.

Fernery.—Each side of the arbour you can raise a mound of earth. The under portion could be composed of any rubbish which makes a good drainage; over this you may form a rockwork, either with stones, blocks of wood, stumps of trees, or any similar material that can be obtained. On this, when finished, you could plant a collection of ferns. They do not require a great depth of soil, but like their roots screened from the scorching rays of the sun; their fronds develope themselves luxuriantly in shady nooks; though fond of moisture, they dislike being saturated. Syringing or watering them with a fine rose at the close of a warm summer day is what they delight in. The ferns in the following list are perfectly hardy; they require but ordinary attention, and are well adapted for a beginner:

Asplenium (*Adiantum nigrum*).	*Polypodium vulgare.*
Blechnum spicans.	*Polystichum angulare.*
Lastrea dilatata.	*Scolopendrium vulgare.*

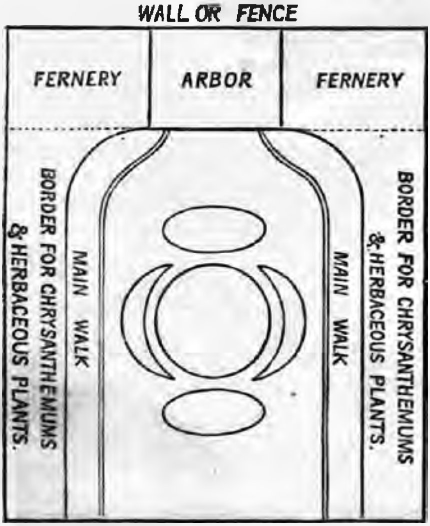
Snowdrops may be planted along the edge of the fernery, and a few British primroses intermixed among the ferns; these would flower early, and be quite in character with the situation. The subjoined plan is a sketch and ground plan of the kind of garden we have been treating of. Of course situation and



other circumstances so far vary that you might not be able to adopt this style, still you may derive such lessons from it as will assist you in carrying out a different design.

Having executed your plans in the formation of the garden, and quite prepared it for the reception of plants, you must now consider how you shall furnish it with those kind of plants that will make it attractive and interesting, not only at the present but at all seasons, and that you may do so we will begin with the year, and say something of what is to be done in every month of it.

January is a month in which very little can be done out of doors, unless you can on favourable days benefit the soil by digging in any leaves or other nutritious substances you may have collected in a heap during the autumn in some out-of-the-way corner. If not sufficiently decayed, you had better turn it over three or four times with your fork before you use it. In digging, the rougher you leave the soil for the present, the more will it be benefited in the future. Be careful not to disturb crocuses, snowdrops, or any other bulbous roots you may have planted, as they are fast pushing upwards, especially the snowdrops. It is to be hoped that you have marked their positions by carefully-written labels. If you have any plants whose roots are likely to be injured by the frost, as hardy fuchsias or tea-scented roses, cover them with some coal-ashes.



GROUND PLAN OF GARDEN.

Your leisure time in the house should be employed in making pegs with sharp points from old birch brooms, making and painting flower-sticks, and preparing labels, as in a few weeks you will be requiring them. During the summer months you will have kept a memorandum of any improvements that may have been suggested to you: now is the period to prepare for carrying them out. Do not clear away the decayed fronds or leaves that may be deposited on the surface of the fernery, as they are a protection to the future fronds. A little earth sifted over them will prevent them being scattered by the wind. If you have a small frame for keeping calceolarias, stocks, &c., it would be a great help. Protect them by coverings from severe frost, but on all fine days admit air and pick off withered leaves.

FEBRUARY.—Let your spare moments be employed in the same way as recommended last month. Any bulbs, such as tulips, &c., that are not planted, should be during the first fortnight of this month.

MARCH.—You may now divide any perennial and herbaceous plants which you may wish to lessen or increase. Never let any of this kind of plants get too large, because they rob the soil of its nutritious properties. No garden is complete without that beautiful autumnal flower, the chrysanthemum. Now is the season to propagate it. The dwarf or pompone varieties are most desirable for small gardens, because they flower early and in more profusion than the larger varieties. Three or four rooted pieces will make a good patch; but, if you cannot obtain that number, one will do, as, by stopping the shoots at intervals till the beginning of July, it will make a nice plant. They are fond of plenty of water, and rich manure applied to their roots during the growing season. The following list includes a few good sorts:

Name.	Colour.
Bijou d'Horticultur	Sulphur white.
Capella	Red chestnut.
Cedo nulli	White tipped with blush.

Name.	Colour.
Drini-Drini	Clear yellow.
Edith	Light rosy salmon.
General Canrobert	Pure yellow.

If you can do so, you might grow one of each in a pot. They should be managed thus: as soon as the stem has made five or six eyes, pinch off the top. It will then push out shoots from each eye, which train and tie to neat sticks as they grow. When they have made four joints, stop them again. Thus treated, by the autumn you will have good bushy plants, either for decorating your window or presenting to your friends.

You should now stir the soil with the Dutch hoe and level it with your rake preparatory to the sowing of seeds. If you possess a frame, sow asters, stocks, and sweet peas in pots. In doing so put plenty of drainage in the pots and fill them with soil to within an inch of the edge; then with a rose give the soil a good soaking of water. Then you may sow the seed, covering it with some fine mould, intermixed with a little silver sand. Keep them shaded till they begin to grow. This will prevent them from requiring water till they have vegetated, as frequent waterings previously are apt to rot the seed.

You should now think of purchasing any seeds you may require, as all annuals do better if sown not later than the first week in next month. The following is a selection of pretty and effective annuals:

Name.	Colour.	Height.
Candytuft	Purple	1 ft. 0 in.
„ alba	White	1 0
Collinsia bicolor	White and purple	1 0
Campanula lorei	Purple	1 0
Dwarf nasturtium	Various	0 6
Escholtzia crocea	Yellow	1 0
Erysimum perofskianum	Orange	1 0
Gillia tricolor	Three colours	1 0
Kaulfussia amelloides	Blue	0 6
Lupinus nanus	Blue and white	0 9
Larkspur	Various	2 0
Mignonette	Fragrant	1 0
Nemophila insignis	Blue	0 6
Saponaria Calabrica	Red	0 6
Virginia stock	Various	0 9

Of course you can add to or reduce the number, but don't forget to sow plenty of mignonette.

The present is the proper season to prune rose trees. Cut the strong shoots back, leaving three of the dormant buds.

APRIL.—The garden is fast becoming cheerful. Polyanthuses and wall-flowers are now beginning to bloom freely. You must give all your spare time to the cultivation of your garden. The annuals must be sown without delay. Use a small hand-fork for loosening the soil after you have sown the seeds. Pat them in the earth with the back of the fork. As soon as they have grown so that you can handle them with your thumb and finger, pull up the weakest and leave the remainder an inch or more apart; after which, if the days are warm, you may, towards evening, sprinkle them with a fine rose. If the earth is rich with manure, they will grow strong and weedy, in which case they will exceed their usual height. As they progress, it would be advisable to stick a few pieces of birch or brushwood among the weakest growers, to enable them to withstand heavy rains and wind.

MAY.—Get some of the bedding varieties of plants. Do not select strong growers, as they often yield the least flowers. The dwarf sorts of scarlet geraniums, calceolarias, and verbenas are in general the most abundant bloomers. There is a dwarf white flowering dahlia, named *Alba nana*, that needs no sticks to support it, and will continue to produce a great quantity of flowers till the frost destroys them. It is useful to cut from for bouquets.

Subjoined is a list of bedding plants:

GERANIUMS.	CALCEOLARIAS.	MISCELLANEOUS.
Trentham rose.	Aura floribunda.	Lobelia speciosa.
Tom Thumb.	Yellow gem.	„ Paxtoni.
Baron Hugel.		White petunia.
Christine pink.	VERBENAS.	Argentum Mexicanum.
Variegated geranium.		Tropæolum elegans.
Flower of the day.	Lord Raglan (scarlet).	
Alma.	Purple king (purple).	
Brilliant.	Mrs. Holford (white).	

When planting any of the above plants not in masses, let it then be done so that they will fill up any of the vacancies caused by the annuals when past flowering, and strive to arrange your colours that they may harmonize as they grow. Keep the ground free from weeds by the use of the Dutch hoe. Do not give your young plants too much water, but a gentle sprinkling over their foliage of an evening: such practice refreshes them very much, besides cleansing their leaves of any dust that may accumulate. Tulips will be in bloom this month. If you wish to prolong their beauty, you must contrive some kind of covering to protect them from the rays of the midday sun and heavy showers.

JUNE.—The summer roses will be in full bloom this month. Keep the buds clear of green fly, for which purpose use a soft brush or feather; look also for the maggot. The curling of the leaf is a certain sign; examine it, and you will be sure to find the insect. It destroys the bud by piercing a hole in it, therefore the leaves must be constantly watched. Pinks will now be in perfection. Keep them tied to neat stakes, and if you want large flowers you must pick off some of the smaller buds where there are more than two or three on the same stalk. The white variety is easily propagated, and much grown on account of its scent. For increasing them by cuttings, cover the soil about an inch deep in silver sand, then put a propagating-glass over them, and shade them till rooted, which you will observe by their commencing to grow. Then gradually admit air till you entirely remove the glass. Attend to the training of your climbers, put sticks to your sweet peas. You may by the end of this month dig up the tulip or any other bulbs you may desire, dry them, after which, clean and put them in bags till required for planting.

JULY.—If you wish to bud any rose with other varieties this is a favourable month for the operation. Remove decayed flowers and seed-pods from your annuals and other plants; it will extend their time of flowering. Your geraniums will be fast coming into bloom. If very hot weather, give them a liberal supply of water. Endeavour and keep your garden in good trim; tie and peg all plants that may require it. If by accident you should break a geranium shoot, dib it in the ground—it will root. You must discontinue to syringe or sprinkle plants in flower, as it damages the bloom and causes them to lose their flower. When using the Dutch hoe, don't let it go in too deep, or it will injure the roots. Uproot all annuals that have done flowering; attend to the training of the shoots of your chrysanthemums. If they and the dahlias get attacked with earwigs, have a thumb-pot, put some dry moss in it, and lodge it in the plant or on the stake that supports it; every morning take the pot out, remove the moss, and empty the contents into water or crush them with your feet. Cloves and carnations may now be increased by laying: the operation is simple: loosen the earth about the plant with the hand-fork, then make a cut half-way across the third joint of a shoot, then peg it into the soil.

AUGUST.—Bedding plants may be said to be at their best during this month. If the weather is very dry, continue to water freely. If you have, or can obtain, convenience for wintering geraniums or such-like plants, you should commence propagating them during the early part of this month: they will root in the open ground or in pots out of doors. You may increase the number of your violets by division. Choose the time when we are likely to have warm showers, as they will assist them to root at once. Select a shady spot on which to plant them. Proceed to note in your memorandum such alterations or arrangements as you may wish for another year.

SEPTEMBER is a very humid month; plants grow very fast; less water is needed. French and German asters will be in perfection. When they have attained their full size, cut them for bouquets; that will increase the size of the after-blooms. Supply the roots of dahlias with plenty of water; cut out all weak shoots; gather the seeds of plants you may wish to save, as they are now ripe (you can clean them indoors at your leisure). Plant wallflower, sweet William, &c.

OCTOBER.—Although many plants are yet gay, still the beauty of the greater number is on the decline. Towards the middle or latter part of this month you may expect a few rather sharp frosts: any plants that you have struck, or others that need protection, let them be so conveniently placed that, should there be signs of a frost, you can immediately protect them. Many plants, such as fuchsias, scarlet geraniums, &c., will exist in a room during the winter, where they can be properly secured from the admission of frost, and you must keep them from growing till the spring, by not giving them more water than will just keep them alive. Cuttings of yellow calceolarias will now root quickly in coarse sand. They need no other protection than a cold frame for preserving them during the winter. Chrysanthemum buds will be swelling fast. Towards evening search for and destroy earwigs. If you want fine flowers, pick off all small buds, leaving one to each shoot. In tying them out, afford all the room you can for each stem.

NOVEMBER.—As leaves fall, collect them together in a tidy heap, and by turning them over often during the winter, they will become excellent manure for your garden in the spring. This is the best month in the year for planting tulips, crocuses, hyacinths, and other bulbs. Tulips and hyacinths should be planted six inches deep; the smaller bulbs three inches. If you have a spot that you could plant a line of crocuses in three rows of distinct colours, say yellow, white or striped, and blue, the effect when in flower would be dazzling. Dig up your dahlia roots, and after allowing the water to drain out of the flower-stalk, hang them up in a cupboard or cellar where the frost cannot penetrate. If you have not that convenience, put them in a box, and cover them with dry sand.

DECEMBER.—Any stalks or refuse of plants can be consumed by fire: the ashes will improve the soil if mixed with it. Now the trees have shed their leaves, clean up and put your garden in tidy order.

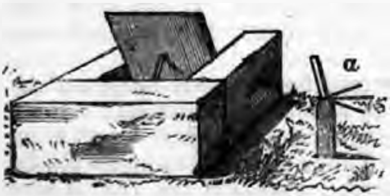
TRAPS.

From time immemorial and amongst every nation of the world, we believe, the art of trapping has been more or less practised: by some as a means of supplying their wants in the shape of daily food, and by others for the purposes of merchandise and profit. In this country, however, almost the only object in view is that of the destruction of vermin, for the protection of our poultry-yards, our granaries, and our game. It is to this kind of trapping to which we shall more particularly direct our attention, and we do not doubt that, independently of the good they will effect, our young readers will derive a sufficient amount of gratification for the trouble they may take in following the few rules and directions we shall lay down for their guidance.

To be a clever and successful trapper, a vast deal more is required than is generally supposed: the mere fact of a person being able to set a trap cleverly and judiciously forms but *part* of his proficiency. He must know more than this: he must at least have some knowledge of the nature and habits of the animal he endeavours to catch; without it he will meet with but indifferent success.

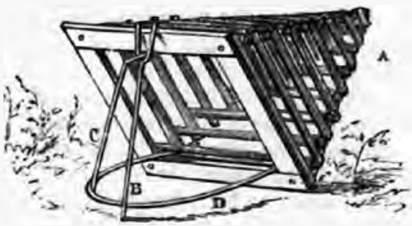
It may be thought possibly by some of our readers that vermin-trapping is the sole province of the keeper, and is therefore beneath their notice. Such, however, we can assure them, is not the case. If they have but the time and opportunity at their disposal, they will be amply repaid for the trouble they may bestow upon it, and, moreover, derive an amount of information which will enable them thereafter to satisfy themselves whether or no their coverts, &c., are properly cared for. There is, moreover, an amount of excitement in the art itself, which our young readers will most certainly find if they will follow us practically through the simple directions which we shall here lay down.

All things must have a beginning, and trapping is no exception to the rule; and as we have vivid recollections of our schoolboy days and of our Christmas holidays, and "Brick and Tile" traps, we shall take this method of trapping small birds as the starting-point of our present article. It is as well known to most of our readers, we doubt not, as to ourselves; but it ought not, we consider, to be omitted from our list. It is formed, as shown in the cut, of three bricks and a tile. The bricks should be placed on their edges, *i.e.*, on their thinnest sides, and the two side ones put wide enough apart to allow the tile to fall easily as soon as the trigger is touched. A peg must be driven in the ground, flattened at the top, and bevelled off on two opposite sides. The trigger should be formed of the joint of a hazel twig, having a branch on each side as shown, and, besides



this, there must be a straight piece about three inches long. To set the trap, raise the tile, place the butt of the trigger upon the top of the peg, and upon it place one end of the straight piece, and upon the other let the tile rest. Some bread-crumbs or seeds must be placed on the ground under the trigger. Directly a bird hops upon the trigger to get at the bait, the tile loses its support, and of course falls, the bird being made prisoner. Care must be taken in removing the bird from the trap, or, the moment you raise the tile, he will escape. The peg, trigger, and straight piece, marked *a*, are shown on the right-hand side of the engraving.

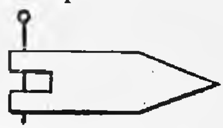
Another capital trap for almost every bird which frequents our shubberies, gardens, &c., is made in the following manner: Make a square frame of four pieces of wood, ¾ in. thick, 2 in. wide, and 18 in. long, nailed together at the corners; and across the frame, from corner to corner, tie two pieces of stout cord of such a length as, when the middle of them is raised, they will form with the frame the shape of a pyramid, as shown in the engraving. Having thus fastened the string, procure a number of straight hazel twigs, as thick as an ordinary cane, and place two of them under the string upon the frame parallel with its sides, and about an inch from its inner side; then place two more transversely, their ends resting on the first two; then two more, and so on, each two approaching the centre by an inch, so that when about eight



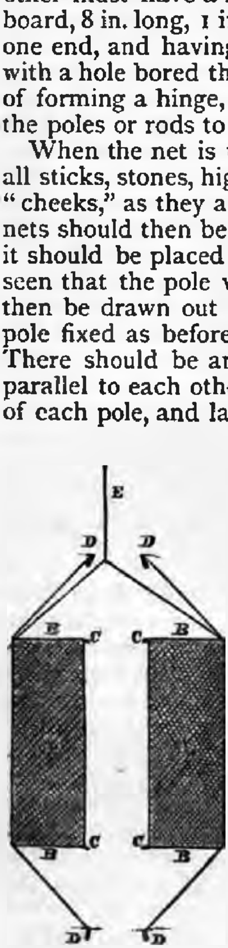
TRAP WHEN SET.
A, the trap; B, the forked stick; C, the piece of bent briar supporting the trap; D, the semicircular piece of cane or briar which is the trigger.

sticks have been laid on each side, the pyramidal shape will have been acquired. Then take a short piece of stick, and placing it under the loops of the transverse piece of string, and above the sticks which have been built up, screw it round and round until the pressure which you thus exert upon them secures them in their places; this piece of stick is then made fast: having seen that the twigs are properly arranged, the superfluous ends should be cut off with a tenon saw or sharp knife; then take a long briar or thin cane, and put each end of it under the lower bar and above the frame on the same side of the trap, so as to form a half-circle that will be inside the frame when placed on the ground. A stick having a fork at one end of it, and a piece of briar cut to the proper length, and bent at about two inches from one end to an angle, forms the whole apparatus. To set the trap, let one side of it rest on the ground, and raise the other side about a foot from it; then place the forked stick (fork uppermost) on the ground, and place the fork flat against the frame of the trap; then place the bent end of the piece of briar in the fork, and allow the frame of the trap to rest upon it. The other end of the briar (but quite the extreme end) must be placed inside the circular piece. It will be seen that directly a bird perches upon the circular piece (which, of course, must be raised about two inches from the ground), it falls with his weight, the bent piece is released, and the trap having no support, of course falls, securing the bird beneath it.

The CLAP-NET is the trap by which most if not all the song birds, sparrows for shooting, &c., are caught by bird-fanciers. It is made in this way: Two nets, 15 ft. long and 5 ft. wide, must be made of very strong thread, such as is used by tailors, and of a very small mesh. Then make four rods of deal without any knots in them, each 5 ft. long, and about the thickness of an ordinary walking-stick, one of which must be laced to each end of the two nets. One end of each of the rods must have a small brass ring screwed into it, and the other must have a hole bored through it. Then procure four pieces of elm board, 8 in. long, 1 in. thick, and 3 in. wide, cut to a point at one end, and having an opening 2 in. long and 1 in. wide, with a hole bored through them edgeways, for the purpose of forming a hinge, by means of a piece of thick wire, for the poles or rods to work in. They should be made thus:



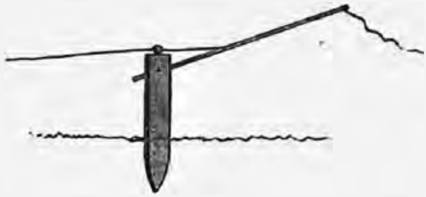
When the net is to be set, an even piece of ground should be chosen, and all sticks, stones, high tufts of grass, &c., should be removed, and one of these "cheeks," as they are called, should be driven into the ground. One of the nets should then be unfolded, and the end of the pole having the hole through it should be placed in the "cheek," and the wire run through it. It will be seen that the pole will work upon the wire from side to side. The net must then be drawn out to its full length, the "cheek" put in its place, and the pole fixed as before: the other net must be set exactly in the same manner. There should be an interval of 6 ft. between the nets, and they should be parallel to each other. A stout cord must be fastened to the ring at the end of each pole, and laid through the edge of the net its whole length, leaving 8 or 9 ft. to spare. It is as well, when the proper length is found, to tie a knot in the cord on each side of the brass ring, so that the end of the pole will always be kept in its place. The ends of the cord are left to be attached to stout pegs driven into the ground, as shown in the engraving.



A A, the nets; B B B B, the poles; C C C C, the cheeks; D D D D, the pegs to which the guide-cords are fastened; E, the drawing-line.

The net shown in the engraving is supposed to be set ready for use. Great care should be taken that the pegs, D D D D, are so placed that they will exert an even pressure on the ends of the poles as they are turned over from one side to the other, and this should be done several times, until the exact proper position of the pegs is ascertained; for unless the net turns quickly and evenly all attempts at success are in vain. It will be seen that the "drawing-line," E, is not attached evenly to the poles. The reason is, that it is necessary that one net should turn over a little in advance of the other; for, unless it did so, it would "foul" the other net, whereas, by being drawn as described, the two nets fall clear of each other.

It is usual in catching song birds, such as linnets, goldfinches, &c., to place "call birds" in small cages near the nets, and also to have what is called a "slur bird," which is a living bird, having a "brace" made of bobbin placed across the back and in front of and behind the wings, and secured at the lower part of the chest. The "slur" is merely a stout peg of wood, having a mortice in it, into which a thin rod about 15 in. long is placed, with a wire run through it, so that it will move up and down when the string attached to it is pulled.



Directly any birds are seen near the net, the "slur" line is pulled, and the "slur bird" is drawn up, and naturally flutters, and thus attracts them to the net. The "slur bird" should be placed between the nets, and round him seeds, berries, thistles, &c. It is most difficult to convey on paper an exact description of this most excellent trap; but at most places, particularly in the immediate neighbourhood of London, bird-catchers are always to be found, who, for a trifling remuneration, would gladly give a practical description of it.

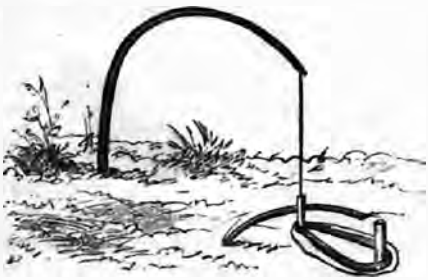
The common SIEVE TRAP, well known to almost every schoolboy, must not be omitted, nor should it be despised. Many and many an hour during the Christmas holidays, and on a piercing cold day, have we sat anxiously watching a trap of this description, and have been amply rewarded for our pains. Sparrows, blackbirds, thrushes, fieldfares, greenfinches, chaffinches have fallen victims to this simple contrivance; a common garden sieve, a stick about a foot long, and about thirty yards of fine string being all the apparatus required. The accompanying engraving will fully explain itself.

Some bait, such as grain, berries, bread, &c., must be laid on the ground under the sieve, and the moment a bird is attracted sufficiently under it, the line must be suddenly pulled; the sieve, having no support, of course falls, and the bird is secured.

The same trap may be made on a larger scale by covering a hurdle with a piece of fine net, which answers admirably in a farmyard for catching sparrows. It is, however, cold and tedious work, as it can only be practised with success during frost, or when the ground is covered with snow.

A very simple way of taking rooks, which are as shy and cunning as any bird, has been most successfully practised, although rooks, when they have once left their nest and begun the world on their own account, and are independent of their papas and mammas, are quite unfit for food, it is done more for the fun of the thing than for any use arising from it. When these birds follow the plough in search of worms, grubs, &c., is the most favourable time for this fun—we will not call it sport. Make up some cones of stiff brown paper—similar in shape to those in which grocers pack small quantities of sugar—then smear the inside of the larger end with bird-lime, and at the bottom place a grub, a bean, or piece of meat, and thrust the pointed end into the soft ground that has just been turned up by the plough. The rook, seeing the bait, pecks at it; his head coming in contact with the bird-lime adheres firmly to the paper, and he is instantly hoodwinked, deprived of sight, and almost of the power of breathing. The poor bird is in a sad plight, and usually takes to flying upwards, and then darting in different directions, so exhausts himself that he soon comes to the ground, and is, of course, easily caught.

Another most excellent trap for birds, such as fieldfares, blackbirds, &c., is made as follows: Take a hazel stick about 18 in. long, and pointed at both ends, and having fixed upon the spot for setting it (there is no better place than a few feet from a high hedgerow), thrust each end in the ground, so that it forms an arch of about one-third of a circle; then take a stout hazel stick, about 3½ ft. in length, and having pointed the thicker end, thrust it upright into the ground at a spot at right angles with your arch, and at such a distance from it as, when its point is bent down to within 18 in. of the ground, it will be exactly over the arch. To the end of this stick must be tied about a yard of whipcord, having a running noose at its end; then take a piece of a thick bramble—for this is most easy to bend without breaking—and bending it until the two ends meet and cross one another. Tie them together; it will then be exactly the shape of a horse-collar. In the upper one of the two ends cut a notch, then, holding the notch against the upper part of the arch, drive a stout peg into the ground, and over it place the round end of the trigger just described. To set the trap, bend down the hazel stick (having tied a knot in the string, which should be previously passed through a small flat piece of wood about 2 in. long, bevelled at one end), pass the running noose under the arch; the bevelled end must be placed in the notch cut in the trigger, and the other end must rest against the arch. The noose must be made larger in circumference than the trigger, and must be spread round it. It will be seen that immediately a bird perches on the trigger he disengages the small piece of wood; the hazel stick springing up, the noose catches the bird by the neck or legs. Bait should, of course, be placed in the centre of the noose.



Immense numbers of larks are caught in horse-hair nooses, which are set in the following manner: Having found a place on the snow frequented by these birds, take about fifty yards of stout string, and stretching it to its full length, peg it down at each end, and at intervals of 18 in. attach the nooses, which should be spread out about the size of the top of a tumbler. Then place all along each side of the line a thin layer of black oats and very small seeds. The larks, attracted by the seeds, and running (for larks do not hop, as most small birds do) amongst it, are at once caught in the nooses. It is as well to be concealed near the spot, so that the birds may be taken out as soon as may be: although in doing so the birds not caught will, of course, be scared, they will soon return after the nooses are reset.

A very successful method of catching small birds is by means of the BAT-FOWLING NET, and the most vivid recollections of our Christmas holidays in years long since gone by are conjured up before us as we call to mind the piercing cold nights we have braved in following this sport. As the bat-fowling net is procurable at most of the large net and twine shops in London, it is needless to give a more minute description of it than to say that it is a small-meshed net, about 7 ft. long and 4 ft. 6 in. wide, attached to two light ash poles, the tops of which are bent and hinged together with leather, the bottom of the net being turned up about nine inches, so as to form a bag.

The method of using this net is as follows: there must be three persons engaged—one to hold the net, another to carry a lantern, and a third to "bash" or beat the bushes, ivy, corn-ricks, &c. The darkest nights should be chosen, and if a stiff breeze is blowing so much the better, for the birds then roost low and are not able to hear so well. The net should be held about a foot from the bush, &c., and the lantern so held that the light be thrown evenly all over the back of the net. The bush should then be slightly beaten, and the birds, on being disturbed, will fly against the net, which should be instantly closed and brought to the ground, and the birds secured. In working ivy or the side and eaves of a corn-rick, two persons will generally be found sufficient, as the birds may be roused from their slumbers by rubbing one of the poles of the net against it. We have known as many as eighteen or twenty sparrows, chaffinches, greenfinches, &c., taken at a single haul, and eight and nine dozen in the course of an evening.

A A A A, the net; B B, the bag; C C, two strings, which keep the poles bent in their proper position; E, the leathern hinge.

This mode of bird-catching cannot be too quietly performed, and the lantern should be covered in walking from one place to another, and, indeed, at all times when not actually in use, provided it be not too dark to see one's way. Thick bushes, such as laurel, holly, fir, &c., are the favourite resort of small birds, as also is ivy and the sides and eaves of corn and hay-stacks. In sheds thatched with straw sparrows are easily taken by throwing the light from the lantern up the corners of them, and then beating the thatch. The birds will fly to the light and gradually flutter down the wall, when they may be taken with the hand. Care should be taken never to remove the candle from the lantern, for two reasons: firstly, on account of the danger that may arise from straw, &c., being set on fire, and secondly, because the light may be extinguished by the birds fluttering against it.

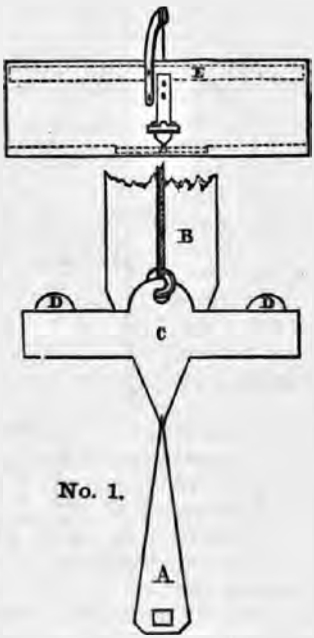
Having described what we consider to be the best kinds of traps for the taking of birds alive, we will now proceed to give directions for the construction of those which are best adapted for the destruction of vermin, and in doing so we are indebted to the kindness of Captain Darwin, the author of "The Game Preserver's Manual," by whose special permission we are enabled to give our readers the benefit of his experience. The first on the list is the "Dead Fall," which is intended for such vermin as rats, stoats, weasels, &c., and is described in his own words as follows:

"No. 1.—The body of the trap must be 3 ft. long, 11 in. high, and 4 in. wide (inside), and the wood of which the treadle is made must be of oak, the body of the trap being deal. The treadle is 1 ft. long and ⅝ in. thick. It works in the floor of the trap in an open space left for it. It must not, however, be flush with the floor, but rather below it, or the weight of the drop will most probably break the pins on which the treadle works. These latter must be of brass and about as thick as a quill. They must be driven into each side of the treadle exactly at the centre.

"The holes in the trap on which these pins work should be burnt with a red-hot round iron after boring, or the wet weather will swell the wood and make the pins bind. On one of these pins the iron point, A, must be riveted. This pin must be made with a square end where riveted, or the point A will turn round on it. When put into the treadle the point A ought to stand away from the body of the trap about one inch, and be perfectly upright.

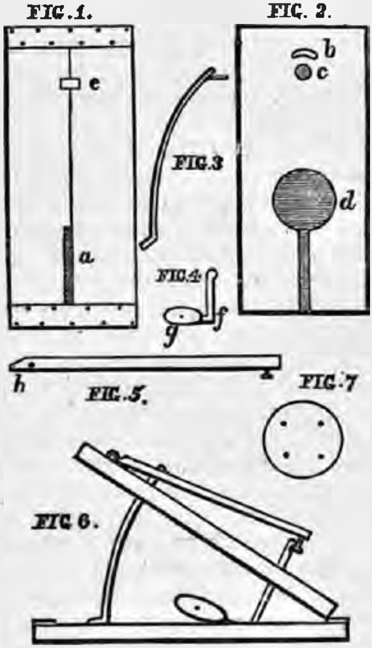
"B is a piece of bell-spring about 6 in. long (or, better still, a piece of truss-spring), and pointed at one end to meet the point A. This spring must be fastened with a couple of screws to the side of the trap directly over A, and should project so far downwards that the end of A has about $\frac{1}{8}$ in. hold on it.

"C is a piece of brass or iron plate, about $\frac{1}{16}$ in. thick, with a hole in it, to tie the string to, that suspends the weight. DD are two strong screws standing out about 2 in. When screwed in and the grooves in their heads horizontal, file away the under half of the heads as deep as the groove. A piece of $\frac{1}{2}$-in. bar iron, flat at one end to allow of two screws, must be fixed in the position shown in the full drawing of the trap.



No. 1.

No. 2.



"It must be made in an arched form at the top to stand over the centre, and a small pulley must be fixed at that end.

"The weight consists of a piece of wood, E, about 3 in. square, and 2 ft. 2 in. long. A staple is driven exactly into the centre, and a string goes from C to this staple.

"To set the trap, press down the spring B, and put it just under the point A; then pass the string over the pulley, and let C catch across the half-grooves in the two screws, D D. The weight ought to hang with its top edge about even with the top of the trap. A weasel running over the treadle at either end disengages the two points, and the spring flying up, strikes C out of the two catches, and the weight drops.

"A, B, C, and D are drawn the proper size for use. The reason why the weight is made 2 in. shorter than the trap is to allow of a peg or two being run into the ground at each end, to keep rabbits, &c. out, and if the weight were the full length, it might catch on these pegs. Rub the spring occasionally with mercurial-ointment to resist the wet, and it will last any length of time. The string, however, being liable to decay, will, of course, require to be renewed occasionally. The point of the spring when the trap has gone off need not fly up more than half an inch beyond the two screw-heads.

"This trap is better adapted for a stone wall country than for any other, though it may be placed with effect against a wall among farm buildings, and may be used also in ditches. It requires no bait; though it is as well, perhaps, to rub the floor of the trap with the entrails of a rabbit, which are an especial attraction to stoats, weasels, &c.

"No. II.—This will be found to be a most excellent trap. It should be made of the very commonest outside boards of deal, and be stained (and not painted) so that it may not be at all conspicuous.

"Fig. 1 is the floor of the trap, 22 in. long, 14 in. wide, and ¾ in. thick. It must be made in two pieces, so as to admit of the trigger being screwed on to the edge of one of the boards, which must then be nailed together with two battens 2 in. wide and ½ in. thick. A strip is cut out, 6 in. long and ½ in. wide, at *a*.

"Fig. 2 is the lid, which may be made either solid or in two pieces like Fig. 1, but 2 in. shorter; *b* is a staple to receive the end of the lever; *c* is a hole to allow the iron stanchion to pass through without grazing; *d* is a hole 3 in. in diameter, with its centre 4½ in. from the hinge end of the lid. An oblong piece is cut out from this hole to the hinge end ½ in. wide, so as to allow the neck of the trigger to work. The hinges may be made of pieces of old stirrup leather.

"Fig. 3 is an iron stanchion made of ½ in. round iron, flattened at the foot, and having two holes for screws. It must be bent to a radius of 15 in. Half an inch from the other end, it must have a pin riveted in, about the thickness of a quill, standing out at right angles, and about ¾ in. long. The stanchion is screwed on to the floor at *e*.

"Fig. 4 is the trigger and plate. From notch to *f* is 4½ in.; from *f* to *g* 3 in. The plate is a piece of round sheet iron, 3½ in. in diameter, with a hole punched in, by which it is riveted to the trigger.

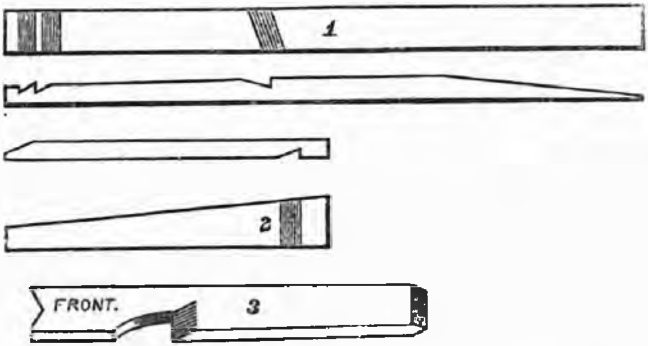
"Fig. 5 is a wooden lever, ¾ in. wide and ½ in. thick, to reach from the top of the trigger when set to the staple *b* in Fig. 2. Two inches from the end, as at *h*, is a hole for it to slip on to the pin in the top of the stanchion, and at the other end, a lath nail to catch the notch in Fig. 4.

"Fig. 6 is the trap when set.

"Fig. 7 is a round piece of sheet iron, 4 in. in diameter, with four holes punched in it to tie the bait on.

"To set this trap, put the lever on to the iron stanchion, raise the lid till the end of the lever catches under the staple, press the other end down, and let the nail catch the notch in the top of the trigger. Weight the lid with stones. Having tied the bait on Fig. 7, merely place it on the hole *d*, with the bait downwards, but not too low. The vermin reaching up to smell at it, lets the trap off by setting its feet on the trigger-plate.

"No. 3. THE FIGURE-OF-FOUR TRAP.—This is an equally good trap, and is made as follows: Fig. 1 is 13 in. long; from notch to notch 4½ in. The reason why one notch is cut rather slanting is to prevent the binding of two broad surfaces. It must be $\frac{1}{2}$ in. wide and $\frac{3}{8}$ in. thick. The notches need only be about $\frac{1}{16}$ in. deep.



"Fig. 2 is $6\frac{1}{2}$ in. long, 1 in. wide at the notch end, and $\frac{3}{4}$ in. at the other, and $\frac{3}{8}$ in. thick. The notch must be from 1 in. to $\frac{1}{2}$ in. distant from the end, according to the weight of the stone. If a heavy stone, you must have a short notch, and *vice versâ.*

"To cut the slant off the proper side, you must hold the piece of wood resting on its point and the notch underneath, then cut the slant from the *right side.*

"Fig. 3 is 7 in. long (calculating 3 in. from foot to notch, and 4 in. from notch to the other end), 1 in. wide, and $\frac{1}{4}$ in. thick. The notch itself is $\frac{1}{2}$ in. deep. To cut this piece of wood properly, hold it *on its edge* with the fork end from you, and the notch uppermost; then cut the slant (to bring the notch to a sharp edge) from *the right.* The long slant may begin at $\frac{1}{4}$ in. from the foot.

"It will be apparent that if these various parts of the 'Figure-of-four' are not cut as directed, they will not come properly together. The forked end of Fig. 3 is to prevent its being turned round when the trap is set.

"To complete this trap, you require a flat stone or slate about 18 inches square, or a board or boards will, of course, answer the purpose; and having placed a small bit of flat stone under or about the place where the outside edge of the slate will rest, you must put the piece of wood (Fig. 3) with the forked end resting on this small piece of stone, which latter is meant to prevent the weight of the slate forcing the trap into the ground. Be sure to keep the proper side to the front as marked in the drawing; then put the notch in Fig. 2 on the top of Fig. 3, with the end beyond the notch only put under the edge of the slate when propped up on it. Now put the point of Fig. 2 into one of the notches of Fig. 1, and bring up the other slanting notch in Fig. 1 till it holds against the sharp notch in Fig. 3, and the trap is set.

"The bait should be tied on to the end of Fig. 1, but you must be careful not to bait with anything very hard, such as the head of a young rabbit, or it will keep the slate from hurting any weasel that lets it off.

"With the ordinary make of this trap, it was very common to find the stretcher (Fig. 1) slipped down till it rested on the ground, or the upright (Fig. 3) twisted round and out of harm if the trap had gone off. With the plan adopted here, it is next to an impossibility that either can happen, as the stretcher *must* fall clear on being touched never so lightly; the notch being placed in an entirely different position to that in the old-fashioned plan.

"Be careful that the ground close in front of the trap is a trifle lower than that occupied by the trap itself, or the stretcher will be broken when the slate falls."

The old-fashioned steel trap no doubt stands prominent for the trapping of all vermin, and needs no description; but though excellent as it undoubtedly is, it requires more skill in its use than is likely to be acquired by our young readers. By this remark, the actual setting of the trap is not meant, but the situation, the times, &c.

Before dismissing this subject we must repeat what we said at the opening, viz., that the method of making the various traps is perhaps the least important part of the business. Trapping—*i.e.*, *successful* trapping—is only to be acquired by an intimate acquaintance with the habits of the different animals, their haunts, &c., which cannot be learned but by long experience; and although this, by some people, may be considered a branch of knowledge only worthy of a gamekeeper, we can assure our readers that there is an immense amount of amusement to be derived from it; and we feel assured that they will be amply repaid for their trouble, and will never regret the loss of such of their leisure time as they will have devoted to it.

Sports.

FISHING.

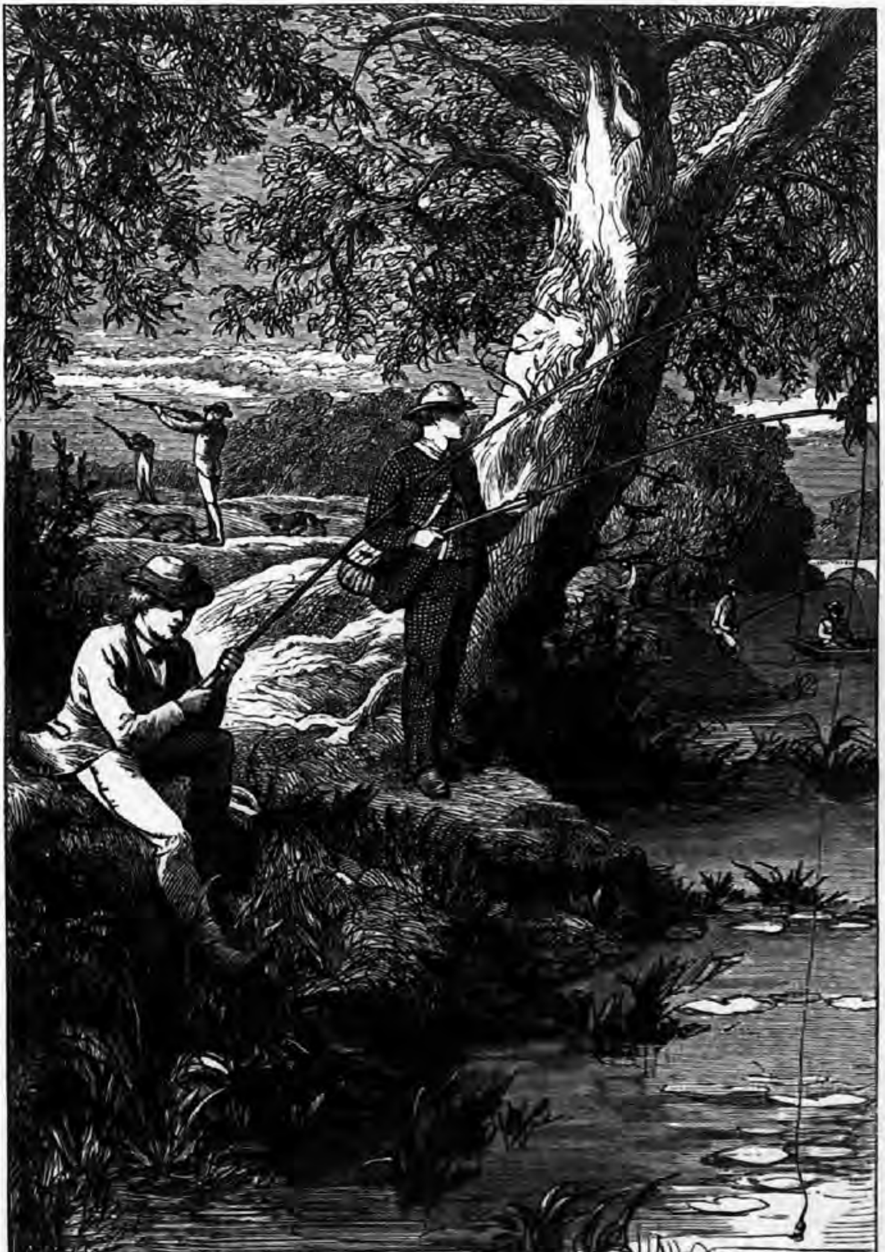
The "gentle art" has been a great favourite, with our countrymen especially, from time immemorial, and among all classes of the community, from the peasant to the peer.

Of all branches of the art of which we are about to treat there is not the remotest doubt that the plan of taking the denizens of the waters with the artificial fly is the most difficult, the most skilful, and at the same time the most enjoyable method. To become really an adept at the art requires the practice and experience of a lifetime; and although proficiency may without doubt be attained without opening a book on the subject, yet, on the other hand, many useful hints may be given and many suggestions made which may materially assist the beginner; and as example, as in most things, is generally more valuable and useful than precept, it is especially so in this, and an hour or two's careful attention to the instructions of a good fisherman will do more than days of study, if those instructions be practically given at the river-side.

As we must all learn to walk before we can expect to run, we think it advisable to defer further allusion to the art of fly-fishing until we have given some little instruction in that of the more common method of angling called "bottom fishing," and to this we shall now beg our young readers' attention. It consists, as its name implies, in taking fish under or at the bottom of the water with a baited hook; and although it bears no comparison with the art of fly-fishing, yet it requires no little skill, practice, perseverance, and patience in order to become a really good hand.

We will now proceed to give our young friends a list of a few necessary articles, in order to enable them to commence their sport, and then, as we proceed, point out in as clear a mànner as possible what we consider the best methods of taking the different kinds of fish which may be found in most of our English rivers, and as we proceed in the different modes of fishing, also point out what further articles are requisite.

There are various methods in use among anglers of joining lines, gut, &c., together. The common kind of knot known as the *Fisherman's Knot* is the most generally in use (Fig. 1). When the two ends are drawn tight, it is perfectly secure though easily undone, and this is its greatest recommendation. It may be nicely bound with waxed silk, and if the meshes are left about one-eighth or one-sixteenth of an inch apart, in case of a sudden strain by a heavy fish, the silk between the meshes acts as a kind of buffer, and the line, therefore, is less likely to break. The *Sailor's Knot* (Fig. 2) is also very useful, though perhaps not quite so neat as the other. It is made in this way: Cross the two ends between the left forefinger and thumb, the end pointing to the left lying at the top of the other; it must be then bent backwards to the other end towards the body, until both ends meet in opposite directions underneath. The *Weaver's Knot* (Fig. 3) is a more secure knot than the above, though



SPORTS.

not so neat. It is made in this way: The ends must be crossed between the thumb and forefinger of the left hand, but the end pointing to the right must lie at the top in this case; the piece belonging to the opposite end is then carried over the thumb at the back of the left end, and brought between the two ends until it can be held between the finger and thumb; the right end is pushed through the loop, and the knot stands as shown in the engraving.

Fig. 1.

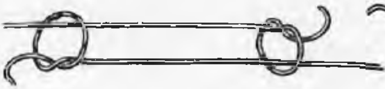
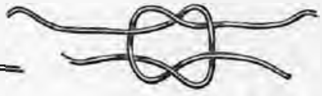


Fig. 2.



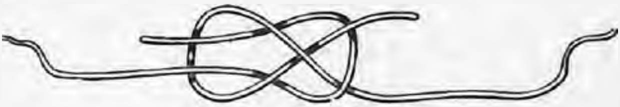


Fig. 3.

A good Rod for bottom fishing, not less than 14 feet long, having one or two extra tops.

A plaited Silk Running-Line about 40 yards long.

Three or four twisted Hair and Gut Lines, about 4 yards long, to attach to the running-line.

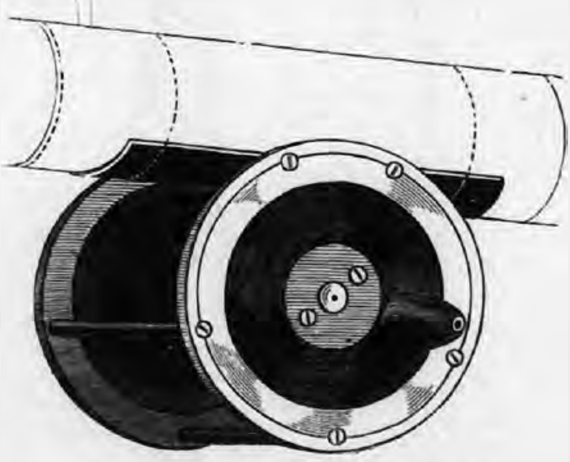
Hooks of various sizes, up to No. 12, tied on the best gut.

A quantity of Split Shot, of various sizes, for sinking the bait.

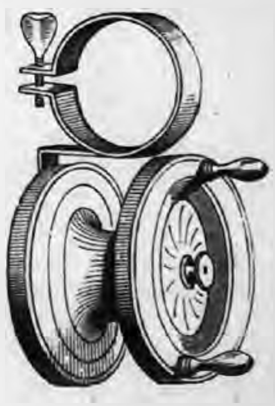
A pair of small Pliers for putting on the shot.

Some extra Caps, made of quill, for fastening the float to the line.

A piece of India-rubber (which never be without), the use of which will be described hereafter.



Modern Reel.



Nottingham Reel.

The Reel or Winch is an indispensable article for an angler: it should

not so neat. It is made in this way: The ends must be crossed between the thumb and forefinger of the left hand, but the end pointing to the right must lie at the top in this case; the piece belonging to the opposite end is then carried over the thumb at the back of the left end, and brought between the two ends until it can be held between the finger and thumb; the right end is pushed through the loop, and the knot stands as shown in the engraving.

FIG. 1. FIG. 2.

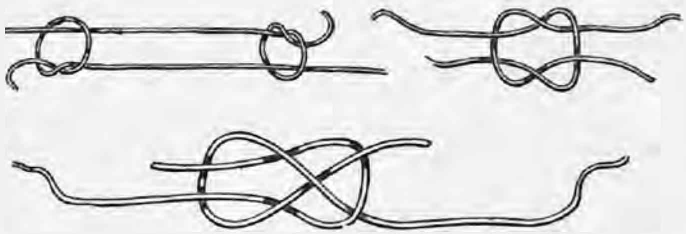


FIG. 3.

A good ROD for bottom fishing, not less than 14 feet long, having one or two extra tops.

A plaited SILK RUNNING-LINE about 40 yards long.

Three or four twisted HAIR and GUT LINES, about 4 yards long, to attach to the running-line.

HOOKS of various sizes, up to No. 12, tied on the best gut.

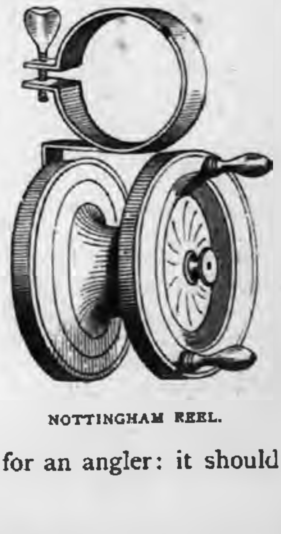
A quantity of SPLIT SHOT, of various sizes, for sinking the bait.

A pair of small PLIERS for putting on the shot.

Some extra CAPS, made of quill, for fastening the float to the line.

A piece of INDIA-RUBBER (which never be without), the use of which will be described hereafter.

MODERN REEL.



NOTTINGHAM REEL.

The REEL or WINCH is an indispensable article for an angler: it should be light, strong, and plain. By some anglers the multiplying winch is considered the best; it may be so in theory, but practically it is worthless. It certainly enables the angler to draw out his line quicker, and also to "reel up" in less time; but with a heavy fish at the end of the line it is next to impossible to do so. The best winch, be assured, is that of a large diameter, but having its plates not more than 1½ inches apart, and, instead of a crank, having a friction-plate with a handle at its extreme edge, as shown in the engraving.

For pike and perch fishing perhaps the Nottingham reel is as good as any, the reel itself being turned out of one solid piece of hard wood.

Three or four CORK and QUILL FLOATS, of various sizes, which may be purchased at the tackle shops. The small cork floats are the best for jack, perch, and chub fishing; but for carp, roach, dace, gudgeon fishing, &c., the quill floats (numbered 4 and 5 in the engraving) or the small cork float (numbered 6) will be found the most useful.




FIG. 4. FIG. 5. FIG. 6. FIG. 7.

FIG. 9.

FIG. 10.

The PLUMMET is another most useful and almost indispensable article. It is used to ascertain the depth of the water when bottom fishing. There are two kinds in ordinary use, perhaps equally good; but the folding plummet (Fig. 9) is perhaps the most simple, as it is only necessary to unfold a small portion of it, insert the line, and fold it up again. In the other, the hook is passed through the brass ring at the top (A, Fig. 9), and its point stuck into the piece of cork which is inserted into the bottom of the plummet at B.

The PANNIER or CREEL (Fig. 10) is made of wickerwork, and may be had of all sizes at the tackle shops; the French, perhaps, being the best, as they are so much better shaped, and are much lighter. The engraving, however, is of one of the ordinary kind made in this country. If fitted with a staple top and brass plate, so as to admit of a small padlock being used, they are handy things to put odds and ends in, such as fishing-book, reel, floats, &c. Some anglers prefer a bag or havresack made of waterproof cloth (Fig. 11). It is certainly a most useful article. It should be about 20 or 21 in. long and 12 in. deep, fitted with a flap and two buttons (as shown in Fig. 11.) It is a good plan to have a division or second bag in the inside, as so many requisites may be carried in it, even to a change of linen on an emergency. It should be fitted with rings or buckles, so that the shoulder-straps may be taken on or off at pleasure.

Fig. 10.

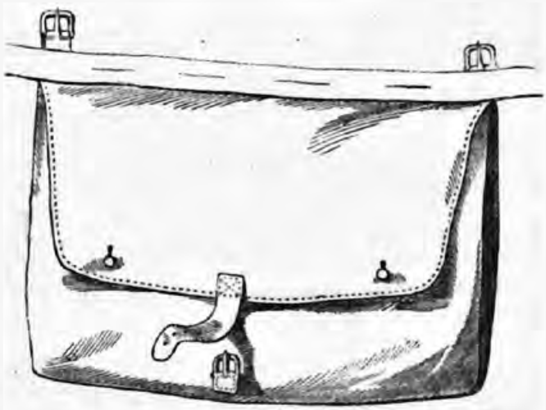


Fig. 11.

The Drag-hook (Fig. 12) is sometimes used (but it is an awkward instrument) for clearing the line from weeds, boughs of trees, &c. The Clearing-ring (Fig. 13) is much handier, and for that reason is more generally adopted. A piece of cord is fastened to the upper end; it is then slipped over the line, which guides it to the obstruction; and by pulling the cord, the hook, line, &c., may be dislodged.

Fig. 12.

Fig. 13.

The DISGORGER (Fig. 14) is another useful article, its object being to dislodge a hook from a fish's mouth: it may be made of metal or ivory. The forked end is placed against the bend of the hook, and then pressed until the hook is released from its hold.

The GAFF is simply a large fish-hook made to fit into the handle of your landing-net, or, if preferred, having a handle for itself. Its use is to land a large fish by simply plunging it into the fish and dragging him bodily ashore.

FIG. 14.

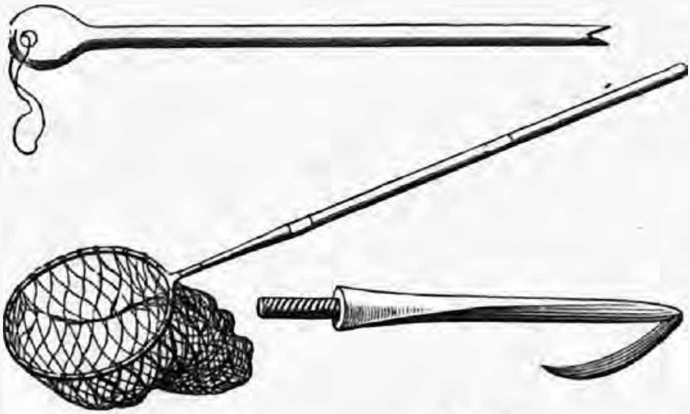


FIG. 15. FIG. 16.

The LANDING-NET (Fig. 15) must be included in the list of an angler's necessaries. The ring should be made of jointed brass, as it is then more easily packed. A FLY-RETRIEVER (Fig. 16) should be fitted to the handle. This instrument is made sharp on the inner edge, in order to cut twigs, weeds, &c., in which your hooks may get entangled. The net itself should be made in small meshes, sufficiently so to enable you to catch minnows with it, and it thus serves a double purpose.

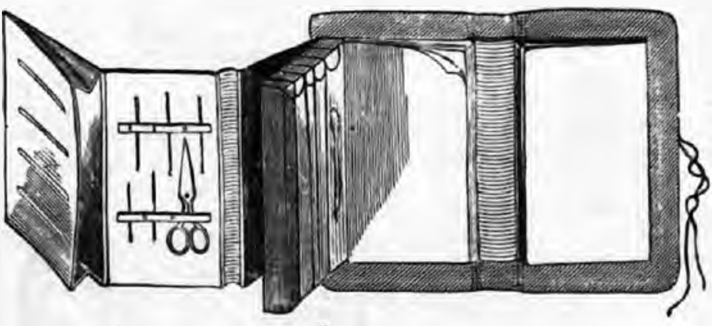


FIG. 17.

The ANGLER'S POCKET-BOOK (Fig. 17) contains various small articles which are in constant use, such as pliers, scissors, knife, floats, wax, gut, hair, thread, string, spare hooks, traces, &c. There are various patterns which may be had in all sizes at the tackle shops.

The MINNOW or LIVE-BAIT KETTLE (Fig. 18) should be of tin, and fitted with straps to go over the shoulder. It should have a second lid, and a small

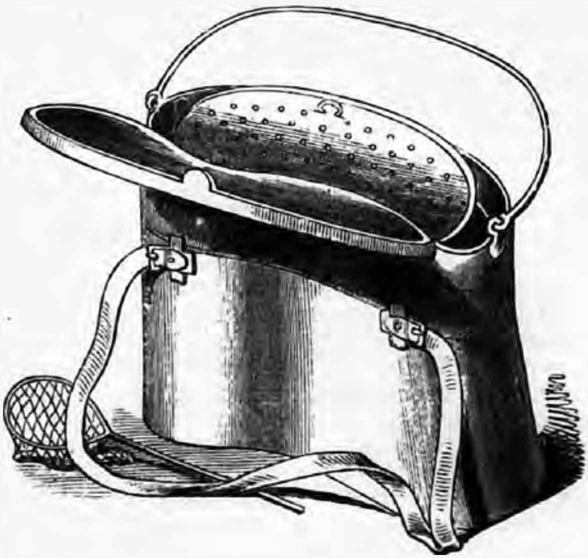


FIG. 18.

hand-net should be used to take out the bait, as nothing is so injurious to them as putting a warm hand amongst them. This, too, may be purchased of any size at the tackle shops.

A tin BAIT-BOX for gentles, worms, &c.

ON RODS, LINES, &c.

No workman, you are aware, can work well without good tools, no matter what his trade may be; and on the same principle good tackle is essential to good sport in fishing. In choosing a rod, see that it is perfectly straight when all the joints are put together, and that it is not too pliable, or many a good fish may be lost in striking; let it also be perfectly taper from the butt to the point.

The running-line should be of plaited silk, and in choosing one, see that it is perfectly round and even, which may be proved by passing it between the finger and thumb, allowing the thumb-nail to rest on its surface; and discard any line which has any uneven places or bumps in it, as it is apt, if it have them, to catch in the rings on the rod, and may cost you the loss of a fish and perhaps of the line itself and the point of your rod.

In choosing gut, see that it is perfectly round, of an equal thickness, transparent, and smooth. If tried with the teeth, it should feel almost like wire.

The kind of hook we prefer is certainly the Kirby for general fishing.

We will now suppose that one of our young friends has arrived at the river-side and is about to commence a day's sport. First let him fasten his reel to the butt of his rod, and draw the line through the two rings fixed upon it; then attach the second joint, and draw the line through the rings in the same manner, and so on to the top joint. This is a far better plan than the ordinary way generally adopted of putting the rod together first and drawing the line through the rings afterwards, as the rod is so very apt to be strained. A few yards of the running-line must then be drawn from the reel, and put carefully through the rings until about 2 feet of it are through the ring at the extreme point of the rod, taking care that in passing it through the rings the line has not been twisted round the rod, which would, of course, prevent its running freely. The gut or hair line must then be fastened to the running-line, which should have a loop for the purpose. When this is done, the float should be attached by first passing the line through the cap of the float and then through the ring at the bottom of it, so that when the float is moved up the line to give the depth required, the cap may be placed over the top of the float, and it of course remains fixed in that position; the gut length, with sufficient shot to sink the bait and cause the float to stand in the water in an upright position, must then be attached to the end of the line. We may here remark that it is a good plan to test the floats as to the number of shot they require at home in a tub of water, or in a pond should one be at hand, so that this may not have to be done at the river-side before commencing fishing; and it is as well to mark each float with the number of shot it requires to keep it in its right position. The next step is to plumb the depth accurately by fastening the plummet to the hook and letting it sink in the water as gently as possible, avoiding letting it fall suddenly and splashing. If the float has been placed too high upon the line, as soon as the plummet has reached the bottom the float will fall on its side and remain on the water; if, on the contrary, it has been placed too low on the line, the plummet will, of course, sink it beneath the surface, so that in either case it can be easily regulated. If the line be allowed to remain with the plummet attached a few minutes in the water before the hook is baited it is all the better, as it then becomes soft and straight, instead of being in coils.

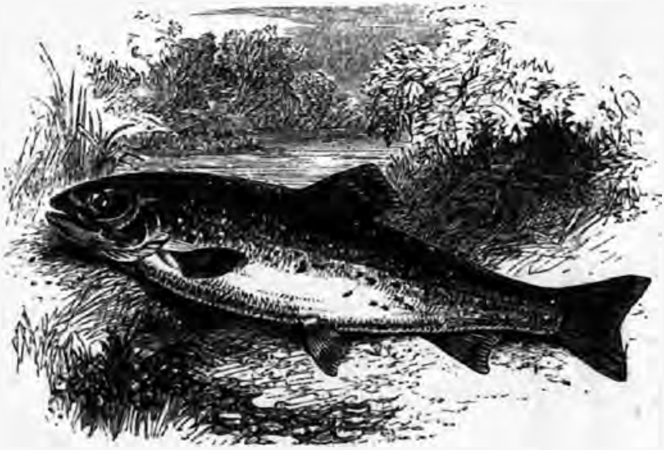
The foregoing remarks apply to fishing for every kind of fish, and we now propose to offer a few hints as regards each sort of fish, with its description, haunts, season, &c., and the most approved methods of taking it, in, we hope, such a clear and concise manner as cannot fail to be perfectly understood by our young friends.

We do not propose to give any directions about the salmon, as that noble fish is an inhabitant of comparatively few of our rivers, and requires far more skill and knowledge of the art of angling than our young friends could hope to aspire to. We shall, therefore, commence with a fish which is almost as much sought after, and for its size is quite as "game," and affords as much sport as its larger neighbour—we allude to

The Trout.

This is one of the most beautiful of fresh-water fish, and is most justly esteemed for the table when in season. The whole of the lower part of the body is of a silvery brightness, gradually assuming a dark greenish-brown colour on the sides and back, and covered with bright pink spots irregularly scattered over its whole length. The trout sometimes reaches the weight of

10 lbs. or 11 lbs.; but they are only to be found of this size in such rivers as the Thames, and even there only occasionally; a trout, however, of ¾ lb. will afford most excellent sport, as he is a very strong fish, and when hooked struggles most desperately, darting in every direction, and often jumping a long way out of the water, and trying every means of disengaging himself from the hook. It is at this time that the greatest skill and coolness is required; for if too sudden a check is put upon his exertions, he will assuredly break away; and if the line is allowed to be too slack, there is every chance of the hook drawing from its hold. If any of our young friends should be fortunate enough to hook a fine trout, he must not be disheartened if he should



lose his fish from either of the above causes, if not from the breaking of his line and the loss of his rod as well, for these are occurrences which frequently happen to expert fishermen, and must therefore be expected to happen to the novice. Patience and a determination to bear up against and conquer difficulties in fishing, as in every undertaking in life, is the only certain method of commanding success.

Although it is in but very few rivers that bottom fishing (excepting with the natural or artificial minnow, which will be hereafter described) for trout is allowed, yet we think we ought to describe it, in case any of our readers may happen to be near a river which is not preserved, and in which some trout may be found.

Use a long, strong rod, with winch and running-tackle, without a float, and a No. 7 hook tied on the best gut, shotted about 8 inches above it, and bait with a well-scoured middling-sized lob-worm, and cast in the bait up-stream, and allow it to carry the bait down, tripping on the bottom. It is advisable to keep as far from the water as possible, to avoid being seen by the fish, for trout—the large ones especially—are very shy.

One of the most successful ways of angling for trout, and more particularly for the large ones, is by spinning with a minnow; and perhaps a great deal of time and trouble may be spared by using artificial ones, which are now made so exactly like the natural fish as to be scarcely distinguishable from it; and as a trout will not notice a bait if at all mutilated or disfigured, we are inclined

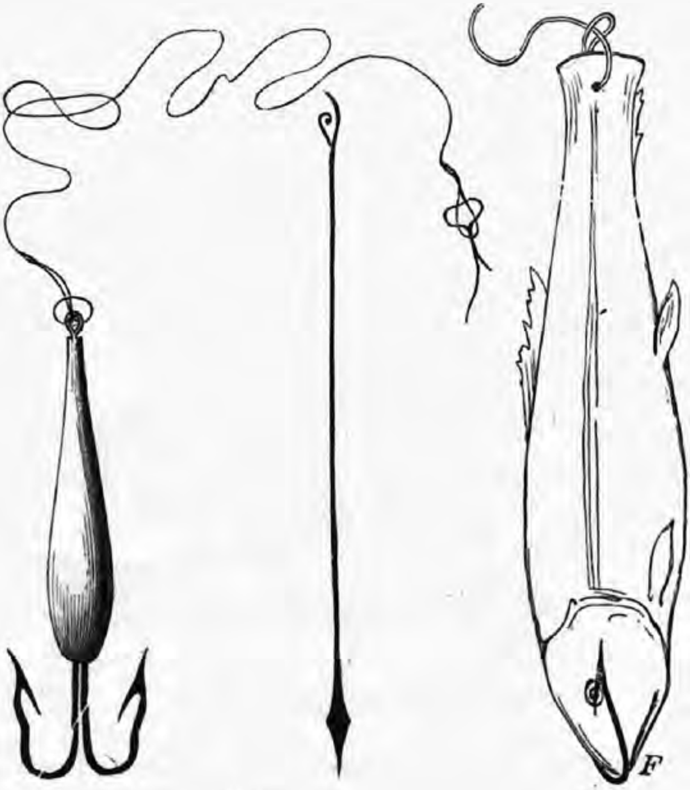


FIG. 19. FIG. 20.

to recommend the artificial bait for this mode of fishing. The bait should be cast across the stream, and drawn by gentle jerks against it, so as to cause it

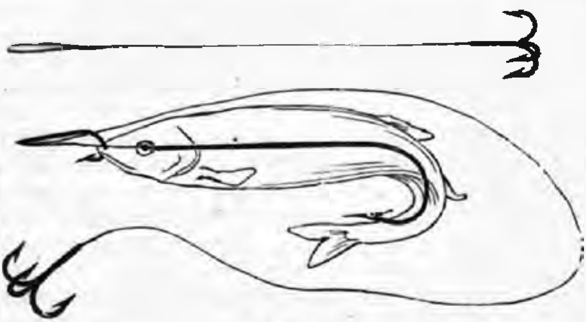


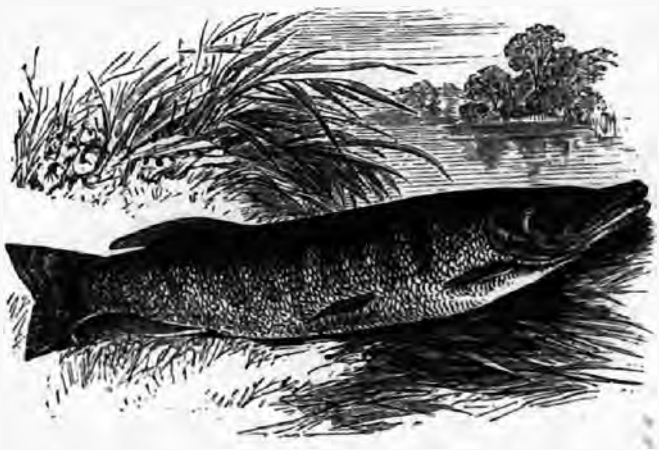
FIG. 21.

to spin in its passage through the water. These baits are so well provided with hooks that the instant a trout seizes it he cannot avoid being hooked, and as the tackle is strong, with ordinary care he may be easily taken.

The mode of baiting with a natural minnow is shown in the accompanying cut. (Fig. 21.)

In the far North minnows are captured by the following ingenious contrivance: A clean glass bottle is obtained, of the shape shown in Fig. 22. A fine meshed net is tied over the mouth, *A*, and a few crumbs of bread are placed inside. It is then placed with its mouth to the current, in a stream frequented by minnows; the water agitates the crumbs; the little gentry assemble to see the fun, and quickly find their way through the aperture *B* into the bottle, where they are joined by their companions by the dozen. This bottle is invaluable, though awkward to carry about.

FIG. 22.



THE JACK OR PIKE

is one of our most well-known fish, and so remarkable for its voracity as to have acquired the title of the "fresh-water shark." He affords some of the best sport obtainable by the British angler, as he grows to a large size and fights desperately when hooked. One great advantage in pike fishing is that it may be pursued in winter, the best season being from September to February, at which latter time they get so full of spawn that a true sportsman will let them alone. They may be caught in several ways.

1. With a live bait and float.
2. By the gorge-hook.
3. By spinning (natural and artificial bait).
4. By the artificial fly.

For each of these methods special merit is claimed. Live-bait fishing is certainly less trouble than the others, and in the *early* part of the season (from

June to September) a small live gudgeon on fine tackle will certainly succeed better than any other bait, however used. It may, perhaps, be objected that it is rather cruel to the bait. In fishing for jack with a live bait, use a rod about 12 feet long, which must be very strong—as you will have to strike hard —with large rings, *fixed upright*, about 40 or 50 yards of prepared silk line, a tolerable-sized float (we prefer an ordinary wine-bottle cork), and a gimp trace and swivel, as shown attached to the hook in the cut (Fig. 23).

The set of hooks shown in the cut is a favourite with many anglers.

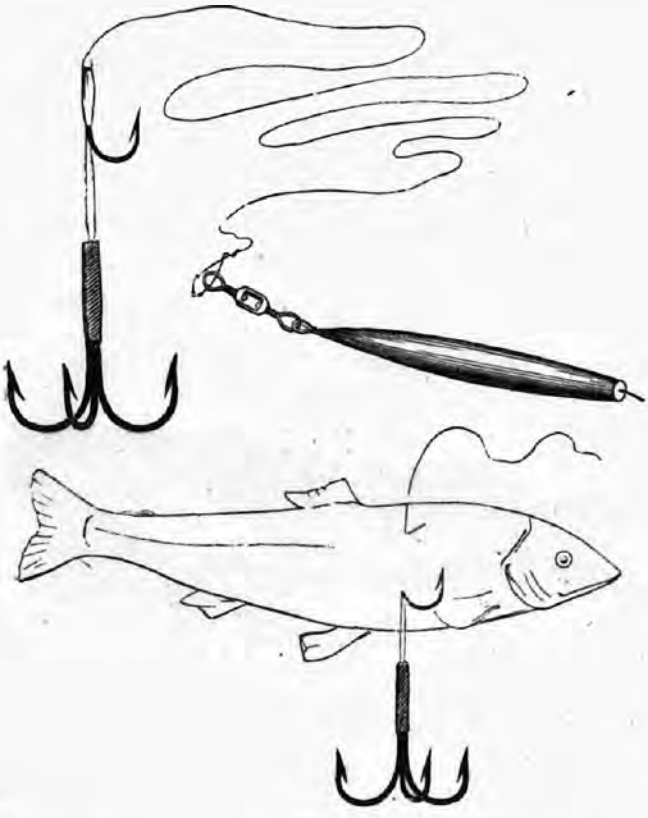


Fig. 23.

In using it, take a baiting-needle, fasten the hook at the end of it to the loop of your hook-trace, and pass the gimp, with one or two stitches, under the skin of your bait, so as to bring the small hook up in the manner shown in the cut. Let your bait swim near weeds, sluices, roots of trees, &c., at a depth of between two and three feet near the bank in rivers, and some distance out in ponds. When you have a run, your float will suddenly go down. Let the fish run a yard or two, and then strike pretty hard. When he is hooked, keep a tight hold of him, and don't let him get into mischief, giving no more time than absolutely necessary. In landing a pike a gaff is the best assistant, and you must keep a sharp look-out for certain very sharp teeth which he possesses. The best form of gaff is described at page 472. It should be screwed into a strong wooden handle.

Under the head of "Live-bait Fishing" we might, perhaps, include the utterly unsportsmanlike practice of "trimmers," which are usually flat pieces of cork, about 4 inches in diameter, having a groove round their edge, and a piece of wood fixed through their centre having a slit at its lower end. The line is firmly attached to the trimmer, about 5 or 6 yards of it is wound round the cork, and a portion of it (according to the depth of water), with a live bait attached, is left loose, being first made fast in the slit at the lower end. The line is then placed and left in the water. As soon as a pike seizes the bait, the line slips out of the slit and allows him to run until he hooks himself; the trimmer keeps, of course, at the top of the water, and shows where the fish is. This method is generally adopted in large lakes, reservoirs, &c., to take pike by night

Another common and at the same time a most successful method of landing pike with live bait is by simply using a large hook, and hooking the bait through the lip or under the back fin.

And now for the gorge-hook. This method, though not so much in vogue as formerly, still enjoys a great measure of popularity. The cuts will, we think,

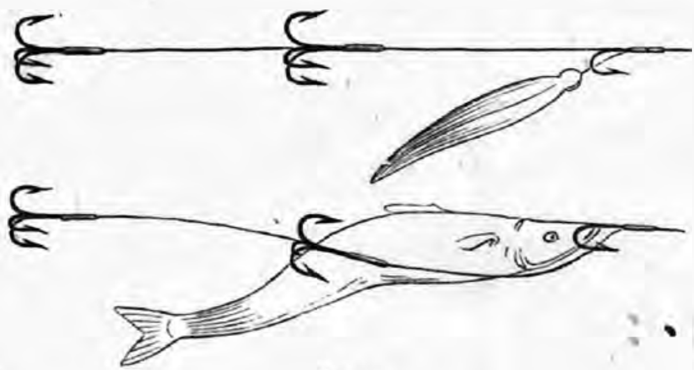


FIG. 24.

sufficiently explain the method of baiting it. As for bait, a nice fresh gudgeon, from 4 to 5½ inches long, is best in summer and up to November, after which, and at times when the water is a little coloured by rain, a good-sized roach or dace is preferable. In fishing with the gorge-hook, try every inch of the water you are fishing if possible: you may often have a run where you least expect it. Cast your bait close to the side of the water at first, and let it drop in quietly head foremost between weeds, &c.; then cast a little farther out, and so on, till you have thrown to the full extent of your power, when, if you have not had a run, you may give up, and conclude that there are either no fish or that they won't feed. When you have thrown in your bait, which should be done with as little *splash* as possible, let it sink nearly to the bottom, and keep drawing it up by gentle snatches to the right and left alternately, and again

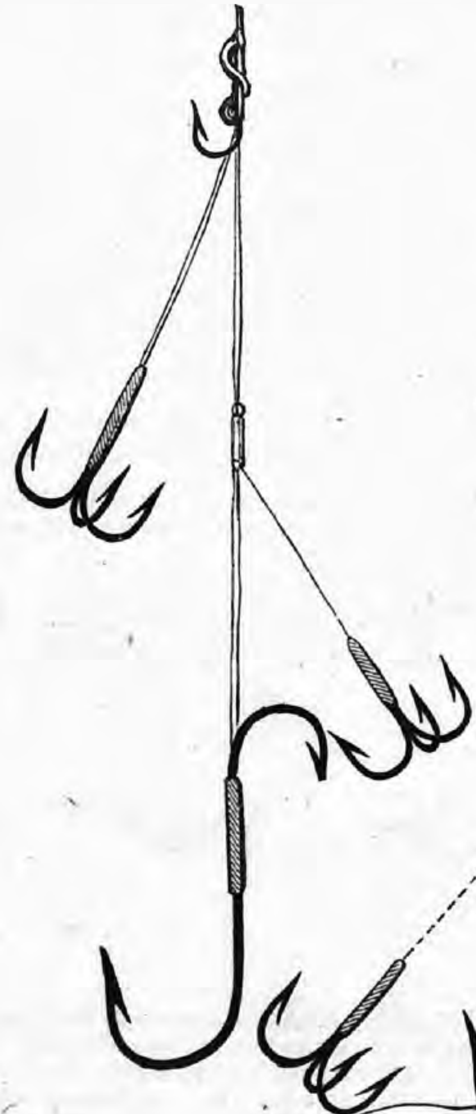
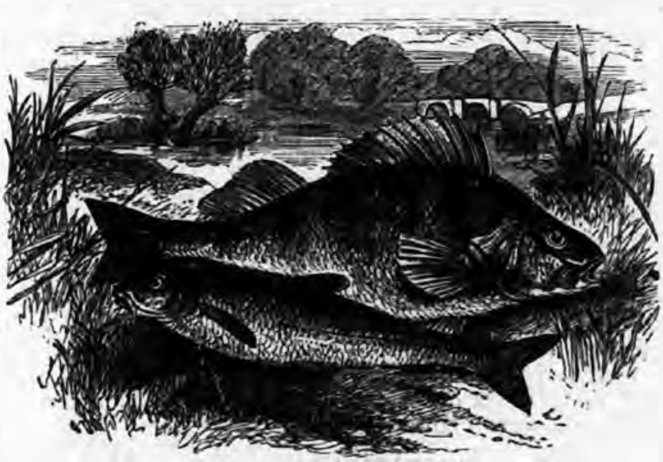


FIG. 25.

FIG. 26.

letting it sink until you bring it close to you. Do not be in too great a hurry to withdraw it from the water altogether, as jack will frequently follow the bait, and only take it at the last moment, when they think it is about to escape. On perceiving a run (which you will have no difficulty in feeling, as the jack takes a good pull at your line), let him go without check until he stops, and give him ten minutes by your watch (unless he move off again before the expiration of that time), at the end of which strike smartly, and play your fish carefully and steadily.

The most fashionable and pleasant method of taking jack is by "spinning." The cut represents the best kind of spinning tackle known, and the mode of baiting it. This should be attached to a trace of gimp with several swivels and a lead, which may be procured at any tackle shop ready made up. In casting with the spinning or trolling bait, draw a sufficient quantity of your line from your reel, and, holding the line in your left hand, draw it up till the bait is within a foot or two of the top ring; then, with a good swing (and a little practice), you will find you will be able to cast the bait to any reasonable distance in the direction desired. When spinning, you must not allow your bait to sink so far as in trolling, and must keep constantly pulling it towards you, as, if not drawn forwards against the water, it will lose its chief attraction, the revolving motion. When you feel or see a bite, let the fish turn with the bait, or you may draw it from his jaws, and then strike firmly. Spinning is preferable to trolling in winter when the weeds are gone, but in waters full of weeds, stumps, &c., you will lose your tackle so often that the latter is preferable on the score of economy, not to mention the benefit of one's temper. Pike fishing with the artificial fly (a gigantic absurdity sold at most tackle shops) will pay well in some lakes and *clear* ponds. We next come to



PERCH AND GUDGEON.

THE PERCH.

The perch, beyond every fish which the fresh waters produce, affords by far the most sport to the young angler. It is to be found in nearly every river in England, and is a bold and ravenous fish. The small ones generally take a bait directly it is offered, and we have several times known a whole shoal of these fish, varying in weight from 2 oz. or 3 oz. up to ½ lb., taken one after

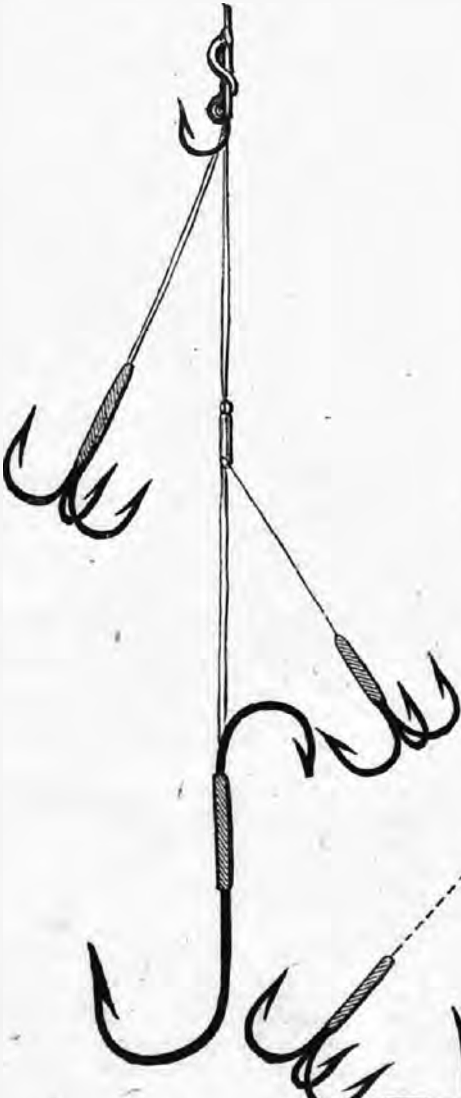


Fig. 25.

Fig. 26.

letting it sink until you bring it close to you. Do not be in too great a hurry to withdraw it from the water altogether, as jack will frequently follow the bait, and only take it at the last moment, when they think it is about to escape. On perceiving a run (which you will have no difficulty in feeling, as the jack takes a good pull at your line), let him go without check until he stops, and give him ten minutes by your watch (unless he move off again before the expiration of that time), at the end of which strike smartly, and play your fish carefully and steadily.

The most fashionable and pleasant method of taking jack is by "spinning."

The cut represents the best kind of spinning tackle known, and the mode of baiting it. This should be attached to a trace of gimp with several swivels and a lead, which may be procured at any tackle shop ready made up. In casting with the spinning or trolling bait, draw a sufficient quantity of your line from your reel, and, holding the line in your left hand, draw it up till the bait is within a foot or two of the top ring; then, with a good swing (and a little practice), you will find you will be able to cast the bait to any reasonable distance in the direction desired. When spinning, you must not allow your bait to sink so far as in trolling, and must keep constantly pulling it towards you, as, if not drawn forwards against the water, it will lose its chief attraction, the revolving motion. When you feel or see a bite, let the fish turn with the bait, or you may draw it from his jaws, and then strike firmly. Spinning is preferable to trolling in winter when the weeds are gone, but in waters full of weeds, stumps, &c., you will lose your tackle so often that the latter is preferable on the score of economy, not to mention the benefit of one's temper. Pike fishing with the artificial fly (a gigantic absurdity sold at most tackle shops) will pay well in some lakes and *clear* ponds. We next come to

PERCH AND GUDGEON.

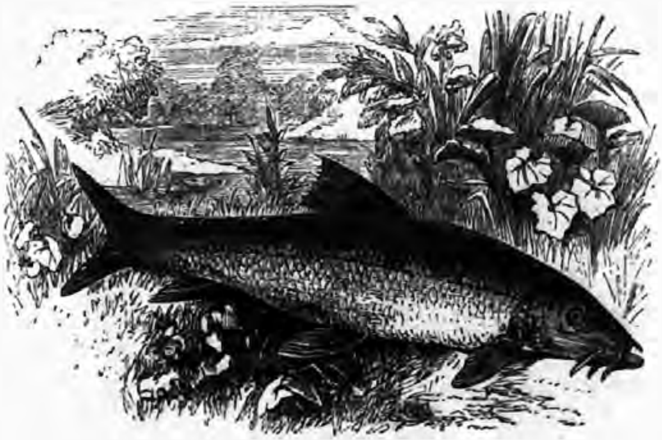
THE PERCH.

The perch, beyond every fish which the fresh waters produce, affords by far the most sport to the young angler. It is to be found in nearly every river in England, and is a bold and ravenous fish. The small ones generally take a bait directly it is offered, and we have several times known a whole shoal of these fish, varying in weight from 2 oz. or 3 oz. up to ½ lb., taken one after the other as fast as the bait was lowered into the water. The large ones afford excellent sport, as from their great strength they are enabled to offer much resistance, and they struggle most violently. The best way of angling for them is with the same kind of rod as that recommended for trout, running-line, cork float, and No. 7 hook, and bait with a well-scoured brandling, red or marsh-worm. The perch generally takes the bait with a sudden jerk, and the float therefore disappears at once. Let him run a yard or two, and then strike smartly, and if a heavy fish, give him line, but keep a sufficiently tight hand upon him to prevent his rushing into weeds, among roots, or round posts, &c.; and as, if you catch one perch, you may generally reckon upon several more being in the same spot, keep as far from the water as you can, and if the fish are not scared, it is more than likely that you may take the whole shoal.

Another very killing method of angling for perch in deep water is with the "paternoster," which is fitted up in the following manner: Make a line of about 9 feet long of the best twisted gut, and to the bottom of it attach a No. 6 hook; about 18 inches above this fix a good-sized shot on the line. Then procure a leaden pellet, about $\frac{1}{2}$ an inch long and $\frac{1}{8}$ inch in diameter, having a small groove all round the middle of it and a hole bored lengthwise completely through it. Pass your line through it until the pellet reaches the shot on the line, on which, of course, it will rest, and above it fix another shot, but not too close to it, or the pellet will not revolve on the line, which it ought to do. In the groove round the pellet whip a bristle about 4 or 5 inches long, having previously tied on a No. 6 hook at the other end. We prefer bristle to gut, as it retains its stiffness in the water, and keeps the bait away from the line. About 18 inches above this place another pellet and hook in exactly the same manner, and a third may be used in a precisely similar way, should the water you fish in be sufficiently deep to admit of it. A good-sized cork float should be used, and your bait should be minnows hooked by the lips. Keep as quiet and still as you can, and let your baited line sink gently into any deep water you can find, which is usually at the bends of rivers, mill-heads, locks, &c. When you perceive a bite, let your fish have the bait a minute or two before you check him, as before recommended, and then strike sharply but not violently, and if you find you have hooked a heavy fish, give him line, and tow him, if you can, out of the hole or deep water, that he may be less likely to alarm other fish; and having played him till he is quite exhausted, you may safely make use of your landing-net. It frequently happens with perch, as with other fish, that though apparently quite dead, the sight of the landing-net serves to put new life into them, and just as you think your prize perfectly safe, they will make a last desperate struggle to disengage themselves from the hook. When about to land a fish, therefore, be at all times prepared for this by never holding your rod in such a position as that the line will not run freely, for, if otherwise, a heavy fish will most assuredly break away.

When fishing with a worm, it is advisable to keep the bait occasionally in motion, by moving it to the right and left now and then, drawing it up a few inches and letting it sink, as when fish are not "strong on the feed," they may frequently be tempted to take a bait which, if perfectly still, they would probably not notice.

Perch are usually to be be met with in sluggish rivers and in the deep holes about bridges and piles; but if the river be at all rapid, choose the stillest and deepest parts: they are rarely found in shallow or "sharp" water.



THE BARBEL.

This fish, which abounds in the rivers Thames and Lea, and in most of our large tidal rivers, though but of little use for the table, affords good sport from the fact of its readily taking a bait, and, being very strong if of any size, struggling most violently when hooked. Barbel are seldom fished for from the bank, the usual mode of fishing for them being from a punt. The barbel bites very sharply and draws the float down very suddenly, and therefore, contrary to the directions given for perch fishing, you should strike the moment you perceive a bite, and if you find you have hooked your fish, raise the top of your rod, and allow him to run some yards before you attempt to check or turn him; then, by putting a gentle strain upon him, keep him away from any obstacles that may be in the way, such as roots of trees, weeds, piles, &c., and keep him in deep water. Play him till quite spent before you attempt to land him; and, if you are careful, there is little fear of your losing your fish, for the mouth of the barbel is more like leather than flesh, and if a hook is once firmly fixed in it, it will never draw.

Having chosen the spot you mean to fish in overnight, your sport will be much increased by using a liberal supply of ground-bait, for which there is none better than a mixture of boiled greaves, bran, and clay; and the same bait may be thrown into the water very frequently whilst fishing with much advantage. Barbel fishing now-a-days is for the most part practised with the aid of a boatman, and he, if a respectable man, as most of the Thames fishermen are, will relieve you of much trouble by taking all that is necessary in this respect. The best baits for barbel are red worms, gentles, and greaves.

There is a mode of angling for these fish almost peculiar to them, which we ought not to omit to describe. It is termed "ledger fishing," and is done as follows: The hook is baited with a well-scoured lob-worm, a large marsh-worm, or with greaves. You should place your ledger-lead (which can be had at any of the tackle shops) on the line about 10 inches above the hook, with a large shot under it to keep it in its place; the bait is then cast into the water, and the lead, of course, sinks to the bottom. The top of the rod should be held over the side of the boat, nearly touching the water, till a bite is felt (for no float is used), when a rather hard and sudden strike should be given. Having hooked your fish, proceed as before directed.

CHUB AND DACE.

THE CHUB.

This fish is found in most sluggish rivers, and although, like the barbel, but of little use for the table, he affords most excellent sport, as he feeds both at the top and bottom of the water. He will take gudgeons, minnows, worms, and paste, and in summer—particularly in the months of July and August—he will take both the natural and artificial fly most greedily. The chub, however, is a shy fish, and great caution, therefore, is necessary in approaching the water; for if he see you he will generally leave that part of the water so long as you remain. The chub is not so game a fish as the barbel, and although when first hooked he generally makes some desperate plunges in his endeavours to escape, yet they soon subside, and he generally allows himself to be landed without further trouble.

Chub are generally found in deep, still holes, and in the height of summer may be met with by the sides of rivers, under overhanging branches of alders, willows, &c., feeding on moths, bees, flies, &c., and afford excellent sport with the natural or artificial fly in such places during the summer months.

In bottom fishing for chub, the best baits are greaves, gentles, paste, and red worms. The paste should be made in the following manner: Take a piece of the crust of a new loaf, about the size of a cricket ball, and soak it for a few minutes in water; then take it out of the water, squeeze out all the moisture, and knead it in the hands until it becomes a stiff paste or dough: then take a piece of the oldest cheese you can get (the more decayed it is the better), and having rubbed it with the hands till it is quite smooth and free from lumps, mix it with the bread paste. Put a piece of this paste about the size of a small nut on a No. 6 hook, and use a large quill or small cork float.

The chub appears to alter his tastes according to the season of the year. Early in the year lob-worms and minnows will tempt him; in the summer he will scarcely condescend to look at them: now is the time for insect baits, natural and artificial. Of the former the cockchafer or May-bug, the humble bee, and a small species of chafer with a green head and copper-coloured body, which infests roses and apple trees about May or June, and is known in Norfolk as the "chovy." Of the latter, the imitations of these insects and a large red palmer (the hook should be tipped with a gentle, or bit of wash-leather to look like one) are the most deadly; after these try greaves, gentles, and plain paste (good-sized pieces, say as big as a small nut); and after this the cheese comes in at the conclusion of his bill of fare. Always remember to keep out of his sight, and to give him a good-sized bait, for he is a greedy fish, though extremely timid. Some fishermen use a paste made of bread dipped in the water in which greaves have been soaked; and if a strong smell is of any use, it ought to do wonders; but we believe plain paste to be quite as good. The humble bee, cockchafer, and cockroach may often be used in spring and summer by fishing in mid-stream or under boughs with a long line and a float at a depth of about 18 inches in strong runs of water.

We now come to the most artful of all the finny tribe,

THE CARP.

This fish is very common in ponds, few pieces of ornamental water being without it, and is also to be found in many of our rivers. In ponds the small ones may be easily caught with a red worm or small piece of plain paste, made as recommended for chub fishing, *without* the addition of cheese, as also may be a kindred species, the Crucian Carp. But the fine old fellows whom you see lazily swimming round the pond on a hot summer's day are not to be so easily circumvented. They will swim up to your bait, look at it, even smell at it, and—pass on. Most people have some infallible dodge for catching them, which sometimes succeeds and as frequently fails. We have seen more caught with plain paste, and next to that with a red worm (these generally smaller fish), than with any other baits. Most careful baiting is requisite: don't let a bit of the hook be seen; and yet we once caught a four-pounder with the head of a red worm that had been nibbled to pieces by some held over the side of the boat, nearly touching the water, till a bite is felt (for no float is used), when a rather hard and sudden strike should be given. Having hooked your fish, proceed as before directed.

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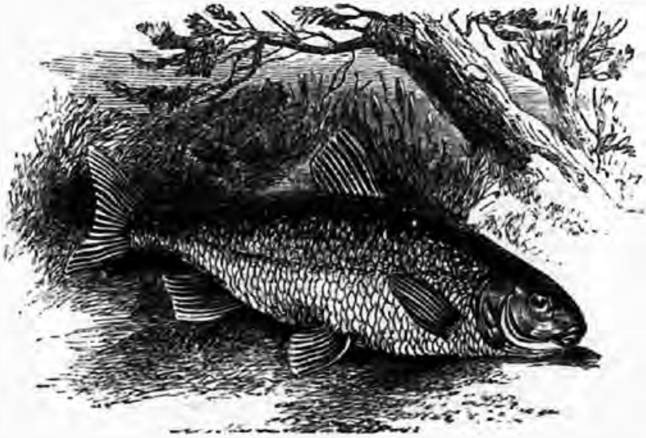
There is a plan very much recommended by some authors for taking them on hot days in summer. You will hear them sucking at the surface of the water, among weeds, with a sort of "chop, chop, chop" sound. Take a green caterpillar from an oak tree, a blow-fly, or a gentle, and drop it on a weed, gradually rolling it off into the water just by the fish's nose. He will generally take it. We have caught many small ones in this way; but where the fish are large it would be a simple act of folly to attempt it, as the carp would be down in the weeds the instant he felt the hook, and good bye to the best of tackle. In fishing for carp running tackle is indispensable. Use a fine gut line of about three yards, a small—*very small*—float, and about 8 or 9 hook.

Of all the *Cyprinidæ* or Carp Tribe (the most numerous of our fresh-water genera)

The Roach

is the most common. There is another species very closely allied to it, and said by many practical fishermen to be identical—although as naturalists deny this, we will not presume to attempt to offer an opinion on the subject—called the RUDD or ROND, which is very similar in its habits and appearance. Several other species or varieties are found in some parts of the kingdom; but as none but a practised naturalist can distinguish them from the common species, as they are rarely met with, and as their habits are almost the same, we will not trouble our readers with a detailed history of them. Few of the veriest tyros in angling have not caught or seen the roach. Old Izaak Walton says "he is called the water-sheep from his simplicity," and the poet describes them as the "unwary roach," but this is a great mistake. True, small roach or rudd, and even large ones, are easily caught in well-stocked ponds with almost any bait; but even here fine tackle and well-scoured clean baits will tell their tale over the less careful angler's day's work. The really scientific way of catching them is in rivers, where they run large, and, though tolerably familiar, as far as not heeding the presence of the angler *if he keep decently quiet*, require the most tempting bait and finest tackle to produce anything like a heavy bag. The roach, which spawns early in May, is not worth fishing for till about July, at which time they are to be found in moderately shallow water (say up to 4 feet), and may be caught with the caddis or cockspur-worm, small red worms, gentles, natural flies below and at the surface of the water, and any small grub or caterpillar. But about the end of September or middle of October, after the first autumn floods, when the weeds amongst which they have lived during the summer have rotted and been swept away by the current,



ROACH.

they begin to retire to the deep parts of the river. Then these pretty fish are in their finest condition and afford the best sport. Choose deep still holes and eddies not too much frequented by perch or jack, on whom the effects of a live bait should, if possible, be tried a few times before commencing roach

RUDD OR ROND.

fishing; plumb your depth accurately, take your finest gut line, with a single horsehair next the hook (if you can manage to be tender enough of hand to kill fish without breaking such slender tackle); select a spot where your float will swim as far as you can reach each way without any change in the depth of the water or the character of the bottom, which should be even, firm (you can feel this with your plumb), and free from weeds. Use a porcupine quill or "patent" float, and as much shot as will, when the hook is baited, bring the upper cap of your float on a level with the water's edge. If you cannot find a perfectly level bottom in say 8 or 9 feet of water (though some noted "roach-holes" are much deeper or shallower than this), and are forced to select a sloping one, choose one which grows gradually shallower, in order that at the end of your swim your bait may drag the ground rather than float above the heads of the fish. Now, having found the exact depth, which is indicated by the top of your float being just under water when the line is held upright and the plummet rests on the bottom, lay down your rod, and let the line remain in the water to soften and stretch. Use the same ground-bait as we recommend for carp fishing, and throw a number of balls of this in at the top of your swim, or, if in still water, just round your float. In the latter case, much less ground-bait will be needed, which should be made of a loose consistency, with more bran and less bread. Bait your hook (a very small one) with two or three gentles, and commence operations. In the later months paste (made as recommended for carp) is, as a rule, better than gentles, taking heavier fish. A short-shanked hook, made for the purpose, and to be obtained of any London tackle-maker, should be used with this bait, and the paste should just cover the hook. Many anglers use this bait on a triangular hook, and, *if they can be obtained sufficiently small*, such hooks are of immense advantage. In a strong stream strike on the slightest motion of the float, but in still water wait till you see that the float is *held* in a different position to that which it previously occupied. Strike very gently—remember you have delicate tackle. Manage a hooked fish carefully; but you may remember that all the carp tribe are what old Walton calls "leather-mouthed," and if your tackle is all right they won't break away like a trout, perch, pike, or grayling, whose mouths are all skin and bone. Use a short rod, about 10 feet long, if fishing from a boat; if from the bank, one about 18 or 20 feet should be used. These last are made of white cane, and sold specially for the purpose of roach fishing.

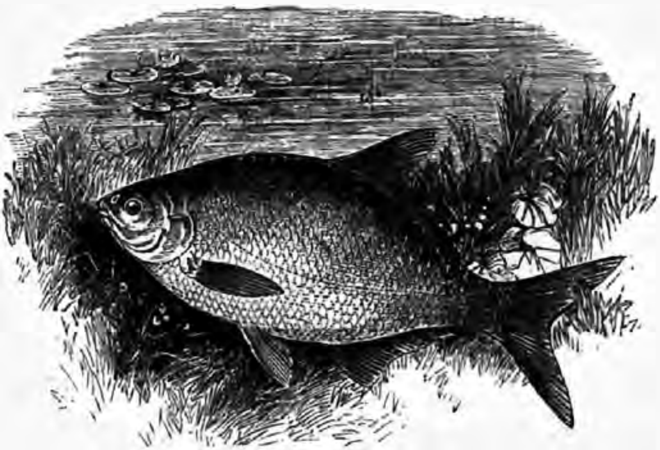
The baits above mentioned are the best for roach, but they are also to be taken with greaves, "blood-worms" (the larvæ of the gnat, which may be found in rain-water butts, stagnant puddles, &c.), and sometimes, especially when the water is a trifle coloured, with the tail end of a small lob-worm. This last, when they will take it at all, is one of the most destructive baits that can be used for *large* roach. Wheat or malt boiled in milk till it is soft is also, at times, found very killing (but not in all rivers) both for roach and

THE BREAM.

This somewhat ungainly, flat-sided fish, of which there are four or five species in this country, partakes somewhat of the characteristics of the carp and the roach. He is found in deep sluggish rivers, and occasionally in ponds and lakes. The "broads" of Norfolk swarm with them, and two or three hundredweight are sometimes taken in a day by a single rod.

The bream is not so easy to catch as many people pretend, being decidedly a capricious fish in his feeding. When once you get amongst a shoal, and they are well on the feed, wholesale murder may be done. They will take the same baits as recommended for carp and roach, but the good old and most thoroughly killing method is that recommended so far back as the days of

Walton. Boil about a peck of malt, or get half a bushel of grains from the nearest brewery (these last should be perfectly sweet; if sour they are utterly useless), choose a place where you have seen bream swimming in shoals in the middle of hot summer days, and from 6 to 9 feet deep, with an even bottom about 3 or 4 yards from the bank. Go to the place about 8 p.m., and throw in two-thirds of your ground-bait. At this time you should plumb the depth, using a No. 7 or 8 hook and stoutish gut line, with a medium-sized cork float and running tackle. Put on enough shot to sink your float, and then draw it



up the line until the shot entirely rests on the ground and the top of the float stands well above water. This saves plumbing the depth in the morning, when it would disturb the fish. As soon as daylight appears, go down to the place, put in the rest of your ground-bait quietly, bait your hook with a small lob or large red worm, and throw it out as far as you can, drawing it in till you are pretty sure that the bait rests somewhere in the middle of your ground-bait. The bream will begin to bite very slowly, the float, perhaps, lying flat on the surface, then moving a little way and quivering with the slow nibbling of the fish below. If this ceases altogether after a little time, your bait has probably been sucked off altogether; but never mind, bait afresh, and in with it. Keep very still, and stand back as far as you can from the water without losing sight of your float. The nibbling will soon end in the fish's rushing straight out for the middle of the river; then, as soon as the line is straight out from the top of your rod, strike smartly. Give line for the first rush, as he is a powerful fish, but as soon as you have turned him he will get "blown;" bring him to the surface as quickly as you can, when he generally turns on his side and gives all up for a bad job, and the landing-net makes him your own.

It is as well to use two or three rods when fishing in this way, and as the ground-bait by attracting small fish also attracts jack and perch, if there are any in the neighbourhood, a live bait may be used with advantage, as, while the fish of prey are prowling about, the other fish will seldom feed. Indeed, it is as well to begin by using a live bait on a night line, or setting a trimmer or two at first starting. If you have plenty of time on your hands, ground-bait your place two or three times before you fish, but take care that no one else finds this out and avails himself of the fruit of your labours. A little bullocks' blood from a slaughter-house is a most valuable, though extremely nasty, addition to your ground-bait.

The Tench

is almost exclusively a pond fish, though it has now been introduced into some rivers, out of which it generally makes its way to the stagnant dykes in the adjoining marshes, if there be any. When on the feed, it is by no means a difficult fish to take. This is only early in the mornings and late in the evenings, except on warm wet days in summer, when they will feed all day. A gut line, cork or quill float, and No. 7 or 8 hook, baited with a red worm, which should almost touch the bottom, will seldom fail to take them in April, May, or June. In the later part of the season gentles will sometimes answer better than worms. Ground-bait with a few hands-full of gentles mixed with wet bran, and occasionally throw a few in close to your float while fishing. If worms are to be used, a small quantity of grains and blood, as recommended for bream, will work wonders if thrown in overnight at the spot where you intend to fish. They are generally associated with carp in ponds, and in fishing for the one you will frequently take the other. It is as well to use a float that will carry a good quantity of shot, so as to sink your bait at once out of the reach of small roach and perch, especially when you bait with gentles.

The Dace

is a fish which affords the angler no little sport. It is something like a miniature chub in appearance, but much more game and a bolder biter. The same baits as are used for the roach will take him, with the addition of greaves and the artificial fly. In fishing for barbel in the Thames, they are often taken with the former of these two baits, or with gentles. They will also take a worm with more readiness than the roach, and the caddis-worm is a very destructive bait in spring. The same tackle as used for roach will do, with a trifle larger hook, say 9 or 10; but you need not be so particular as to the fineness of the gut, as, though rather shy fish, they are not so particular in their biting, which they do boldly, and should be struck immediately. They are found in more rapid streams and in shallower water than the roach, and a heavier ground-bait is consequently necessary. The best plan is to mix clay with the bread and bran recommended for roach, and, if you are baiting with gentles, put a few live gentles into the middle of each ball. This is also a great "dodge" in barbel fishing. Of flies they will take any natural one, and nearly any small artificial one; but the point of the hook should be covered with a gentle, or, if this be not procurable, a small piece of wash-leather. This is advisable in using an artificial fly for any of the carp tribe, as they nearly always smell at the fly before taking it, unless in a very rapid stream. The whereabouts of the shoals of dace is generally to be discovered by their rising at flies, &c.; but if they are not rising, and the water is not clear enough to enable you to see them, fish in moderately deep eddies by the side of rapid streams.

The Bleak

is a small fish, not unlike a sprat, of the most beautiful silvery lustre. He will take almost any bait and rise to a very small artificial fly. In roach or dace fishing with gentles he is a perfect nuisance, taking your bait long before it has time to sink to the bottom, where, however, he will not trouble you very much. If you want to catch bleak, take a gut line about 3 yards long, put about six hooks on it as directed for fastening flies to a collar, throw a few crumbs of bread or a little bran on the surface where you see them rising, and when they are in full rise (which they will be in about two minutes), having attached this to your reel-line, cast this as you would flies, without either float or shot: you will soon feel them tug; in fact, you may see them bite, and may pull three or four out at a time. We once caught nearly three hundred in about a couple of hours in this way. The bleak is a very useful bait in spinning for jack or very large trout, owing to its silvery brightness.

THE GUDGEON.

This well-known little fish, small as it is, affords much sport to the angler. Use a light rod, float suitable to the stream, fine line, and No. 10 to 12 hook, baited with a blood-worm or small red worm. Take the depth exactly in shallowish water, say from 2 to 4 feet, and let your bait drag the ground. Do not strike so quickly as in roach fishing, but wait till the cap of your float is under water. They will take gentles with tolerable freedom, and we have caught them with the caddis when they absolutely refused the worm. Instead of ground-baiting, get a rake to rake the bottom, or, in very shallow water, stand in the water and stir up the mud or gravel with your feet, which is the method most practised in the Trent. They are a valuable bait for the carnivorous fish, both when used alive and dead,—in fact, the best live bait that can be used, and also are excellent eating, almost equalling the smelt in delicacy.

In fishing for the gudgeon, you may often catch the POPE or RUFF, a small sort of perch, but coloured somewhat like the gudgeon. It is not found in every river, but, in those where it is found, it may be caught without the least difficulty,—not that it is worth the trouble of fishing for. It will hardly ever refuse a small worm at the bottom of the water.

Of the MINNOW, STICKLEBACK, STONEBACK, and BULLHEAD one need scarcely speak, as, though useful as baits, they are not worth fishing for with a rod and line. To catch minnows for baits, use a small meshed net spread across a common hoop (an iron one), with four or five strings attached to the sides and tied to a piece of cord, which should be fastened to a pole about nine or ten feet long. Throw some crumbs of bread or red worms into the water over this net, which should be allowed to lie flat on the bottom, and when the shoal of minnows are feeding on them over the net, draw it up suddenly. In choosing minnows for baiting, do not take the largest: "the medium size and the whitest are the best," says old Walton. Any minnows will, however, do for live bait for perch. The stoneback or loach is a capital bait for night lines, and may be used for spinning. Two of the finest jack we have seen caught were taken in the latter way by this bait. It is not unlike a gudgeon, but longer in proportion to its size, without scales, and has a profusion of barbs or wattles round its mouth.

There is a fish in some rivers called

THE BURBOT or EEL-POUT,

which grows to two or three pounds' weight and is excellent eating, but is seldom caught with a line, though occasionally with night lines. For this reason we will dismiss him, merely observing that he is an ugly-looking fish with a big head, lots of barbs at his mouth, a thin tail, and of a sort of brownish colour, with dark purplish spots. It is the only fresh-water fish of the cod tribe in this country.

THE EEL

is also unworthy the consideration of the sportsman, and is best caught with night lines; but as, in fishing for other fish, our readers may often have the misfortune to catch one, a piece of advice may here be given. Directly you have got him out of the water, put your foot on him and cut through the back of the neck, so as to sever the back-bone and render him helpless, when the hook may be extracted without trouble.

BAITS.

There are endless varieties of baits, all good in their season, but the chief of these is the worm. Of this there are several kinds:

1. The LOB-WORM, which may be found on lawns and garden-paths at night after a shower of rain, or in a heavy dew. Some little adroitness, which practice alone can give, is requisite in catching them, as they retire into their holes in an instant when disturbed. This is beyond doubt the best worm for fishing, but is almost equalled by

2. The RED WORM, a smaller species, of a deep red colour, and good for nearly all fish. Part of a red worm answers well for small fish which could not take in even part of a lob.

3. The BRANDLING, a striped worm, found in dung-hills and tan-heaps. This requires much "scouring" before use.

4. The MARSH-WORM is the common earth-worm, with somewhat of a bluish head, and is of less use than the others.

We next come to an important class of so-called worms, viz., the larvæ of various insects. CATERPILLARS of all kinds are a deadly bait, more particularly the smooth ones. The little green sort found on oak trees from April to July are especially destructive.

The BLOOD-WORM is the larva of a species of gnat, and is found in stagnant puddles, sometimes in such numbers as to appear as if the whole had been converted into blood. It is about half an inch long and of a brilliant red colour. Several of them must be used at once in baiting.

The CADDIS-WORM of various kinds is almost too well known to need description, and is a deadly bait in its season for trout, dace, and roach. We once took a number of gudgeons out of a small stream with this bait when they refused the red worm.

In using all these worms, the angler should consider the state of the water he is fishing in. In low bright water a small red worm is to be relied on; but in thick or heavy water a big lob is best.

Be careful to scour your worms by keeping them in clean damp moss for some days before using them. A well-scoured worm is tougher and livelier, and a brighter-looking bait altogether, than one fresh from the earth.

To keep worms in a tolerable condition for fishing, a mixture of garden-mould and tea-leaves is much used. This will not do well for the lob-worm.

In dry weather, when the worms do not appear at night, a few pails of water thrown on the lawn will often bring them up in an hour or so.

There are many other grubs, &c., all of which are good in their season; but the best of all is the GENTLE, or larva of the blow-fly. When scoured with a little sand, or, if you can give a little longer time, bran, they are an *almost* universal bait.

Of natural FLIES we will say nothing here, as we verily believe there is no insect that a fish will refuse, and have treated of the more special ones in mentioning the different fish, with, we think, the omission of the grasshopper only, a most deadly bait for trout, grayling, chub, and dace.

FISH BAITS we have already spoken of, but we may here add sprats as a first-rate and cheap bait for spinning for pike in winter. ARTIFICIAL BAITS had better not be used while the natural ones are attainable.

The best PASTES have been mentioned in their places. Wheat and malt boiled in milk until quite soft are a favourite bait for roach and bream with many anglers.

The green "silk weed," twisted up into little balls, has been lately recommended as a bait for roach, but we have much doubt as to its utility.

FLY-FISHING.

We will now proceed to give a few hints on this most delightful branch of the gentle art.

For trout it is not only one of the most successful, but also is the only method permitted in most rivers. The grayling and the dace afford capital sport to the fly-fisher, as also the chub. Salmon—of which we will not treat here, as those of our readers who are fortunate enough to get the opportunity of salmon fishing will not have any difficulty in procuring plenty of that example which is so far superior to precept—are caught with the artificial fly, and even the pike is sometimes taken by a strange-looking half-fly half-bird.

Firstly, of your rod. This should be much lighter and more pliable than a bottom-fishing rod: about 12 feet is the most convenient length, and neither too stiff nor too "whippy." You had better get some old hand to choose one for you if possible, but if you cannot, endeavour to pick out one that plays truly when shaken in the hand, and appears to become gradually more flexible as it tapers. Do not take one beyond your strength: it is as bad as an over-heavy cricket-bat. You will require a winch, containing 30 yards of line of fine silk, or tapered silk and hair mixed (some prefer the one, some the other). At the end of this fasten by a loop in the ordinary way 3 yards of round, fine, even gut, to which attach your fly. After you have attained some dexterity, more than one fly may be used; but the utility of this practice is questionable, and we strongly dissuade a novice from attempting it, unless he wishes to bring his tackle into utter grief every two or three casts.

Now as to casting. We believe that all the written directions on the subject would not be of half so much good as one hour with an experienced fly-fisher. Our directions are, therefore, *get some one to show you—not by words, but by actual example.*

As regards a stock of flies, do not fill your book too full: an entomological museum is not wanted, though most of the tackle-makers will endeavour to persuade you to the contrary. The number of species of real use is not so large as people pretend. We will merely give the names of the different sorts of most utility, without directions for making them, as in these days, when the best London makers will send the best flies by post to almost any part of the globe, and these flies only cost two or three shillings a dozen, it is hardly worth the trouble of making them oneself. The names here given will be known by any *good* tackle-maker.

1. Hofland's fancy
2. The Francis
3. The alder-fly
4. The cinnamon
5. The March brown
6. The red spinner
7. The blue dun
8. The yellow dun
9. The coachman
10. The coch y bondu
11. The fern-fly
12. The governor
13. The black gnat
14. The stone-fly
15. The May-fly
16. The sedge-fly
17. The brown moth
18. The white moth
19. The hare's ear
20. The spider-fly

A few red and black palmers of various sizes, and a few large red palmers, with double hooks for chub fishing, will be found very useful. It will be as well to have Nos. 1, 2, 3, 4, 5, 7, and 8 of several sizes and shades, as the insects they are intended to represent vary much with the state of the weather and period of the year.

Trout begin to rise in some rivers about the middle of March, when the March brown and the blue dun are the best flies. In fact, they are the best flies to commence the season with in every river. At this time your only chance of taking anything is in the middle of the day. Later on in the season fish earlier and later, the middle of the day being now useless, unless wet or windy, when the angler who has the pluck to venture out gets the pull of the fine-weather fisherman. In a lake, in fact, it is next to useless to fish unless a strong breeze be blowing or rain falling. The latter end of April and beginning of May are the most glorious time for the fly-fisher, except, perhaps, in those rivers where the May-fly is found, where the fish will not rise freely till it puts in an appearance. About this time the alder-fly in the morning, and Hofland's fancy, the Francis, or the duns in the evening, will do much execution. At the end of May or beginning of June the May-fly appears. The artificial imitation will kill early in the morning and late in the evening. Throughout May the stone-fly is an excellent fly, especially late in the evening. The sedge-fly will also do well at this time. After the disappearance of the May-fly the trout will not rise much in the daytime; but the sedge-fly, coachman, and various moths will come in very usefully after sunset.

Remember that, if you can see a trout, he can generally see you, and that no *whipping* will induce him to rise. Look out carefully for big fish rising under an overhanging tree, and sucking down every fly that passes over them. If you can, let your fly fall a foot or two above them, so that the current may bring it down over their noses; but don't pitch it behind them or right on their heads. Where a big stone or stump obstructs the stream and forms an eddy, throw your fly so that the stream may bring it round the obstacle into the comparatively still water, where a trout delights to lie in wait for what floats down. You will soon know if he takes your fly.

In playing a trout, remember never to let your line become slack. This, indeed, should not be done with any fish, but a trout, unless very well hooked, will almost invariably break his hold in such a case.

The grayling, a fish not found in many rivers, will take most of the small duns, and has the advantage of coming into season just as the trout leaves off: the best month for fly-fishing for grayling being October. In fishing for grayling, let your flies sink a little.

Of fly-fishing for dace we have already spoken. The big double-hooked palmers should be thrown under the boughs of trees about August and September, when you will frequently be rewarded by hooking large chub.

Remember to vary your flies according to the state of the weather and water: small light-coloured flies on bright days and in clear water; large dark ones on cold windy days or in a coloured water. Accustom yourself to use the finest tackle you can: you will have far more real sport in killing a big fish with tackle that would not lift half his weight, than if you dragged the poor brute out "by the hair of his head." In the evening, when you cannot tell what obstacles may be in the way, and you must hold a fish fast if you want to kill him, then stronger tackle is certainly necessary; and, having read all this advice, remember one chief rule above all others, "*Don't let the fish see you!*"

SEA FISHING.

Although it is beyond all doubt that the capture of fresh-water fish with the rod and line requires more skill and patience, and a greater knowledge of their habits, than is necessary to ensure success in salt water, yet there is much to be learned and much practice is required before one can attain to anything like proficiency; and although in the far north the glorious salmon affords to those who have the good fortune to be able to enjoy it the most exciting sport, and the trout in the more southern parts of this country is prized almost as much, yet there is something most enjoyable and fascinating in sea fishing, which amply repays one for the comparative discomfort it entails, although such a word is scarcely known in connection with sport by those who are its genuine votaries.

We will now proceed to lay before our young readers a list of the various kinds of sea-fish which are generally caught with hand-lines, and also a few plain directions for making the best sort of tackle; and while on this subject we may observe that although, generally speaking, the lines, &c., of our fishermen at the various watering-places are of the roughest kind, and although they take abundance of fish, we are convinced from the experience of some years that he who takes the pains to make fine tackle—though of course of sufficient strength—will be fully repaid. We remember a gentleman who used neat twisted horsehair for his "snoods" (the short lines to which the hooks are attached), instead of the clumsy cord ones which two fishermen had in the same boat with him, on more than one occasion caught nearly double the number of whiting that they did.

Much sport may be had at most of our watering-places in fishing for dabs, flounders, &c., and the same kind of tackle may be used for them, and, indeed, for nearly every kind of sea-fish. It is of the most simple construction, and is made as shown in the annexed engraving.

A is a leaden plummet (regulated in size according to the strength of the tide, for it is desirable that the bait should be kept as near the bottom as possible), weighing about half a pound and of the shape shown in the drawing, having a hole bored through it capable of allowing a piece of whalebone, about 15 in. long and of the thickness of an ordinary lead pencil, to be passed through it and fixed by its middle. At each end of the piece of whalebone should be attached a "snood," made of twisted hair or the fine line sold for the purpose, about 15 in. long, to which the hooks are fastened. At the upper end of the plummet the hand-line must be attached, which should be carefully wetted and stretched before being used, in order to take all the "kink" out of it. It should be 40 or 50 yards long. This line is used as follows: the hooks being baited with lug-worm, the soldier crab, mussels, &c., all of which are capital baits, they are lowered over the side of a boat until the plummet reaches the bottom; it is then raised sufficiently to allow the baits to clear it, and the line should be held between the finger and thumb of the right hand, which should rest on the gunwale of the boat. Immediately a fish bites, which is known by a sudden

and sharp tug at the line, it should be pulled sharply and suddenly upwards. If the fish is hooked, he should be hauled on board at once, unless it be a large one, in which case it is advisable to give him line and gradually bring him to the surface, when he should be secured by a gaff and hauled on board. Nearly every kind of fish which frequents our coast may be taken by this kind of tackle, and, indeed, we know of no better. Good sport may, however, be had by fishing with a strong pike-rod and running-line and large cork float; but we much question its being equal to the hand-line. Numbers of fish of all kinds are caught by means of a long line called a "trot," the length of which may be optional—from 50 yards to 500, or even double or treble that length. At intervals of a fathom, snoods should be attached to it, each having a strong whiting-hook securely fastened. The hooks should be baited as before described; and just at the commencement of the flood tide the line, each end of which should be secured to a heavy stone or other weight, must be laid on the sand across the tide, viz., parallel with the shore, and care should be taken not to lay the line on the dry sand: the best way is to walk into the water up to your knees before laying the line; for if it be laid on the sand before the tide reaches it, there are innumerable insects always at the extreme edge of the water, which will devour every atom of your bait before the fish find it.

Simple as it may appear, there is a right and a wrong way of making this line, and we will now endeavour to put our young friends in the *right* way.

If for in-shore fishing, procure 150 or 200 yards of cord, called at the fishing towns "marline." Get the "kink" out of it by soaking it for an hour or two in water, and stretching it out its full length. And now for the hooks and snoods (the proper twine for which is sold at all fishing towns).

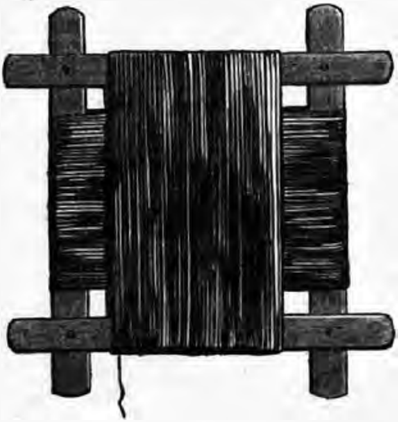
Take the extreme end of the snood line between the forefinger and thumb of the left hand, and draw the line between the finger and thumb of the right hand until the end reaches up the right arm just above the elbow: this will give you the proper length ; then with the finger and thumb of the right hand make a "half-hitch," or loop, the line next the ball being undermost ; then place the shank of your hook through the loop, and make another half-hitch the contrary way ; hold the hook with the left hand, hold the short end of the line in your teeth and the line next the ball in your right hand, and draw the knot tight on the hook ; then cut off the line next the ball about one-eighth of an inch from the knot, and your hook is firmly tied, and will never draw. Never tie a hook on the *end* of the line if you can avoid it, but always proceed as above, and for this reason : when the hook is tied on in the way described, all the strain of a fish is on the lower hitch ; but if the hook be tied on at the *end* of the line, the strain will of course be on the upper one, and therefore more likely to draw. Attention to trifling matters of this kind will always amply repay you for the slight trouble they may occasion.

At each end of the line should be a loop by means of which you can attach a stone or other weight, then holding the end in the left hand, stretch it out as far as you can to the left ; then run the line through the right hand, which must be held out in the same way to the right : this will give you the proper distance ; then take one of the snoods, tie a knot in it at the end, and fasten it to the line by two half-hitches ; this will never slip, on account of the knot at the end. This way would do equally well for tying on a hook if a *large* one, but for *small* ones it would be in the way.

The best way of keeping this line is in a half butter-tub, the large line being coiled round the inside, and the snoods and hooks lying in the centre. It is a good plan to loop up each hook on its own snood, so that when you draw the line out of the tub, the hooks, being reversed, will not take hold of anything that may happen to come in their way, and when they are wanted for use they can be easily undone.

Those of our young friends who may be fortunate enough to visit Scotland, particularly the west coast, will find a most amusing and successful mode of fishing during the summer months. Four or five or more stout rods, about 6 or 7 ft. long, must be procured, and to the end of each must be attached a strong line about the same length, and to the end of the line should be tied a length of twisted horsehair about 3 ft. long, and to the end of this piece of horsehair is fastened what is called a fly, though we certainly never saw any living creature bearing the slightest resemblance to it. It is composed simply of two white fowls' feathers tied to a No. 6 hook, which might be supposed to represent wings. To use this very successful bait, you must procure a boat, and a man, who must row you about very slowly. Your rods should be held out from the sides of the boat, so that the flies and lines are clear of it. As the boat is rowed forward, the flies, of course, trip on the surface of the water, and are greedily taken by the voracious salmon really faster than you can take them off the hooks. We have taken on one occasion more than a hundred in the course of an hour and a half off Oban. We have also taken them in great numbers in the Sound of Mull, also at Stornoway, and at the north end of the Crinan Canal.

Another mode of taking several kinds of sea-fish is by means of what is called "whiffing." It is simply a long baited line, without any lead, towed astern of a boat either under easy sail, or while being pulled by oars, or when at anchor if the tide is strong. The line is held in the hand, and must be struck sharply the moment a bite is felt.



The best method for keeping the lines for sea fishing is to have a frame made of wood about 9 in. square, as shown in the engraving. The line should be wound round it in both directions. It is then easily carried, and will not get entangled, and is easily "paid off" when wanted for use.

Soon after the mackerel appear on our coasts, great sport may be had by fishing for them with a long line and a "spoon" bait, which may be had at any of the tackle-shops. This mode of fishing is practised from a boat under sail. There being two or more swivels on the line, the bait, by the action of the water, revolves and glistens as it passes through it, and is a never-failing bait for these fish.

Bass and grey mullet may also be taken in the same way.

SHOOTING.

For many centuries, Shooting, either with the bow or gun, has been one of the leading sports, and, comparatively speaking, almost peculiar to natives of this country. Sport, in its legitimate sense, is nowhere else so well understood, nor is it in any other country so thoroughly appreciated. On the Continent, what little game is found is slaughtered indiscriminately; coveys are fired into, and birds and hares are "potted" from behind hedgerows—the sole object being to kill, and *no matter how:* so long as game is brought to the bag, the means of doing so are neither questioned nor considered; but in this country, and amongst our countrymen abroad, any one having the slightest pretensions to being a sportsman would as soon think of shooting the poultry in a farm-yard as of firing into a covey of birds.

It is this feeling of fairness and consideration, even towards the very animals of which he is in pursuit, which, at all times, characterizes the English sportsman, and elevates him above the "pot-hunters" of other countries; and it is a feeling which we would most earnestly desire to inculcate in the breasts of our young readers—a feeling they may profitably cultivate in all the relations of life, and one which will teach them to be above taking a mean advantage.

We cannot do better than quote a few words on this subject from that charming work, "The Rifle and the Hound in Ceylon," by S. W. Baker, than whom a better sportsman never existed. He says:

"I would always encourage the love of sport in a lad. Guided by its true spirit of fair play, it is a feeling that will make him above doing a mean thing in every station of life, and will give real feelings of humanity. I have had great experience in the characters of *thorough* sportsmen; and I can safely say that I never saw *one* that was not a straightforward, honourable man, who would scorn to take a dirty advantage of man or animal. In fact, all *real* sportsmen that I have met have been really tender-hearted men—men who shun cruelty to an animal, and who are easily moved by a tale of distress."

These sentiments we endorse to the very letter, and maintain that the word "sportsman," in its truest sense, conveys far more than the fact of a man being fond of field sports. To be really a sportsman, he must possess qualities of a high class.

RIFLE SHOOTING.

As Rifle Shooting has, within the last few years, become a national pastime, we will commence our article on this subject by giving a few hints which may possibly be of service to our young readers—many of whom, if they have not already done so, will sooner or later join the ranks of our citizen army.

THE ENFIELD RIFLE.

We here give a drawing of the Enfield Rifle—the weapon now in the hands of our Volunteers, and with which all the prizes for Volunteers have been shot for at the Great Annual Meeting at Wimbledon, and at other similar gatherings throughout the country since they were established; and, although it has fully answered the purpose for which it was originally designed, yet—just as the railway displaced our mail coaches, which had arrived almost at perfection—so is the Enfield rifle doomed to be superseded in the first place by the Snider (with which the greater part, if not all, of our regular troops are already armed), and eventually by the Henry-Martini, or such other improved breech-loading rifle as may be fixed on by the Government.

We deem it unnecessary to give any detailed description of this rifle—not merely because it is all but out of date, but because it is, beyond a doubt, well known to our young readers.

The Snider Rifle, which, as we said before, is now the standing arm of our troops, may not, however, be so well known, either as regards its principle or the requisite manipulation. We therefore give a detailed description of it, which we trust will not fail to convey to our readers a thorough knowledge of its mechanism and action.

THE SNIDER RIFLE, WITH FLAP OPEN READY TO RECEIVE THE CARTRIDGE.

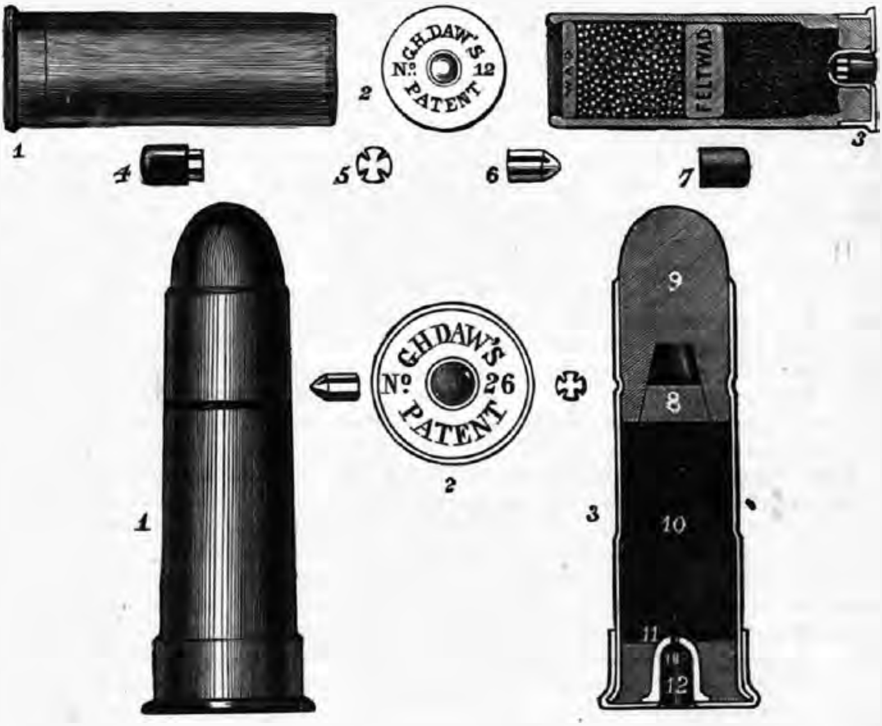
As regards the stock, lock, sight, and barrel (excepting at the breech), it is exactly similar to the Enfield ; but at the breech there is a flap, A, opening on a hinge from left to right, in order to admit of the insertion of the cartridge, which must be pushed sufficiently forward with the thumb of the right hand into the barrel to allow of the flap being closed : when this is done the rifle is loaded.

THE SNIDER RIFLE WITH FLAP CLOSED READY TO BE DISCHARGED.
A, the flap ; B, the projection or nipple ; C, the piston or plunger ; D, the hinge ; E, the extractor.

The flap itself is a solid piece of iron through which a long piston or plunger works, and this, when struck by the hammer, is forced forward, and, coming in contact with the percussion cap in the centre of the base of the cartridge, ignites the charge.

At the lower end of the flap, A, and on its right side, is a projection or nipple, B, and through this, and extending downwards and in an oblique direction—terminating exactly in the centre of the upper end of the flap—is a perforation in which the piston or plunger, C, is fixed, which, as before mentioned, is forced forward on being struck by the hammer, and is brought back, on the hammer being raised, by a spiral spring. D is the hinge on which the flap works, and on the upper end of the flap is the extractor, E. The flap is so arranged that, when open, it can be drawn backwards on the hinge; and when so drawn back, the extractor, catching the rim at the base of the cartridge, withdraws it from the barrel after it has been discharged into the hollow in which the flap rests when closed; by turning the rifle sharply over to the right, the empty case falls out and makes room for a fresh cartridge.

We here give an engraving of the Central-fire Cartridge, manufactured by Mr. Daw, of Threadneedle Street, for which he gained the prize of £400.



THE CENTRAL-FIRE CARTRIDGE,
APPLICABLE TO THE SNIDER AND OTHER BREECH-LOADING RIFLES.
1, cartridge; 2, base of same, showing the end of the percussion cap in the centre; 3, cartridge in section; 4, cap and anvil; 5, end view of anvil; 6, longitudinal ditto; 7, cap; 8, plug at base of ball; 9, the bullet; 10, the powder; 11, capsule which contains the percussion cap; 12, the cap itself.

given by the Government as being the best cartridge. It is not, however, the present service cartridge, although it bore off the palm. Why it was not adopted we confess to being at a loss to understand, seeing that it was proved to be more certain in its action, more impervious to damp, more neatly manufactured, and, moreover, very much cheaper, than any other cartridge hitherto produced.

This cartridge is composed of a thin piece of brass foil, the two edges of which overlap each other about a quarter of an inch, and are carefully soldered together. This roll of brass is fitted into a cup or base of the same material (No. 2), in the inside of which is a block of pulped paper, which secures the *capsule* (No. 11) in its place, and this capsule is perforated at its upper end, so that when the percussion cap is exploded, the flame passes into the gunpowder above it. The *anvil* (Nos. 5 and 6) is made of a piece of brass wire of the proper size to fit exactly the inside of the percussion cap, having one end of a conical shape, so that it meets the oblique blow given to the cap by the piston. It has four longitudinal grooves cut in it, so that when the fulminate explodes, the flame passes along them and through the hole at the top of the capsule, as before described.

To make the matter even more intelligible, we will proceed to point out how the component parts of the cartridge are put together.

The *anvil* (No. 5) is first placed with its point resting against the fulminate in the percussion cap. The *cap* itself (No. 12) is then pushed, mouth first, into the capsule (No. 11), which it fits tightly. The *powder* (No. 10) is then poured into the cartridge-case, and upon it the *ball* (No. 9) is placed. No. 8 is the *wooden* or *clay plug* which is placed in the cavity at the base of the Minié ball, which, when the explosion takes place, is driven forward and expands the base of the ball into the grooves of the rifle.

As with the ordinary shot gun, too much care cannot be observed in handling a rifle. *Never, on any occasion, or under any circumstances—even although you know a gun to be unloaded—allow yourself to point it at any one.* No good can possibly accrue from such a thoughtless and useless act, and in an unguarded moment, a gun may be taken up containing a charge; and how could our young readers forgive themselves if, by so foolish an act, they should cause the death of a fellow-creature? The golden rule to be observed in all cases is *always to consider a gun loaded, and to treat it accordingly.*

After the manipulation of a gun or rifle is thoroughly understood and *practically* learnt, one of the first steps towards becoming a good shot, more particularly with a rifle, is to acquire nerve, and to get entirely rid of that trepidation which, in a beginner, nearly always accompanies the act of drawing the trigger, commonly called "flinching." This is fatal to good shooting, *and must be overcome.* A very simple method of determining whether or not you are perfectly steady is to balance a penny piece on the end of the barrel of an *unloaded* rifle, then take a steady aim at any small object, and gradually press the trigger until the hammer falls, and if you can do so several times successively without causing the penny piece to fall, you may be satisfied that you are sufficiently steady. It is by no means a bad plan to practise this very frequently even after you have commenced target practice.

As all the minutiæ of rifle shooting will be taught practically at the butts by the musketry instructor, it is not our intention to enter more particularly into the subject than to give a few hints that our young readers may profit by in the competitions in which they may be engaged, and which it is more than probable may never be imparted by the musketry instructor.

However monotonous and tedious it undoubtedly is, it is equally certain that more advantage is gained by "position drill" than is usually accorded to it. But in taking these drills, we would earnestly impress upon our young readers the necessity of not practising them carelessly: *they should always be taken under the immediate supervision of the sergeant instructor*, who will, of course, from his long experience, detect any little error of position, which might, if allowed to continue, materially interfere with a perfect acquisition of it afterwards. For bear in mind, that in rifle shooting, as in other things, it is far easier to acquire bad habits than to get rid of them.

We here give an engraving of the Hythe position, as taught in the army, and in which all prizes are shot for at Wimbledon and elsewhere at 500 and 600 yards. At 200 yards this position is not allowed; the shooting at this distance must be from the shoulder, standing.

And now for a few words on the subject of the actual use of the rifle at the butts. And first, as to loading the Enfield rifle. This, no doubt, is an operation which everybody is acquainted with; but there are, nevertheless, some little matters quite worth while bearing in mind, and which may possibly be overlooked unless attention be drawn to them.

It is always advisable, before commencing firing at the target, to fire a "warmer" into the pit. Your rifle may be properly cleaned, oiled, &c., but after lying by for a day or two it is quite possible that a small drop of oil or a particle of dust or dirt may have inserted itself into the lower end of the nipple, which will, most probably, cause a hang-fire; and nothing that we know of is more likely to cause nervousness in a beginner and make him flinch than this.

In loading, tear off the top of the cartridge gently and evenly, and in wetting the waxed end of the cartridge with the mouth round the ball, be careful *not to wet the end itself*, for if this be done, when it is rammed home upon the powder it will, of course, moisten a certain portion of it, and so much of the powder will be lost—no slight consideration where every grain makes a difference as regards elevation at the long ranges; and while pouring the powder into the barrel, if there be any wind, always stand with your back to it, as, otherwise, much of the charge may be blown away. It not unfrequently happens that in cartridges which may have been made any length of time, a portion of the powder will be found caked at the bottom of the cartridge next the ball. The case should therefore always be examined, and well shaken and pinched, which will disengage any powder which may adhere to it.

The pressure exerted on the bullet by the ramrod should be but gentle—only sufficient to ensure the base of the ball being well down on the powder. After several shots have been fired, greater force is necessary, for the explosion of the powder will most likely have formed a slight deposit just above where it takes place, and unless the ball is driven home beyond this a vacuum will, of course, be formed, and the danger of the barrel bursting is incurred.

Few, if any, of the Government caps can be forced down upon the end of the nipple by the mere pressure of the thumb, and if the fulminate is not in actual contact with it, it is most probable that a hang-fire will be the result. The best and safest way of driving it home is by lowering the cock *gently* upon it, and exerting a gradual pressure by placing the thumb against the back of the comb of the cock ; but in doing so be most particular on all occasions to place the butt of the rifle against the upper part of the thigh, and keep the barrel pointed at as nearly a perpendicular position as possible; and above all things, guard against acquiring the habit (which, we have shuddered to see, has become a common practice at the firing-points) of lowering the hammer upon the cap, and then giving it a succession of gentle taps on the percussion cap: one of these taps given rather too violently might cause the loss of a life.

As regards "practice" at the butts in the ordinary acceptation of the term, we must admit that we are no advocates for its being carried to any great extent after a beginner has acquired a knowledge of the use and manipulation of his rifle. No amount of practice *alone* at a target, we are convinced from long experience, will give a man that peculiar nerve and coolness which he must be master of before he can hope to aspire to be a good and successful match shot. It is *match practice only* in competitions *and in the presence of others* which will ensure the possession of these indispensable qualities.

A beginner should train himself to be proof against *anticipating* making a bad score. He should learn to treat with the most perfect indifference all remarks he may chance to hear as to the result of the match or of his own shooting. He should learn, above all things, to trust to his own judgment of light and wind, for the longer he depends upon information gained from others the longer he will be unable to trust himself. It is perfectly marvellous with what accuracy most of our leading shots will tell the necessary allowance to be made at the long ranges on a strong wind blowing from the right or left, and yet it is within the grasp of any one possessed of ordinary intelligence if he will but accustom himself to remember the position of his shots and that of his aim, and also the appearance of the flag at the butts. The distance in feet from the centre of the target may easily be computed by bearing in mind the breadth of the targets. This knowledge, however, is not to be acquired in a day, but, on the contrary, is only to be gained by long experience and the most patient attention, nor should failure be allowed to be accompanied by any feeling of despair: like everything else in this life which is worth gaining, a steady and determined perseverance will ensure success. Never allow a bad score to dishearten, but rather to act as a stimulant to renewed efforts, and you will find that the requisite knowledge will creep almost imperceptibly upon you.

On no account ever allow yourself to get into the dangerous habit of carrying your rifle with the hammer down upon the cap. Always carry it with the hammer at half-cock, and in uncocking your rifle bear in mind the necessity of always allowing the scear to descend below the "bent" in the tumbler, and then draw the cock back until you *hear* the scear catch at the half-cock; but never adopt the dangerous practice, too often followed, of letting the scear slip from the full to the half-cock: it may, and often will, catch on the edge of the bent, and the slightest jar will, to a certainty, cause it to fall on the cap, and the rifle will be, of course, discharged. This caution is also equally necessary with sporting guns, of which we shall speak hereafter.

It will be found a most useful plan in shooting a match never to inquire about or care for the scores of other competitors; let all your energy and attention be confined to your own.

If shooting in a match with nine or ten other men, the judgment of all of whom you believe to be generally sound as to their knowledge of the strength of the wind which may be blowing from either side, and you should happen to be at nearly the bottom of the squad, it is no bad plan to carefully watch the position of their shots. If you find that the majority of them incline to the right or left of the target, make rather more or less allowance, as the case may be, with your first shot, and you will generally find that you have learnt the secret, and act accordingly. Immediately *before each shot*, however, carefully notice the effect of the wind on the flag at the butt. A sudden gust or lull will frequently take place, and your shot will, of course, be acted on accordingly. The effect of light, too, is as difficult to contend with as that of wind. A dark cloud suddenly passing over the sun on a bright day will as suddenly alter the elevation; but although this is an established fact, it is not advisable for a beginner to pay much attention to it until he fairly understands the sighting of his rifle, and can implicitly depend on it for accuracy.

Immediately before and during a match remain as quiet as possible; do not move about more than is necessary, nor talk more than you are obliged. There may possibly be but little for or against this advice; but where the exercise of the faculties is required to be concentrated on one object, it is most certainly advisable that others should be thought of as little as possible. "Chaff" is at all times to be deprecated at a rifle match, however truly good-natured it may be. do not chaff others, and if you should be chaffed yourself, treat it in good temper and with as much indifference as you can command. If advice be given you, even if you *know* it to be erroneous, always at least *appear* to be thankful for it.

If in a corps competition you have a *personal* friend, there is no harm in asking his opinion as to wind and elevation; otherwise it is advisable not to do so. It may cause unpleasantness to both of you, should his advice, however genuine, prove to be wrong; it is possible you may think it was purposely given. There are men too who, lacking the courage to refuse to give it, will purposely mislead; but we are proud to say there are others, even if we were shooting off a tie against them, on whose information and advice we could implicitly rely—men who would tenfold rather sacrifice the prize they were shooting for than purposely deceive. "*Timeo Danaos et dona ferentes*" is, generally speaking, the best maxim to abide by.

Opinions are divided as to the advisability of keeping a rifle constantly wiped out: some of our leading shots invariably wipe out their rifle after every shot; others very rarely clean their rifle at all; some, again, will wash out their barrels with a copious supply of water; while many will aver that, in spite of the virtues to be found in the mysteries of "Wishart" and of "Gould," there is nothing so effectual as saliva. Without wishing to disparage either of the above-named compositions, we must honestly confess that, so far as we have been able to judge from the experience of some years, they are in no way superior to it; and we are inclined to the belief that a vast deal more importance is attached to the fouling of a rifle than it deserves. It is true that after repeated discharges a ridge is formed just where the base of the ball lodges at the breech of the rifle; but if, as is the case, the force of the explosion expands the ball and fits, as it were, its sides into the grooves of the rifle, it is manifest that all fouling of the previous discharge must be carried away with it. The only fouling that *can affect the flight of the ball*, whether it has been discharged ten times or fifty, is that occasioned by the preceding explosion. A great deal of the hard incrustation at the breech may be got rid of if, after every discharge, the barrel of the rifle is held downwards and shaken by a blow or two with the hand. To test the truth of this, hold the barrel over a piece of white paper. Never in a match omit to use a cartridge-tester, for the charges in cartridges vary a good deal, very often sufficiently to throw you off the target.

With these few remarks we must close the subject of match shooting, and trust that the few hints we have given may be of some little use to our young readers at the commencement of their rifle career. Experience will soon acquire for them all further necessary knowledge.

THE SHOT GUN.

We must now turn our attention to another branch of our subject—the shot gun or fowling-piece—and would remind our readers that all the precautions we have hinted at under the head of rifle shooting are equally applicable to the shot gun, and are quite as necessary to be observed.

As no work can be properly done without good tools, so no one can expect to become a successful shot unless he has a good gun. This is the first step to be taken; and in these days of perfection of workmanship, in which our artizans are so nearly equal in proficiency, it would be invidious to name this or that maker; but, as the experience of the past five years with one of Daw's central-fire guns and his inimitable cartridges leads us to the belief that it is superior to every other kind, we can confidently recommend it. The central-fire cartridges of other makers are far inferior to them, owing to the slovenly make of the small anvil enclosed in the cap, which is flat, instead of being cylindrical as in the Daw cartridge, and consequently liable to cause miss-fires and accidental explosions by shifting its position, while the anvil in the Daw cartridge, fitting, as it does, the inside of the cap to a nicety, cannot be displaced, and such consequences are not likely to follow. We have fired several thousands of these cartridges during the last five years, and have never been annoyed by a single miss-fire. Another great recommendation is the absence of all escape of gas, the whole of the explosion taking place within the cartridge. In proof of this fact, it may be mentioned that we have frequently, after a hard day's shooting, passed a white handkerchief over the parts of the barrels where the cartridges are inserted without its being soiled. Safety in all matters connected with firearms is also a matter of great consideration; and as the Daw cartridge requires an *oblique* blow of the piston to explode it, it cannot by any possibility be ignited by a fall; and such an accident is rendered less likely to occur from the fact of the end of the cap containing the fulminate being *countersunk*, or, in other words, below the level of the face of the base of the cartridge. In proof of the superiority of these cartridges, we may add that they gained the first prize given by the Government, on the report of the Small Arms Committee, at the termination of the competition at Woolwich last year. It may also be added that the cases, after being used, are capable of being refilled and fired four or five times.

Within the last few years breech-loading guns have come into almost general use; and, although we are still wedded to the old-fashioned muzzle-loading gun so far as its shooting powers are concerned, yet we must admit the vast

DAW'S CENTRAL-FIRE GUN.

superiority of the breech-loader in every other particular. It is much safer, as the sportsman's hand need never be at the muzzle under any circumstances. It is far more expeditiously used, as powder, shot, cap, and wadding are all inserted in the barrel at the same time; and it is far more easily cleaned, as all that is required is to draw a piece of flannel attached to a string through the barrels once or twice after a day's shooting. The operation of filling your cartridges is certainly a tedious one; but a proper supply may always be kept in hand by devoting an hour or two on wet days. We would strongly advise our young friends not to attempt it at night, on account of the danger of a lighted candle or lamp being necessarily so near the quantity of powder which must be on their table. The best way, no doubt, if the expense be not an object, is to purchase your cartridges ready filled.

The above engraving was taken from one of Mr. Daw's best central-fire guns.

Fig. 1 shows the gun closed and ready for firing; Fig. 2 shows it when open, with the cartridge introduced into the barrel. A, the extractor; B, the base of the cartridge.

This gun is opened and closed by means of a lever, which lies under the trigger-guard, as shown in the drawing, and, when pressed downwards, withdraws a bolt, which, when the gun is closed, shoots forward into a slot in a block beneath and between the barrels. This method is far more simple and more easily worked than that in the ordinary breech-loading guns, in which the lever is pushed sideways.

The extractor applied to this gun is a most ingenious, and at the same time a most simple, piece of mechanism. It has no spring whatever, but is advanced or withdrawn by the action of its bevelled end as the barrel is raised or depressed. The end of the extractor has a groove, which fits the rim at the base of the cartridge, and withdraws the empty case when the gun is opened.

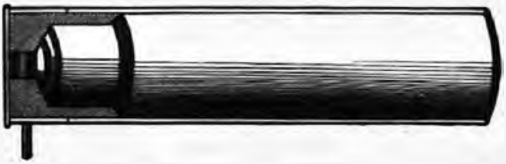
We do not think it necessary to give any description of the cartridge, as it is identical with that manufactured for the Snider rifle, which is fully described at page 501, the only difference being that shot is used with it instead of ball, and the case is made of paper instead of brass foil.

THE PIN-FIRE GUN.

We now come to the Pin-fire Gun, which was the first kind of breech-loader introduced into this country, and is still very extensively used, many sportsmen considering it quite equal, and indeed preferable, to the central-fire gun.

Tot homines tot sententiæ applies in this case as well as many others. This gun, as its name implies, is used with a cartridge, at the lower end of which, and standing at right angles with its side, is a brass pin, projecting about a quarter of an inch. At the upper side of each barrel of the gun is a small notch to receive the pin when the cartridge is introduced, and on the pin being struck by the hammer the cartridge explodes

The accompanying drawings show the gun closed ready for firing, and when opened for the purpose of inserting the cartridge.



SECTION OF PIN CARTRIDGE.

At the base of this cartridge will be seen a cavity in the pulped paper block, in which a small ordinary percussion cap is placed sideways, so that one end of the pin, which is inserted in a perforation made in the side of the base of the cartridge, falls into and rests on the fulminate. When, therefore, the pin is struck by the hammer, the cap explodes and ignites the powder in the cartridge.

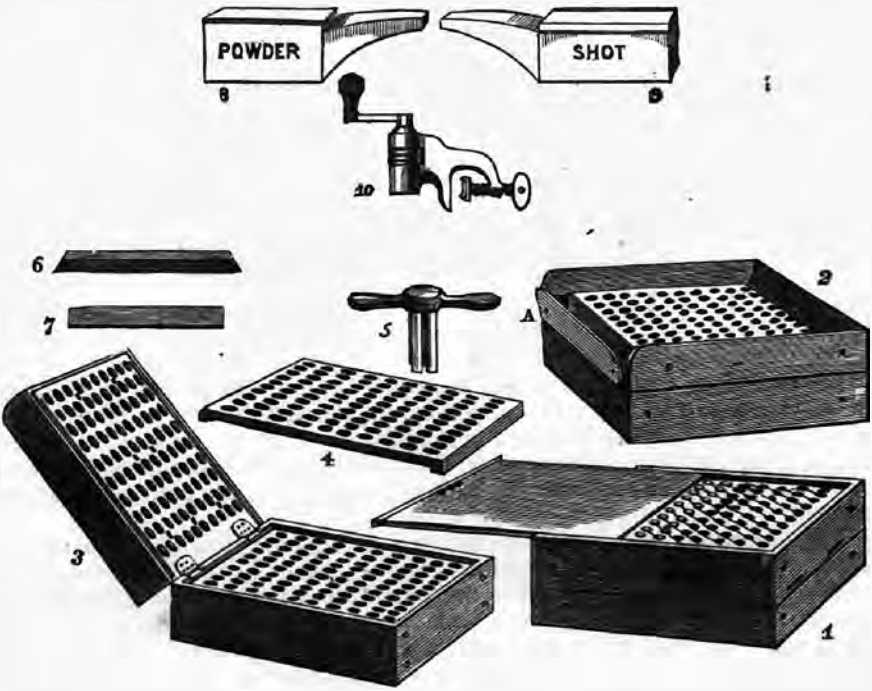
The objections in our opinion to this cartridge are twofold. One is, that, unlike the central-fire cartridge, it must be placed in the barrel in such a position as that the pin falls into the notch made for it on the upper side of the barrel; this requiring some little care, necessarily renders it a slower operation than that of loading with a central-fire cartridge. The other objection is, that there is always, more or less, an escape of gas through the hole made to receive the pin.

In spite, however, of the many advantages on the score of convenience,

THE MUZZLE-LOADING GUN.

quickness in loading, &c., possessed by the breech-loading gun, our love remains as it ever has been, unchanged and unchangeable, as regards the old muzzle-loader, which, so far as actual shooting is concerned, we still consider to be superior.

We give an engraving of this gun, but we consider it to be so generally well known as not to require any detailed description.



ERSKINE'S CARTRIDGE-LOADING MACHINE, FOR BREECH-LOADING GUNS.

We here give an engraving of a most ingenious contrivance for loading cartridge-cases, which we consider by far the best that we have seen. It is very simple and most expeditious in its operation, as a hundred cases may, by its aid, be loaded at once. The directions for using it are as follow:

1. Invert the machine, draw back the slide, as in Fig. 1, and place the cartridge-cases in position, fitting the *pin* cartridges in the grooves.

2. Return the slide, and place the machine as in position 2, fitting the powder-box, A, into the recess in front. Take powder-holder, 8, and scatter the contents over the surface; then with streak (Fig. 6) draw all the surplus powder forward into A, which remove and empty into 8. Place one hand at front of machine near the bottom, and with the other draw forward the top part as far as the slide allows, when all the powder will fall simultaneously into the cases below; after which slide back the top of the machine again.

3. Throw back the upper part, as in Fig. 3, and place the wadding-board (Fig. 4, filled with wadding) in position over the cartridges, so that the pin fits the hole at the top of the machine; then, with the rammer (Fig. 5), press home the wads, four at a time; after which, withdraw the wadding-board, and close down the machine, as in the second position.

The same process is gone through with the shot as with the powder; after which, let the machine set as in position 2, draw out the slide (bottom), when all the loaded cartridges will fall out on the table.

The bridge (Fig. 7) is used as a bar to place on the machine when less than a hundred cartridges are loaded, in order to prevent the powder and shot from passing into the holes when there are no cases below.

With the additional boards or slides on top of machine, extra charges may be added to any extent.

The turning-down machine (Fig. 10) will be found very effective and most simple, finisning off the cartridges without crushing and with great rapidity, by simply holding the cartridge against the revolving wheel inside the bore with the left hand, while rapidly turning round the handle with the right.

Having said thus much on the subject of guns and cartridges, and on the supposition that our young friends have possessed themselves of a really good gun, we will now proceed to give them a few hints as to its successful use.

The Method of Holding the Gun when Firing

is shown in the annexed engraving; many first-rate shots, however, prefer holding the left hand close against the trigger-guard: it is all a matter of fancy.

As what little proficiency we may have acquired was originally gained from a careful study of the late Colonel Hawker's admirable work, "Instruction to Young Sportsmen," we cannot do better than transcribe a few of his admirable directions. He says:

"First let a beginner take a gun that he can manage, and be shown how to put it to his shoulder *with the breech and sight on a level*, and make himself master of bringing them up to a wafer fixed on the wall of his room. Then let him practise at this mark; and when he can draw his trigger *without flinching*, he may proceed to take his second lesson, remembering that in doing this *the moment the gun is brought up to the centre of the object*, the trigger should be pulled, as the *first* sight is always unquestionably the best.

"Then send him out to practise *at a card with powder* till he is perfectly steady, and afterwards load his gun *occasionally* with shot; but never let the time of your making this addition be known to him, and the idea of its being perhaps impossible to strike his object will remove all anxiety, and he will soon become perfectly collected.

"The intermediate lesson of a few shots at small birds may be given; but *the above plan throughout* must be adopted at game, and continued in the *first* instance till the pupil has quite divested himself of all tremor at the springing of a covey, and observed in the *last* till most of his charges of shot have proved fatal to birds. If he begins with *both eyes open* he will save himself the trouble of learning to shoot so afterwards. An aim thus from the right shoulder comes to the same point as one taken with the left eye shut, and it is the most ready method of shooting quickly."

The failure in killing birds on the wing, or ground game running, is attributable in nine cases out of ten to firing too low, when the object shot at is going from the gun, or immediately at it when crossing from left to right, or *vice versâ*. When game is going from you near the ground, the aim should be full high, or the bulk of the charge, if not the whole of it, will pass below it; and when birds are higher than the gun going from you, the aim should be equally low, or the charge will pass above them. In cross-shots within say, thirty-five or forty yards, the aim should be at least a foot or a foot and a half in front of it; at greater distances the allowance should of course be more. In partridge shooting, always endeavour to get cross-shots if possible, and this may generally be done by walking across or heading your dog when pointing. If you go straight from him to the birds, they will generally go straight away; birds when flying across you present a far easier shot, and expose a more vital part.

Quietness in partridge shooting is a most valuable ingredient in a successful day's sport, and yet how seldom is it that it is practically observed and enforced! No one but those who have actually tested it on a hot day in September can form an idea what noise is made by two persons coming across a stubble; but when to the rattling and cracking of the straw is added the hum of conversation and the universal shouting of the keeper, "Car-lo!" "So-ho!" &c., &c., is it to be wondered at that birds should be considered wild? In nine cases out of ten, if silence were preserved the birds would lie well and be easy of approach. In proof of this, take an opportunity some day of lying down at the side of a field when two guns are crossing it, and you will be surprised at the noise they make, but will not be surprised that birds will not lie. Avoid calling or speaking to your dog as much as possible—a shrill whistle to attract his attention, and a movement of the hand in the direction you wish him to go, is far more effective, and will gain you many a shot which would otherwise be lost. Our limited space will not admit of our dwelling longer on this branch of our subject. Let us, therefore, say a few words on covert shooting, and on the prince of our game birds,—

The Woodcock.

Without any exception, the most difficult of all shooting is that of the woodcock; and the prince, no doubt he is, of all our feathered game. As compared with other game birds, he is scarce, and therefore eagerly sought after, and duly appreciated when bagged. To a novice his flight over a covert appears to be heavy, steady, and slow, owing to the apparently tardy movement of his wings; but in reality his pace is rapid: in fact, there is no bird that we know whose flight is more deceptive than the woodcock's; and so variable is it, that one never knows what to expect. As a rule, a cock, when flushed, will rise perpendicularly from the ground until he reaches the level of the top of the underwood, and then go away in a straight line. Sometimes he will rise in the way described, and then suddenly dart to the right or left as soon as he has gained the topmost branches. At others he will commence his evolutions directly he leaves the ground, and, instead of rising like a sky-rocket, will twist and turn amongst the stems of the surrounding bushes in such a way as to defy the quickest shot. The precise way to shoot a cock can only be learnt by experience. Like "a good hand for a horse," it is the most difficult thing to impart to another, however perfectly it may be known to oneself.

There is in our opinion more sagacity displayed by the cock in the way of eluding his pursuers than by any other kind of game. Unless you see a cock actually alight after being flushed, it is next to impossible to guess by the direction he was taking when you last saw him where he is at all likely to be found, and indeed we are almost inclined to think that the very opposite will be generally found to be the correct one! When a cock is flushed for the first time, he generally rises close to you; not so, however, the second, particularly if he be shot at and missed *(which sometimes occurs!)* He then frequently rises fifty or sixty yards away, and commences his darting propensities in a manner we can only compare in uncertainty of direction to a cracker when ignited and thrown into the air.

We have several times known a cock fly straight at us, and hoping to get a shot as he went away behind us, have waited for the purpose, and turned round just in time to see him make a turn like lightning round the stem of the nearest tree without giving us time even to pitch our gun to our shoulder.

The knowledge of the best places to search for a cock is only to be acquired by experience, so much depending on the general character of the country and on the weather.

In most parts of England one seldom hears of men going out expressly for cock shooting; they are usually taken as they come, while the coverts are being beaten for other game, and hence it is that so little is generally known about them; but in Ireland, Wales, and Scotland, where cocks are more abundant than in most parts of England, men go out expressly for cock shooting, and in these localities the habits of the bird are better known. How often have we heard such a remark as "What a beautiful covert for a cock this must be! 't is so wet, and there are so many springs." Never was a greater mistake. Though a feeder in damp places, there is no bird that likes to lie drier than a cock; and as he feeds for the most part during the night, he is seldom to be found near his feeding-ground during the day. Generally speaking, if a covert be large, with swamps and rills in it, a cock will be found on the high parts of it, and on the sunny side, particularly near holly bushes, or where the covert is thickest, where he can find shelter and lie warm.

If a covert be flat and nearly all swampy ground where cocks are known to feed, we should prefer searching for them in any small adjacent covert which lies higher and may have the benefit of the sun. We have noticed that in such situations cocks are more likely to be found after moonlight nights, and for this reason: that when the nights are dark, they are not much on the feed till nearly the dawn of the day, and therefore continue their meal in the day-time; but if the nights be light, having satisfied their hunger, they repair to such places for quietness, warmth, and repose. On a dull, drizzly day, cocks will be found to be much more on the move than on days that are dark or gloomy, and when they are plentiful may be seen on such days frequently changing their position, flying perhaps a hundred yards at a time in search of food. As a rule, if the nights are dark, search for a cock in the low damp parts of a covert; if light, look for him in the high parts. Cocks, however, are not always in covert. We have frequently killed them in turnips; and, as they frequent low swampy meadows in search of food, may often be found in dark, thick hedgerows adjacent to them. During a hard and long-continued frost, a cock may be expected to be found close to any running stream, and for this reason: that this is the only situation in which the ground is soft enough to admit of his feeding.

The difficulty of cock shooting depends, of course, in a great measure on the nature of the country in which he is found. Quick as he is in his movements in ordinary coverts in the south of England, where they are for the most part flat, or on hills of tolerably easy ascent, this difficulty is much increased when he is sought for in Scotland and in Wales.

There, his favourite resort is on the wooded side of deep ravines, principally where there is generally a tortuous stream or burn running at the bottom. We do not pretend to say that in such places his flight is different, excepting so far as it is varied by the irregularity of the covert itself; but as the walking becomes more like climbing among the rocks which one meets with, it of course follows that a man cannot use his gun with the same ease and quickness as he can on comparatively level ground; and as larch and fir plantations there form the greater part of the coverts, it is infinitely more difficult to shoot among a series of upright poles, each one of which will hold the shot, than when one has to fire through the branches of oak or hazel, when a cock may be killed, though not actually seen at the precise moment when the trigger is drawn. In such situations, a cock, when "flushed" high on the bank where he is generally to be met with in fine weather, usually flies nearly straight down the hill-side, and then follows the course of the burn for some distance until some object, such as an evergreen or a rock, presents itself, when he will, with wonderful quickness, suddenly dart round it and leave his whereabouts a matter of perfect mystery. He may have alighted close at its bottom; he may have ascended the opposite hill; or, what is very often the case, having "doubled" round it, he may have come right back almost to the spot where he was first found. We think, as a rule, where a cock is once "flushed," the place to look for him is where you did *not* see him last; for, even if you are correct in your supposition that he did actually alight, before you can reach the spot it is more than probable that he will have run some forty or fifty yards, and in which direction no one can tell but "Becasse" himself.

The best kinds of dogs, beyond a doubt, are spaniels trained for the purpose; though it is seldom they are met with, owing probably to the scarcity of these birds as compared with other kinds of game—rendering it not worth while, if not impossible, to keep dogs for the express purpose, and if kept, to retain their good training for want of practice. For our own part, under such circumstances, we prefer a steady old pointer and a retriever, or a retriever alone, who thoroughly knows his work and does not require to be continually spoken to, but who will "keep to heel," even when a bird is killed, until told to "seek dead."

Heather is a favourite resort of the woodcock, particularly when he first reaches the northern counties; and it is worthy of note that he is more frequently found on the shady sides of the hills in fine weather than on the sunny sides, as is the case in the covert. This may probably be owing to his preferring as dark a place as he can find for his snooze—the heather not affording so much shelter and shade as underwood and brambles

Cocks are found, too, occasionally in places where no one would think of looking for them, and which no length of experience would lead the oldest sportsman to search. We have "flushed" one in an old saw-pit, and more than one from a flower-bed on a lawn. We remember, too, killing one which got up close to a faggot-stack in a cottage garden.

We believe it is pretty generally acknowledged that there are two, if not more, "varieties" of cocks which visit this country, one being very much darker in plumage than the other. In Wales we know there is a cock called the "muff cock," from the fact of his having a sort of frill of feathers round his neck. We remember killing three or four of these birds in Glamorganshire, below Swansea, several years ago, but do not recollect ever seeing any like them elsewhere.

The Pheasant

must next demand our attention, though we cannot reconcile the method practised at the present day with our notions of legitimate sport. We dare say we should be laughed at if we were to assert that there are three varieties of pheasants in this country, "in a naturalist's point of view;" but, practically speaking, it is nevertheless true.

There is the wild and noble denizen of our woods (the common pheasant and the ring-neck), who has been hatched and bred there in his natural state, and who has been thrown entirely on his own resources for a subsistence; and there is the "Leadenhall"—a poor, lame, and effeminate wretch, who has passed the first part of his miserable existence in a coop, preparatory to being transferred to the above market *en route* to my Lord Puddledock's preserves at Murderem Hall, with about as much claim to the designation of a pheasant, in a sporting point of view, as a costermonger's pony has to that of a race-horse! He is turned down in a secluded part of a covert, regularly fed by the keeper, comes running out of the brambles when whistled to at feeding-time, and is so degenerate, and has passed such an artificial life, that in many instances he forgets, or rather has never known, his natural mode of roosting, and squats on the ground; and to save him from foxes, he is frequently driven up to the trees by the keeper!—who, if asked how his pheasants are getting on, replies probably in this way: "Oh, beautiful, sir; I never see'd such a splendid lot of birds in my life. I counted seventy-six cocks and almost as many hens *all round me* this morning at feeding-time; and I should think by the look on 'em, *they'll be ready in about another* *week.*" A party is accordingly duly invited, and the "sport" commences. As the beaters gradually pass down the covert, an occasional bird rises and is shot down often before he reaches the top of the underwood, but by far the greater number run some twenty or thirty yards in front of the men until the "corner" is reached. Here excitement is at its height! Most of the beaters are thrown back; the stems of the trees are struck to keep the birds from returning to the covert, and the head keeper alone goes forward; the birds rise by twos and threes, and dozens; the "sportsmen"—some nine or ten, or possibly more—stand round, all with breech-loaders, and many of them with two, and a man to load for them; and, as the birds all but darken the air, they are shot into from every direction. And this constitutes pheasant shooting of the present day!—one of the many results, unhappily, of "foreign aggression."

But sport, in its genuine sense, is not understood by foreigners, as stated, and correctly too, by Mr. Baker, the great Ceylon hunter and author already mentioned, who goes on to say: "The foreigner hunts for the pot, and by Englishmen alone is the glorious feeling shared of true fair and manly sport. The character of the English nation is beautifully displayed in all our rules for hunting, shooting, and fishing;" but we are inclined to fear that this feeling is fast degenerating, and exactly in proportion as foreign ideas of sport are introduced. "But what, then," may be asked, "are our ideas of pheasant shooting?" Our answer is that this kind of shooting as it used to be practised years ago, is the pheasant-shooting of the true sportsman; when the enjoyment consisted as much in witnessing the good working of clever spaniels as in the actual shooting, and a man was obliged to fag hard in covert in order to obtain anything like a bag; and no kind of shooting with which we are familiar (with the exception, perhaps, of cock shooting) equals it in fatigue and real hard work. For its thorough enjoyment a man must have good dogs trained to hunt, within twenty or thirty yards of him, and, thus provided, there are few better kinds of sport.

In hedgerows, too, these birds afford fine wild shooting, as they do also in gorse, where they are frequently found, should it lie anywhere near a covert. We have had great sport in the large fir or larch plantations on the Wolds of Yorkshire, where, we have noticed, these birds are unusually wild, and one rarely gets any but true "sporting shots."

Sport, in our opinion, increases exactly in proportion with its difficulties; and although if one goes to Rome one must do as Rome does, and must, therefore, submit to the mode of shooting as at present prescribed, yet we would ten times rather go out with a friend, or at most two, with three good dogs, and bring home our two or three brace of pheasants and a stray cock or two than take part in the finest *battue* that ever was provided, where it is impossible to tell what one shoots, and where we run every possible risk of being shot as well. The only real way of enjoyment at a *battue* (a plan we have always adopted) is, in a large wood, to lie back about a hundred yards from the end of the covert to which the birds are being driven, put our backs to a tree, and stand perfectly quiet; the hares and rabbits which run back and the pheasants which come skimming over the top of the covert will afford ample sport, the latter requiring real skill and good shooting. A man who can kill an old cock pheasant going his hardest over the top of the timber really well must be able to handle his gun in good style; but very little credit is due for the "pot shots" he is obliged to take at the corner, where everybody fires at everybody else's bird. The numbers of birds that are wounded and crawl away to die a lingering death after a day of this sort are simply incalculable; and although a good bag is what every good sportsman delights in obtaining by fair shooting, we have yet to learn that there is any real sport in wholesale murder, which requires but little skill in its accomplishment, and when birds are already as tame as barn-door fowls, and every means of escape denied them.

Rabbit Shooting.

There are few animals known to the English sportsman which afford so much genuine sport as the rabbit. Whether in covert or hedgerows, he is ever welcome to the lover of the gun, and when the regular shooting season is over he affords a fund of sport by means of ferrets. Difficult as the various kinds of shooting may be, none of them are more so than rabbit shooting, particularly in covert; and a man who is quick enough to kill rabbits really well, in our opinion is equal to any kind of shooting. As in other things, the "*savoir faire*" is the great secret. When this is acquired the art is reduced almost to a certainty, difficult as it may appear. As we have said in another branch of our subject, the cause of failure in nine cases out of ten proceeds from one cause, viz., not making sufficient allowance. It is very seldom indeed that a rabbit is missed by reason of the charge striking the ground *in front of him.* No kind of shooting with which we are acquainted requires such quickness, and yet there is nothing more simple when the knack is once acquired. In addition to the fact of firing well forward being the most successful plan, it is absolutely dangerous to adopt a contrary course; for generally speaking, in coverts either beagles or terriers are used, and in many instances a dog is so close to the "scut" of a rabbit in thick covert that unless your aim is *well forward* he will receive your charge, and the rabbit go scathless away. Rabbits require a very hard blow, and, unless struck in a vital part, will struggle to the last so long as they have any life, and if by any chance a burrow should be in the way, they will always scramble into it. Nothing will improve a beginner's general shooting more than practice at rabbits. He must be quick in order to succeed, and if he can pitch his gun and shoot a rabbit really well as he crosses a "ride" in a covert quickly, he need not despair of being equal to any kind of shooting.

Shooting rabbits to ferrets is considered to be no indifferent sport, though we have often heard it condemned. As it is usually practised very early in the year and during very cold weather, unless rabbits bolt well to the ferret we must admit it is very tedious work; but when, on the contrary, they bolt freely, we cannot admit its inferiority to many of the varieties of sport derived from the use of the gun. In this, as in most things, there is a right and a wrong way of going to work, and where one man in a morning up to his work will take his five or six couple of rabbits home with him, another, who is "at sea," will go empty away and vote this kind of sport no sport at all. The great secret is to observe the most perfect silence, and to avoid as much as possible moving from place to place. Never fire at a rabbit, no matter how near he may be to you, until he is well clear of a burrow; for if not, and you do not kill him *stone dead*, he will to a certainty crawl into it, and be the means of arresting the attention of your ferrets for perhaps hours to come. We have more than once seen men who would have been greatly offended if told that they knew nothing about the matter, when ferreting on a hill-side, the moment a rabbit was wounded, run their hardest down the hill to prevent his escape, and then wondered why the rabbits had suddenly ceased to bolt? Had they remained perfectly still a heavy bag would have been the result in all probability.

Rabbit-shooting in hedgerows is also capital sport when you have good dogs that are under good command, and will keep within thirty or forty yards of you; but let your rabbit come well out of the hedge before giving him his *coup de grace*, as you may possibly shoot a valuable dog, and for the same reason avoid shooting *into* the hedgerows,—have but a little patience, and you will have plenty of sport outside of them.

Rabbits by many may be despised; but, for our part, whether in the covert or on the table, we have a wonderful weakness for Bunny!

We will now direct attention to a branch of our subject which, though a great favourite of our own, may not be in accordance with the tastes of many of our readers, subjecting, as it does, its votaries to hardship, loss of rest, and exposure to cold and wet. In spite of these, however, we must confess to being passionately fond of it, and we feel sure that such of our young friends as have opportunities of engaging in it, provided they are disposed to "rough it," will find, as we have done, the greatest gratification in its pursuit.

Wild-fowl Shooting.

To a novice there is nothing more deceptive than the distance which birds appear to be when on the water, and many a well-directed aim is rendered fruitless by this simple fact, and a shot fired at birds in the belief that they were within range, serves only to frighten away, perhaps, some hundreds of ducks, &c., and is not the most likely thing in the world to improve the temper and to invoke expressions of tenderness and love. An old rule among wild-fowl shots used to be adopted (we are speaking, of course, when using an ordinary fowling-piece), viz., never to fire at birds until their eye could be seen distinctly; and if any reader should be disposed to try this test with fowls in a farmyard, he will, we think, find that their eye is not clearly visible at a greater distance than about thirty or thirty-five yards. Experience and practice, however, are the best guides in these matters, and will soon enable our young readers to judge pretty correctly. Simple hints, however, like these, will not be unserviceable.

Another most useful hint to bear in mind when in pursuit of these birds, is the fact that, quick-sighted as they are, their power of scent is ten times more sensitive; and we are sure it is possible to get a hundred yards nearer by keeping to leeward of them than by going directly down wind. Supposing birds to be on the water directly due north of the boat, the best way is to keep the boat's head about two or three points to the eastward or westward of north, instead of sailing directly down upon them. Little observances of this kind will frequently ensure a shot, where a disregard of them would most certainly have a contrary effect, while thus running down upon birds.

All moving about in the boat should be avoided, and the body kept as much from view as possible by the sails. The lower the position when firing, if a number of birds are together, the better; a larger family-shot may be made in this position than when standing, as the aim is not so likely to be distracted by the motion of the boat.

Of all the marplots which a wild-fowl shooter has to contend with, there are none so bad as curlews. Wherever there are wild fowl these birds are nearly sure to be found; they are, we believe, more quick-sighted than any other kind, and ten times more active. In proof of this, we remember when returning from a day's wild-fowl shooting, coming suddenly upon a number of these birds in a small creek in Canvey Island (on the Essex coast) feeding with a lot of sea-gulls; and, having been during the day disappointed of two or three shots at wild fowl by reason of their quickness and watchfulness, we felt inclined to wreak our vengeance upon them, and let go four ounces of BB's at the flock. Our annoyance may be guessed on finding that, although we had killed seven gulls, only one curlew was the worse for our visitation: they rose at the flash, and the whole charge passed under them, while the poor gulls, not nearly so active, received its full benefit.

Another hint we would give is, when firing at a large lot of birds on the water—we mean with a big gun—say from seventy-five to one hundred yards, always to aim point-blank at the three or four birds that are *farthest* from you within shot; for remember that, though only for a second or two, shot does take *some* time in travelling a distance. and if birds are with their heads up preparing for a start, as they usually are when you draw the trigger, they may move a few inches from the water, and those, therefore, that are nearest to you get the full benefit of the charge. Besides, the shot has a tendency to depression at that distance; whereas if you fire point-blank at those nearest to you, owing to the rising of the birds, however trifling, and the depression of the shot, the great body of it will pass under them. In shooting at a flock of birds, endeavour, if possible, to select for your aim those birds that are sitting with their heads away from you, particularly when using a small gun, in order that the shot may pass under the feathers: for every bird you will kill in this position you would fail to hurt two or three though you struck them sitting facing you.

Every one knows how much more guns suffer from rust in sea-air than they do from being even hours in the hardest rain. A sovereign remedy against the effects of sea-air and salt water is to anoint your guns thoroughly with mercurial ointment; but although this is a sure remedy it is a very disagreeable one, as it makes your gun so greasy. For your fowling-pieces set apart purposely for your boat shooting there is no plan like the following: In the first place see that your locks are clean and properly oiled; then fix them in their places, and take a little white wax and place it over the edges of the lock-plates where they join the wood of the stock, and then pass a hot knife over the wax till it melts and runs in between the wood and the lock-plates; your locks are then perfectly secure against wet and damp. And now for the barrels: take them out of the stock and give them a good coat of copal varnish, and let them remain in a warm room until the varnish becomes so dry as to be only sticky when touched with the finger; then get some bronze powder, which can be obtained at most of the oil-shops, and with the end of the finger rub it evenly over the whole of the surface of the varnish, and when finished put them away in a warm room until quite hard. In appearance the barrels look as if made of a composition something between brass and copper, but this system renders them perfectly impervious to mist or damp, and will last a whole winter. If you wish it, it may easily be removed with a little spirits of turpentine, and the gun when cleaned will look as well as ever. The best plan for a large shoulder or punt-gun is to give it two good coats of white paint, and perhaps a good coat of varnish. In spite of the cold and, we may say, misery attending it, we cannot help feeling that wild-fowl shooting, if really good and birds plentiful, is quite as exciting and enjoyable as any other sport the gun affords, supposing, of course, a man is well equipped for the purpose. A novice must expect that he will meet with many a bitter disappointment, and many a bitterly cold one too; but let him once get fairly among birds, and if he can handle a big gun well, is a judge of distance on the water, and is a tolerably good shot, he will, we think, be inclined to coincide in our opinion. We may mention here one thing which constantly causes disappointment to a young hand: he has "worked up" well to a "trip" of birds and well within range; he takes a steady aim, fires, and sees the whole flock rise and go away; he takes his eyes off them in disgust. Let us give him one hint: never take the eyes off the birds till they have gone right away, for it nearly always happens that there are several birds in a flock mortally wounded, which fly possibly one hundred or even two hundred yards, and then suddenly fall dead. We remember following and picking up five widgeon out of a flock which we thought we had fairly missed. We need hardly say we were more careful afterwards.

As we have often said, and as we all know to be a fact, the interest of sport increases exactly in proportion to the difficulty experienced in obtaining it, and to the pursuit of no animal with which we are acquainted which is a native of Great Britain, with the exception, perhaps, of the red deer, does this remark apply with more force and truthfulness than to that of the seal.

Time was, within the memory of men now living in the north of Scotland, when most of the rocky inlets of that coast swarmed with these curious animals, and there is a small rock in the Bay of Oban, in Argyllshire, only visible at low water, and certainly not more than fifty yards from the esplanade, on which five or six of them might be seen every day basking in the sun, regardless of the passing and repassing of people on the shore.

Matters, however, are far different in the present day, owing, no doubt, to traffic having increased tenfold in consequence of railroads and steamboats, and a seal is now looked upon as a curiosity whenever (and it is but seldom) it is seen. There are, however, many places out of the beaten track of tourists where, with some little difficulty, seals may be found.

More than once we have been told, "It is no use shooting them, for if you kill them you can never get them, as they always sink." With a novice and, generally speaking, even with sportsmen of mature years, this is perfectly true. Not so, however, with the old hand, and in this, as in most matters, there is a right and a wrong way of going to work. A seal, as we all know, though it spends nine-tenths of its existence in the water, is constantly coming to the surface, for the simple reason that he cannot remain more than a certain time beneath it.

A young hand, we will imagine, has discovered the haunt of a seal or two in some snug out-of-the-way bay, and has ensconced himself amongst the rocks, patiently awaiting the chance of a shot. The seal has appeared at the top of the water two or three times, each time coming nearer to our young friend, who has abstained from firing, in order that he may make certain of his prize. When he rises to the surface a few yards nearer, the coveted opportunity arrives—the seal's head appears: he places his rifle to his shoulder, takes as steady an aim as his nervous excitement will admit of, and fires; he shoots the seal through the brain, and it sinks, probably in twelve or fourteen feet of water, as he has been told it would do. He is certain his aim was steady, and that the ball passed through the seal's head, and that it was shot dead. This is quite true ; and now, then, for a solution of the problem, and for a simple method of avoiding such disappointment in future.

A seal, as we said before, is continually rising to the surface of the water for air. *Immediately* he appears he is shot, and in nine cases out of ten he sinks and is lost. Now, then, for a simple *dodge*, the result of some little experience which has never failed us. When the seal reaches the top of the water he has well-nigh exhausted all the stock of air he had imbibed at his previous visit to the surface; patiently, therefore, let him enjoy his next supply for, say, two minutes, and then give him his *coup de grace*, when he will float like a cork long enough at all events to enable you to reach him in a boat, for the simple reason that he will have been enabled in that time to take in a sufficient supply to keep him on the surface of the water. This is a dodge worth knowing, but one, simple as it is, we have met with few of the many we have known who have spent days in quest of these animals who were alive to it.

The seal, from the fact of its being an animal most difficult of approach, and unless shot through the brain most tenacious of life, renders it an object most greedily sought after. Remarkably quick-sighted, and possessed of the acutest scenting powers, it now, for reasons before stated, is rarely to be found but in the wildest and most solitary parts of the far north. Within the last fifty years these creatures were in the habit of congregating in a cave called "Gress," in the Island of Lewis, about nine miles north of Stornoway, in such numbers, that the natives used, for the sake of the oil obtained from them, to repair to it and slaughter them with clubs. This cave is most curious, its opening to the sea being but a few feet in diameter, and never dry even at low water; but after squeezing oneself through it in a very small boat, the cavern suddenly enlarges, both in height and breadth, being, we believe, in some places many feet high and 200 yards long, with no other outlet than the one mentioned. On the occasions alluded to, a certain number of the party used to remain at the mouth of the cave armed with spears, guns, clubs, &c., and the rest entered bearing torches, and the work of destruction began, and, as may be expected, but few escaped. We have twice visited this cave, but being unable to procure a proper boat or a man who could be trusted as a guide, we dared not venture into the interior; for, unless the water be perfectly smooth, and the proper time of the tide is taken advantage of, it is a service of no ordinary danger.

An instance is mentioned of a gentleman who made the attempt against advice, and, whilst passing through the low-arched entrance, the swell lifted the boat, and his head was dashed violently against the roof. The sound at the mouth of the cave is most peculiar, caused by the swell suddenly receding after having as suddenly closed the opening. At this spot seals may very often be seen on their way to or from the cave, but to attempt to shoot them under water would be about as useless a proceeding, as the Irish say, "as to whistle a jig to a milestone."

The only chance of shooting them (they may be killed inside in the way described, but butchery, we are sure, would not be desired by our young readers) is to take up an adjacent position and wait patiently till some of them either wriggle themselves on to the shelving rocks, or appear with their heads above water. We have often heard it asserted, but treated the statement as one of the marvels one is so apt to hear among country people, and placed no credence in it, that seals are particularly alive to the strains of music.

"Music hath charms to soothe the savage breast,
To soften rocks, and bend the knotted oak;"

and "humbug seals," the poet might have added, had he been with us one day off the Island of Scalpa, in the Sound of Sleat, which is between the Isle of Skye and the mainland.

It was Sunday, and of course we had no gun, but we plead guilty of having, with a view of trying the experiment, actually "whistled," and the seal, which had just appeared, followed the boat for some minutes. Keepers and others have assured us that their fondness for the sound of any musical instrument is well known, and that they may be enticed near a boat by means of it; but we cannot, from actual experience, state more on the subject. Should any of our young readers entertain a desire to shoot a seal, we can put them in the way of doing so, should they happen to be in the Highlands and in the neighbourhood of the island before mentioned. Near Broadford, in the Isle of Skye, at which the steamer stops on its journey northward, a great many seals may be found, and permission to shoot them be readily obtained. Loch na Keaull, in the Isle of Mull, and the small Isle of Ulva, on the western side of it, are both frequented by seals, as is also the small island called Canna, on the south-western side of the Isle of Skye, and the greater part of the Ross-shire coast.

We would strongly recommend no one to go out expressly for the purpose of shooting seals without a lump or two of lead attached to a stout cord, and a piece of cork at the other end; for if a seal sinks when shot, you can at once mark the exact spot by dropping the lead immediately over him and allowing the cork to float; the water is generally so beautifully clear, that a seal may be plainly seen at the bottom of fourteen or fifteen feet of water, and may, under such circumstances, be easily removed by means of a grapnel made of three large hooks fastened to a lump of lead of a pound weight and a stout line.

Should a seal, while basking on the rocks, be only wounded, the best way of securing him is of course, if possible, to get between him and the water, and to seize him by the fin or flipper, avoiding the chance of his bite, which is awfully severe; and we would suggest the greatest caution in approaching him from the rear, for in his exertions to escape—(we do not believe it is designedly done)—he will cast the shingle and stones with great force behind him, and a cut from his posterior flippers is no joke! A struggle with a wounded seal is no easy task, as he is immensely strong, and can inflict the most desperate wounds both with his teeth and claws.

He is, nevertheless, a prize worth all the trouble he occasions. The oil produced from his blubber, which lies between his skin and flesh, is valuable for dressing sea-boots; and his hide, if well dressed, makes a famous bag for carrying clothes, etc., being perfectly waterproof, and will wear for a lifetime.

Any exciting incidents which occur during the life of a sportsman are calculated to take such hold on the mind as to be but rarely forgotten; but we doubt much if any of our Lord Chancellors ever felt more dignified by the possession of it, or on whom a greater *impression* was ever made, than on us on the occasion of our obtaining our first *great seal.*

Snipe Shooting.

Lest we might be thought to have forgotten the subject, we feel we ought to say a few words on this particular branch of it. To a beginner there is no bird more puzzling, and, therefore, more difficult to shoot. Its flight is most uncertain, most variable, and most irregular—rising at one time as evenly as a lark, and flying close to the ground with scarcely the slightest deviation from a straight line; at another, springing from the ground as if fired from a gun, and then flying in a zigzag course to the right or left, and, indeed, in every direction; and sometimes, again, rising to a great height, and then going straight away with the rapidity of lightning. And yet, with all these apparent difficulties, when the knack is once acquired, it becomes comparatively easy —indeed, is reduced almost to a certainty: the great art in this kind of shooting is coolness and to avoid being too much hurried. And, in this, as in every other kind of shooting, the first sight is the best: the moment you are "well on" your bird, the trigger should be pulled. In cross-shots, fire well before your bird.

Contrary to the usual practice, you should always walk down wind; the reason for this is that snipe always rise against it. Sometimes snipe are very wild, and at others will lie until they are almost trodden upon. If there be much wind, your best chance is to "down with them" as soon as they rise from the ground, or you have little hope of getting a bag.

This kind of shooting is rendered more difficult by the kind of ground you have to walk over. In a smooth, even marsh, perhaps, in this respect it differs but little from any other kind of shooting; but where there are occasional rills and the marsh is "tussacky," the mere fact of your footing being uneven and unsteady will render your position most puzzling, particularly when birds fly suddenly round you to the right or left. Bogs and marshes, however, are not always the only places to find snipe. In a sharp frost, the best situations to search for them are the sides of running water, for snipe can only feed where the ground is soft enough to enable them to insert their bills into it; and in very wet weather, when the marshes are overflowed, they are frequently to be met with in turnip-fields, in stubbles, and on grass land; for, although fond of *moist* ground, a snipe will not alight unless the water is shallow enough to enable him to wade without wetting his feathers.

A steady old pointer or setter is most invaluable for this kind of shooting, and so is a retriever if accustomed to it; for, not only will he show you when he is "on" snipe, but he will save you many a long search for a dead one, for we know of no more difficult bird to find—(nature has so assimilated the colour of his plumage to his haunts that you may pass close by him a dozen times without seeing him)—and this is a great consideration on a short winter's day, when every minute is an object.

The common or "full" snipe on rising—particularly if not shot at—will generally rise to a great height, and after many evolutions in a circular direction, will return and drop at the same place whence he started, or not far from it; while the little Jack snipe, even when shot at and missed, will generally alight again within fifty yards. This little bird is particularly fond of very rough ground at the side of a ditch.

The best sized shot is No. 8 for both these birds.

We cannot better conclude our article on this subject than by giving a few practical hints; and, first, as to

Dress.

The dress for shooting should be adapted, of course, to the season of the year, and also to the kind of covert. For grouse shooting there is nothing better than knickerbockers, and shoes made to come well over the instep—broad in the tread, low and broad in the heel, and nailed with about a dozen nails, and no more; for when the sole of a shoe is thickly studded with nails, they, of course, afford a smooth surface to stones, rocks, &c., and are therefore, more likely to cause a fall than prevent it; whereas, if the nails are wide apart, the edges of stones, rocks, &c., get between them, and the foot is prevented from slipping. The best hand-knit stockings, which can be purchased at the Scotch warehouses, are all the covering required for the legs, and are quite a sufficient protection from the heather; knickerbockers, a long waistcoat, and a short jacket complete the dress. In partridge shooting the same dress may be recommended, substituting lace-up boots for the shoes, and adding a leather gaiter to be worn over the stockings. Trousers are also good, but they are much improved if, from a little above the knee, they are covered with the leather made from the seal-skin to be obtained at the leather-sellers'. The trousers should be cut off a little below the knee, and the seal-skin (glazed side outwards) sewn on: this completely resists thorns, &c., and is perfectly impervious to water, so that all mud, &c., may be at once removed with a sponge.

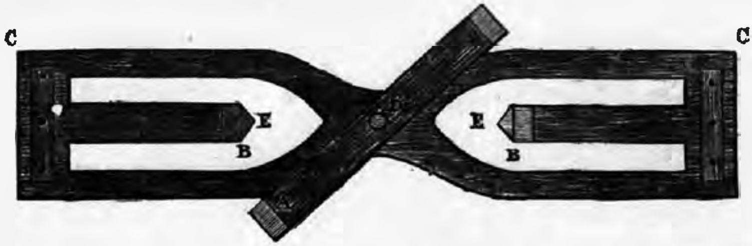
The same dress may be recommended for covert shooting, as may also a boot reaching to the knee, and a pair of old trousers cut short so as to fall about three or four inches over the tops of boots. For wild-fowl, snipe, &c., there is nothing better than these boots, particularly if wet feet are dreaded; but when (as it used to be with us) a matter of indifference, the lace-up boots are to be preferred, as they are so much better for walking.

For wild-fowl in a boat, nothing equals the long fishermen's boots, with a couple of pairs of thick yarn stockings under them, plenty of flannel, a thick woollen Jersey, and a loose, short, double-texture macintosh overall, and a sou'wester. A pair of easy leather gloves may be worn, and over them, in very cold weather, a pair of woollen mitts, which are warmer than gloves, and can be instantly taken off when the gun is to be used.

How to carry Birds.

The subject of carrying birds has for years (trifling as the matter may be) been a source of much annoyance. In hot weather nothing is worse or more likely to ensure their going bad than carrying them in a basket or game-bag; and all the contrivances we have seen (though, as regards the birds, answering the purpose) are very awkward to carry from their great length, and from offering, moreover, too tempting a weapon in the hands of an angry keeper in the case of a refractory dog or a wounded hare, and when thus used are sure to come to grief—the long ones are very apt to spring open and let the birds fall out. The sketch below will probably sufficiently describe the carrier we have used, and which we can confidently recommend. The pattern was given to us by an old friend and sportsman, and can be easily made by any carpenter, or, indeed, by our young friends themselves.

It should be made of oak three-quarters of an inch thick, 5 in. wide, and 28 in. long. The slits or openings for the necks of the birds should be 9 in. long and 1 in. wide; the solid part or handle 6 in. long, and have the edges rounded. It will be observed that the grasp of the hand keeps the cross-piece in its place, and effectually prevents the birds falling out. A A, is a piece of wood turning on the pivot, D, having bevelled ends, which, on being shut down, slide under the edge of the blocks, B B, and thus, while they prevent the birds from falling out, support the two tongues between the slits, E E, being the points at which the birds' heads are inserted. C C are two flat pieces of brass screwed on to strengthen the wood at each end.



To such of our young readers as prefer the muzzle-loader, a capital contrivance for carrying the lever shot-pouches may be worth their attention. Any saddler can arrange it for them. A short strap must be sewn to the bottom of the pouch and carried upwards, A, to just below the socket which carries the charger, where another small strap, B, must be sewn round the pouch, and to this piece must be sewn a strong iron ring, C, about three-quarters of an inch in diameter; then procure one of the brass swivels, D, which are used for the pillar-rein in a stable: this must be fastened to a piece of strap 2 in. long which must be sewn to another strap about 2 in. broad, which is to be worn round the waist. By this contrivance the weight of the shot is not felt; none of it can escape in getting over hedges, &c.; it is ready to the hand, as it falls under the skirt of the coat.

It is a good plan to carry in the pocket of the shooting-coat a piece of macintosh about 15 in. square, which will be found very useful to sit on on a damp bank, piece of timber, &c., when taking luncheon, as in damp weather nothing is more likely to give a severe cold.

If the mode of carrying the shot-pouch above described be not approved of, it is a good plan to have pockets made in the *waistcoat*—one on each side—sufficiently large to hold the powder-flask and pouch, as the weight, being close to the body, is not felt. Avoid as much as possible carrying anything heavy in the *coat*, as nothing is so tiring as carrying a weight which is continually swinging about.

Home Pets.

We have now to talk about Pets—pets furred and feathered, biped and quadruped, that is, two-footed and four; pets with tails—some curly, some straight, some short, some long, and some without tails at all; pets with beaks, and beakless; large pets and small, pretty and ugly—for some cherished and petted creatures are valued chiefly for their excessive ugliness; pets gentle and fierce, playful and savage; some that have musical voices, and some that utter only discordant cries and screams; pets that play all manner of tricks, and sullen, morose pets that will not play at all, but only eat, and drink, and sleep, and look solemn. But, whatever they be, we should always remember that God has given them into our care, and it is our duty to treat them with kindness and see that their wants are well supplied. And so, with this little introduction, let us begin with that most charming kind of pets—

CAGE BIRDS.

Here at once we plunge into a wide subject, and must take care we do not lose ourselves and lead our readers astray. We wish to give them as much sound, useful information as possible in a small space, and therefore shall say little about the poetical associations of the delightful songsters that make our homes so lively and musical. We might talk by the hour of all the beautiful things that the poets have said and sung about them, and quote

PETS.

long passages of description from those who have observed them in their wild state; but this, although very delightful, would not accord with the object of this book, and perhaps the boys and girls for whom we write would not care to read them, although they must be pleased, when they take their walks abroad, to observe for themselves the interesting manners and customs of the feathered people.

A young friend of ours who was grievously tormented by having exercise papers to write on various subjects, generally used to begin by saying that chalk or cheese, iron or indigo, tea or tobacco, or whatever the subject might be, was of two kinds, and when he had got as far as this he was out of his depth directly, and floundered about in a sad state of bewilderment. Well, he was right: there *are* two kinds of most things—good and bad; but this simple arrangement will hardly do for our present subject.

Of cage birds there are a good many kinds, and one scarcely knows how to classify and arrange them. Scientifically, we might do it easily enough, and set them forth all in apple-pie order (whatever that may mean), in orders, and genera, and species, with a lot of Latin names attached, that few of our readers would understand, and therefore they would most likely turn away from the page and say, "Bother science!"

We say so too, and, notwithstanding the frowns of Minerva, who, every boy knows, was the Goddess of Wisdom and grandmother of Dr. Birch, we shall leave science out of the question, attempt no arrangement whatever, and try to make everything as plain as A B C. Now, let us begin with

The Canary,

that most delightful of all feathered songsters; and in saying this we do not forget the nightingale, the poets' favourite, that certainly has the richest and most melodious *natural* song of any bird that we know of. But then we only hear the nightingale for a short period in each year, and very seldom see it, and if we did there is little to please the eye in its appearance: it is a plain brown bird, and not particularly lively in its motions. It seldom lives long in confinement, and very rarely becomes quite reconciled and familiar. But look at the canary, which is a kind of finch, a hardy, lively, playful, and beautiful bird, a most accomplished musician, and never weary of pouring out his sweet strains, in which are combined the various excellences of all the best feathered songsters, added to its own natural song. Some canaries that have had nightingales for music-masters—and this is often the case in Germany, where they have regular schools for them, and elsewhere—sing so like their instructors that one can hardly distinguish between them: they have quick ears and retentive memories, and are very docile and teachable pupils. Beautiful did we say? they are most beautiful, and sprightly, and loving. Why, of all pets the chiefest is ever the pet canary. How well he looks in that pretty cage, hung aloft out of the reach of the puss, or flitting about in the aviary, or hopping about on the breakfast-table, or perching on his mistress's shoulder, in his bright golden plumage, or it may be a more varied dress of black and yellow fading into white, or mottled with green!

Canaries are great favourites with bird-fanciers: on their breeding and education they bestow much pains, and from their sale they derive a large part of their income. Many are bred in this country; but it is from Germany that the chief supply is obtained. The price of a good singer varies from a crown to a guinea, and even more. In the canary shows, at which prizes are given for the best birds, shape and colour are considered more than powers of song, and no birds are admitted to those shows unless they come up to a certain standard of excellence in these respects, however fine a singer he may be. The show birds are arranged in classes, in accordance with some peculiarities of colour and marking. There are "Jonques," and "Lizards," and "Mealy birds," and other names cunningly devised to puzzle simple people, and exalt canary-breeding into a science; but we must not trouble ourselves with all that. Once more—Bother science!

The canary, as my readers are doubtless aware, is not a bird native to Britain. We never see it flying about in the woods and fields like the larks and its relatives the pretty finches. Originally it came from the Canary Islands—turn to your maps and see whereabouts *they* are. But the wild birds are not so beautiful as those we behold in our cages and aviaries. Cultivation has improved the appearance, as well as the voice, greatly. All, or nearly all, of the wild canaries are grey, with a greenish tinge; the rich golden plumage which is so familiar to us, is seldom seen among them. They were first brought from their native islands as long ago as the latter part of the sixteenth century certainly, perhaps earlier than this, and the first European ground in which they found a resting-place was that little island in the Mediterannean Sea called Elba. It is stated that a ship, bound for Leghorn, with some of these Canary Islanders on board, was wrecked at Elba, and the prisoners escaping, settled and bred there; and in this manner, we are told, the first canaries found their way into our quarter of the globe. Since then, how many thousands have been brought from their distant home, and how many millions, we had almost said, have been bred and dispersed all over the world! Throughout England there are canary-breeders, and it is curious to note how many of them are either hairdressers or weavers. Yorkshire and Norfolk are the two counties that send out annually the greatest number of these birds; those from the former county are most celebrated for their strength and powers of song, those from the latter are the most graceful and beautiful birds, as they are also the most delicate. They are generally sent up to London in the autumn, and then is the time to choose a canary pet, when the markets are well stocked with young and vigorous birds. From Prussia and Belgium they generally come earlier in the year, and among these foreign importations are some of the finest songsters. The dealers live in all parts of London, but chiefly in the neighbourhood of Holborn and Oxford Street in the west, and Clerkenwell and Whitechapel in the east. They are no doubt very honest people, but they sometimes make mistakes. so it is best, when you have made choice of a bird that pleases you, to *bring it away.* We have known such a thing as a hen substituted for a cock, in which case you do not get what you doubtless require, a sweet songster; for the hen does not sing—she only, as the breeders say, "chatters."

"First catch your hare," says Mrs. Glasse in her famous cookery-book, "and then skin it;" but if nobody ate hare until he or she had caught one, there would be few hare-eaters in the land. People generally have their game caught or shot for them, and so they have their canaries bred and trained for them, and they must first buy one, and then put it into a cage. And what sort of a cage should it be? Why, a pretty cage, of course. Yes, but prettiness is not the only quality which recommends it: soft wood, such as fir, should never be used in the construction, as this would be likely to breed insects, with which cage birds are often much troubled. A metal cage is perhaps best. as it can be most easily cleaned, and can be made very light and pretty. The shape should be circular, and there should be at least a foot in height of interior space, and eight inches in length and breadth; there should be two or three perches, one very near the bottom, so that the bird can stand on it and peck from the seed and water-vessels, which are best of glass; another about half-way up, and one yet higher, unless there is a ring suspended on the top of the dome; these perches should cross each other. The breeding-cage, of course, must be more roomy, and of a different shape; but about this we can give no directions that would be of much service: if any of our readers mean to go into canary-breeding, a book on the subject had better be procured.

Take care that your canary cage is not hung in a draught, or in a place where there is a foul smell of any kind; the lungs of the bird are very delicate, and many a pet has languished and died without any perceptible cause, through breathing keen or unwholesome air. If in a room where gas is burned, the cage should always be lowered or taken away before it is lit, as the air above soon gets heated and unfit for breathing.

Seed and water-vessels are best of glass, as they can be most easily kept clean and bright, as everything about a bird should be—clear as the crystal water and bright as the sunshine in which it delights. Yet there should be provision made for shelter, too; it cannot live always in a glare: naturally much of its life is passed in the shadow of green leaves, so let it have some green about it when in confinement, leafy boughs that quiver and wave as the breeze kisses them, and fresh flowers that give out a pleasant perfume, or, if these are not available, draw a covering of emerald-tinted gauze, or some other thin stuff, partly over the cage when the sun is hot and bright. All this is very troublesome, perhaps you will say; no doubt it is, but remember that all pets are kept for the pleasure or profit of the keeper, and it is pure selfishness to grudge any pains or expense which may help to render their lives happy and comfortable; besides, if the pets are really loved, this necessary attention to their wants and comforts will not seem a trouble; if not, they had better not be kept.

Canaries, like all shut-up birds, are subject to a variety of diseases, which probably do not affect them in a wild state, where they have plenty of air and exercise, and the food which exactly suits them. We cannot enumerate all the ailments to which they are subject, but may just lay down two or three simple rules by which they may be kept in health.

First, as to suitable food, without which no bird or other creature will keep well. Rape and canary-seed mixed in about equal proportions, with now and then a little linseed added, is best under ordinary circumstances, and green meat, such as water-cresses or groundsel, of which all finches are especially fond; but this should not be allowed to remain in the cage over twenty-four hours. A little piece of sugar may be placed between the bars for the bird to peck now and then, but not often; nor should sweet cake, or rich food of any kind, be frequently given, as it is likely to produce surfeit. When breeding or moulting, hard-boiled eggs, chopped small and mixed with crumbs of stale bread or bun, with a little maw-seed; fresh clear water, changed every day, and a scrupulous attention to cleanliness. Attend to these simple rules, and your bird will be brisk and blithe, and well repay your care and attention by his sweet song and pretty engaging actions. If he can be let out to fly about the room occasionally, so much the better, and better still if he can have the range of an aviary.

The claws of canaries, like those of other cage birds, often get uncomfortably long. when wild they keep them short by scratching. When they require cutting, it should be done with a sharp pair of scissors: the bird to be operated on should be taken gently, yet firmly, and the toes turned up to the light, so that you can see how far it is safe to cut. When moulting-time is coming on, which is generally in the autumn, the bird loses its liveliness, and becomes silent; then the cage will be strewn with feathers, and then is the time for extra care and nourishing food, such as chopped egg and maw-seed, with a little saffron in the water.

We need but mention one more troublesome visitation, which one is indeed often a legion: if you see your pet canary moping about, moving restlessly from side to side of his perch—which should always be of a good size and round, so that the bird's claws can grasp it tightly—and seeming generally very uncomfortable, take him out of the cage, blow open the feathers beneath his wings and other under parts, and you will, no doubt, see a number of little crimson dots, which are the insect pests called red mites. It is extremely difficult to get rid of these when once they take possession of a cage: the best plan to rid the bird of them is to put about ten grains of white precipitate powder into a wine-glassful of warm water, and with this solution wash the bird carefully wherever the mites are likely to be, taking care that none of the solution gets into your pet's eyes, nose, or mouth; then wash him well with clean warm water, wrap him in flannel, and put him in a warm place to dry. The cage should also be well washed in precipitate-water of about three times the above strength; if a wooden cage, with many holes and crevices, it had better be destroyed. These mites, which are a small kind of bug, often infest breeding-cages, and so torment the sitting hens that they leave their nests, and so render the hopes of the breeder futile.

Cross-breeds between the canary and other finches are called "mule birds." Some of them are highly valued for their beauty and powers of song; none of them more so, perhaps, than that between the canary and

THE GOLDFINCH.

And what a beautiful bird is Master Goldie!—the "Goldspink," as he is called by some—the "Thistle-finch," by others, from his love of the downy seeds of the thistle. Naturalists name him *Elegans*, which means elegant, and the term is well applied, for he is so, both in shape and arrangement of colours on his plumage of buff and brown, that melts away into white in the under

parts, and is ornamented with gold and crimson. He is a docile and affectionate bird; has a good natural song, capable of great cultivation; and is not so liable to diseases as many other feathered pets. Several varieties are known to fanciers under the names of "Whitethroats," or "Cheverals," which have a white streak entirely down the throat; "Bastard Whitethroats," with the streak half-way down; "speckled birds," with one or two white spots only. All these fetch high prices, not because they are more beautiful than the others, but because they are more rare; and a thing generally is valued more on account of its rarity than for its beauty or utility.

Canary and rape, with maw and poppy now and then, and hemp in the breeding season, are the best seeds for the goldfinch, with thistle and groundsel, in seed, when they can be had.

This, as well as several other pet birds, can be taught to draw its own food or water, as shown in the illustration.

THE BULLFINCH

is another highly valued cage bird, very handsome, and gentle, and teachable. Like his near relative Goldie, he may be taught all sorts of tricks, such as drawing up a bucket from an imaginary well. But we should not care to give him much of this sort of work to do: it is amusing and pretty to see, but the bird never really likes it, and we should not punish any creature for our pleasure.

This bird has a rich and flexible voice, and may be taught to pipe any simple tune when young. Piping bullfinches fetch high prices. The Germans take great pains in teaching them, and have regular schools for their instruction, in which they are divided into classes, with a teacher to each. The birds are kept very much in the dark at first, so that their attention may not be diverted from the tune which they have to learn; this is sometimes whistled to them, at others played on a hand-organ or flute. The teaching has to be continued for about three-quarters of a year, and as with children so it is with these feathered pupils, some are much quicker at learning than others. There are bullfinches that whistle or pipe three distinct airs, and these will fetch several pounds; but generally they have but a single simple air.

There are curious varieties of this species, such as white, black, and speckled, and these are highly valued on account of their rarity; but they are nothing like so beautiful as Bully in his natural plumage, with his black velvet cap and coat of soft grey, deepening at places into blue, with a fine vermilion tinge, like the reflection of fire, over the breast and under parts.

"Peck-a-bud" the gardeners call him, and no doubt he is mischievous among the fruit trees; but he pecks off the green buds chiefly because he knows there is a little green maggot under, which would prevent its coming to perfection; and he likes a few ripe cherries, just as payment for this service. So don't shoot him, Mr. Gardener, he is so beautiful and such a sweet songster.

In confinement he should have rape, poppy, and millet-seeds, with now and then a little sprouting wheat, barley, or oats; lettuce, water-cresses, ripe fruit, and, as a great treat, cracked nuts—which he can eat, having a strong bill. Hemp-seed should not be given, or he will become too fat, and liable to apoplexy.

Young bullfinches should be reared upon rape, bread and milk, with a little soaked hemp-seed bruised in a mortar, or buckwheat-meal.

Other Finches.

The Chaffinch, the Hawfinch, the Greenfinch, the Serin Finch, and the Siskin or Aberdevine, are all birds of this family, which are sometimes kept in confinement, and valued on account of their beauty of plumage and singing powers.

SISKIN.

Most of the finches are very neat nest-builders, and the first-named of the above is the neatest of all; its natural song is not much, but it is a bird which may be easily taught, so that it often becomes a very good songster indeed. It is a pretty creature too, and so brisk and cheerful that the French have a proverb—"as gay as a chaffinch;" while to show the high value set upon it by the German fanciers, we may quote their saying, that "a chaffinch is worth a cow." The treatment of this bird in confinement should be pretty much the same as that of the other finches: but it mav haye more hemp-seed than Bully.

The Hawfinch is large and handsome, but not a good bird for the cage or aviary, as it has no vocal powers. The Greenfinch is pretty and vivacious, and a fair songster: it is properly a linnet, but is generally called a finch. The Siskin has good powers of imitation, and is a pleasing, lively bird. The

Serin finch is an intelligent foreigner, but seldom seen in this country, never in a wild state.

There are also many other finches, brought from various countries, and very beautiful some of them are, but we have not space to describe them, nor is it necessary for our present purpose. Let us now take a glance at

THE LINNETS,

one of which, we may remember, bore the torch at the burial of poor Cock Robin, after he had been shot by that wicked Sparrow.

"Who'll bear the link?
'I,' said the Linnet,
'I'll fetch it in a minute:
I'll bear the link.'"

Bechstein, the great German writer on cage birds, says that the linnet has a very agreeable, loud, and flute-like song, and that it utters some high-sounding notes, which are called its crowing, on account of their resemblance to the crowing of a cock, and that it will not only learn the song of any bird that it hears, but also imitate melodies of airs and dances which are piped to it, and it will even learn to repeat some words.

The linnet is a plain brown bird generally, with black marks and shadings. At some periods of its growth, the forehead becomes of a blood red, and a reddish tinge prevails at other parts of the plumage, and then it is commonly called the "Redpole." It is in the male bird of about three years old that the change of colour is most noticeable.

The term "linnet" comes from the Latin *linium*, flax, and originates in the marked fondness of the members of this family for the flax, or linseed, as it is usually called.

Linnets, like larks, are gregarious birds, that is, they go in flocks in the winter; and then the net and the gun play sad havoc among them. The lesser redpole, spoken of by some writers as a distinct species, seems to be but a smaller variety of this bird, whose proper food, in confinement, is rape or linseed and canary. For the young, soak crumbs of bread and bruised rape-seed, squeeze tolerably dry, and mash together.

THRUSHES.

These are large birds, and require more ample space than those we have hitherto spoken of. A thrush's cage should be of wood, at least two feet long, by one and a half wide, and about the same height, with a shelving roof like that of a house, and solid back and sides. The water and food-vessels should be large, and placed outside the cage, for the bird is a gross, untidy feeder, and makes a sad mess if he has a chance of doing so. Barley-meal moistened with water is a good general food, with a little hemp-seed, and now and then a worm, or snails with shells just cracked: when at liberty the thrush, which is a great snail-eater, manages this himself by taking it in his strong bill and knocking it against a stone or other hard substance. Keep the bottom of the cage well cleaned.

Thrushes are not good birds for the aviary, as they are greedy and dirty; but they are fine songsters, and therefore often kept in confinement; a little too loud, perhaps, for most people, and too constant. a caged thrush will begin to tune up as soon as it is light, and keep on, with but short intervals, until it is quite dark. Its music sounds very sweet when mellowed by distance, coming across intervening fields and woodlands, but is ear-splitting when too near. The natural song is good, and may be much improved by instruction.

The common brown, or Song-Thrush, called by old English writers the "Mavis," is the species usually kept; but the Missel-Thrush, that feeds much upon mistletoe-berries, and, from being particularly noisy before a storm, is often called the "storm cock," is sometimes made a pet of, and becomes very familiar; as, however, he cannot sing, and is much given to screeching, he is not a desirable house bird. He is the largest of the thrush family, in which is included the much-admired

Blackbird,

a rich and mellow songster, very handsome in his glossy black plumes and golden bill, affectionate and intelligent. He may be taught to whistle simple airs. In his natural song there is not so much variety as in that of the thrush; but it has in it more of richness and melody. He, too, wants a large cage, with plenty of water for bathing, barley-meal, and moist food, ripe fruit as a treat, and frequent cleaning. Young thrushes and blackbirds should be fed upon white bread soaked in milk, and a little raw meat, chopped fine.

Larks.

A favourite cage bird is the common Skylark, or "Laverock," as the Scotch call it; but it always seems a pity to make a prisoner of such a creature as this, which delights to soar and sing in the open sky, above the corn-fields and breezy commons and wide grassy downs; and yet he does not seem unhappy in his confinement, but sings away, from morn to night, right merrily, amid

the bustle and din of the busy city. It is a strange sound to hear in the crowded street, the joyous trill of this "bird of the wilderness," as the Ettrick Shepherd called him, "blithe spirit," as he was termed by Shelley, whose "Ode to the Lark" is one of the most perfect poems in our language; a strange sound that takes one away to the quietude of nature, and somehow refreshes the mind.

But we must be practical, and not poetical, so, if you do have the skylark for a pet, give him a good roomy cage, with a circular front projecting like a bay-window, where he can stand out and sing to his heart's content: a piece of fresh green turf should always be placed there for his feet to rest upon.

He is a pretty, lively bird, with a somewhat slender body, and longish legs, with toes that spread out a great way, and are armed with sharp spurs. There are flowers, you know, called "larkspurs" from their resemblance in shape to the feet of the lark. When this bird stands up to sing, he lifts his head, and the crest of silky feathers on the top of his head, which is generally flat so as not to be noticed, rises into an erect position, his speckled breast swells out, and he looks as proud and happy as a bird well can. Not unfrequently he flutters his wings, as though he would say, "Oh that I were out of this cage, and far up in the golden sunshine; then would I sing, and sing, until all the earth and air were filled with my joyous melody!"

The larks in a wild state live much on insects, they also eat small seeds and grain. In confinement they should have poppy and crushed hemp-seed, barley-meal and bread-crumbs, with some green food and insects occasionally; a few ants' eggs, or lean meat cut very small, will make them more lively and inclined to sing. They sometimes acquire the strains of other birds.

Young larks should be fed with white bread soaked in milk, crushed poppy-seeds, and ants' eggs.

THE WOODLARK is a sweeter though not so loud a songster as his soaring relative. Abroad its song is seldom heard, as it is a shy bird, and loves retirement. When confined it requires great attention, being rather delicate; but its delightful song will well repay any care which may be bestowed upon it. A piece of fresh turf, once a week, slightly moistened, is almost indispensable; with this the bird cleans and cools its feet, which are apt to become diseased otherwise. White bread soaked in boiled milk, with poppy and maw-seed, or bread-crumbs, with ground hemp, ants' eggs, meal-worms, flies, and other insects, are its proper food. It should have sand at the bottom of the cage, of course; all birds require this, instinct teaches them to swallow some to assist digestion, and some species roll in it, and dust themselves with it.

Young woodlarks require bread and milk, mashed up together, with soaked rape and ground hemp. Nothing but ants' eggs and meal-worms will save birds of this species if caught when fully grown; with this food, and gentle treatment, they may become reconciled to confinement.

THE TITS,

or Tomtits, as they are generally called, are charming little birds to keep, on account of their beauty and liveliness; but it is difficult to preserve them in health, as they require so much insect food. There are several species of this family, such as the Ox-eye or Greater Tit, the Cole, the Blue, the Crested, the Bearded, and the Long-tailed or Bottle Tit, which builds a curious nest, like a bottle with the long nose turned down, and all covered with moss and leaves.

They are funny little mountebanks, these tits, running up and down the sides of the cage—which should be tolerably large—as they do the branches of the trees in their native woods when they search for insects, and assuming all sorts of attitudes and positions. They are best kept in a room or aviary where there is plenty of space for their antics. One defect in their character is that they are apt to quarrel with, and sometimes kill, their fellow-prisoners;

so, if you have a "climbing Tommy," or a "Joe Bent," as these birds are playfully called, in your aviary, look sharply after him, and give him notice to quit if he manifests murderous propensities.

Cooked meat, suet puddings, boiled vegetables, and hemp-seed should be given to the tits—indeed, almost anything that birds can, and do, eat; they are fond of earth-worms, which should be chopped small for them. They must not be confounded with

THE TITLARKS OR PIPITS,

which are sometimes kept. The best known of these is the Titling, sometimes called the "Meadow Lark;" this is the bird in whose nest the cuckoo, who seems to have no home of its own, most frequently lays a single egg, about the hatching of which it takes no sort of care, but goes wandering about uttering that curious cry of *cuck-oo*, as if it were playing at hide-and-seek with echo.

The titling is not a good songster, having too weak a voice; but it is a lively and amusing bird, and very cleanly in its habits. It should be fed and treated like the larks.

There are also the Tree and the Rock Pipits, pretty little birds both, but wild and shy, and seldom or never seen in cages. Richard's Pipit is another species of this family, of which but two or three specimens have been taken or shot in this country.

THE BUNTINGS.

Of these, the bird known as the Yellowhammer is the favourite species, if we except the foreign buntings, many of which are very handsome, and therefore highly valued as cage birds. The "Yellow-Yowley," "Yeldring," "Yolkring," "Yoke," and all sorts of queer names, have been given to this bird, which is not deficient in beauty; but he is by no means a good singer, being much given to the utterance of harsh shrieking sounds. In the cage he is awkward and heavy in his movements. His food and general treatment should be the same as that of the larks.

The Corn, the Cirl, the Black-headed, the Ortolan, the Snow, and the Lapland Buntings are the other members of this family known in Britain. The two last are extremely rare, and none of them are at all common as cage birds, although one or other of them may be met with occasionally in well-stocked aviaries: they have little or no power of song. Very nearly related to them is the common Sparrow, that bold, inquisitive fellow who twitters on the house-top, and builds between the chimneys, or wherever he can get. He can sing as well as twitter; but his musical powers are seldom cultivated. Like the poor, he is "always with us," and is certainly a feathered pet.

THE GROSBEAKS

are large birds, with remarkably thick strong bills, adapted for splitting hard grain, nuts, and the kernels of fruit, on which they chiefly live. They are nearly allied to the finches, one of which, the hawfinch, is often called a grosbeak. About twenty species are in the list of cage birds, nearly all of which are foreign. Perhaps the most highly valued of them all is

The CARDINAL GROSBEAK, which is very large and handsome, having plumage of a beautiful bright red, relieved by glossy black about the head

and throat; it is sometimes called the "Virginian Nightingale," being a sweet and powerful songster. It is fed on millet, canary, rape, and hemp-seed, and is not a difficult bird to keep.

The AMANDAVA FINCH is another of the family, much valued for its beauty and sprightliness; its feathers are mostly crimson, tipped with white, which gives it a speckled appearance. It has a soft and agreeable song, and is a very sociable bird. Then there is the little Wax-bill, the Paradise, the Grenadier, the Cinnamon, and a host of other grosbeaks and finches, from all parts of the world.

WARBLERS.

"Why, are not all song birds warblers?" some of our readers may perhaps ask. Yes, they certainly are; but they are not called so in Natural History books by writers who aim at scientific classification, and, although no such attempt is made here, yet we have thought it best to place together all those soft-billed, insectivorous birds, which naturalists have agreed to call warblers, because they mostly modulate their songs with many turns or variations, and so they warble. We have said that they are soft-billed and insectivorous; that means that they feed chiefly on insects. They are mostly birds of slender make and delicate constitutions, difficult to keep in confinement, and requiring more care and attention than those of which we have been speaking. In a wild state, we know them in this country only as summer visitants. Generally they are very sweet songsters, and hence the high value that is put on them as cage birds, and the effort made to rear and preserve them.

Of this musical family the highest place is by common consent awarded to

THE NIGHTINGALE,

whose delightful song is generally heard in the groves and shrubberies of our southern and western counties from quite early in April to the end of June, and sometimes later. And what a rich strain it is! preferable, we think, to that of any bird whose "wood-notes wild" have been improved, as it is said, by cultivation.

The bird-catchers are on the look-out for the arrival of these musical visitors, and as soon as the first sweet warble is heard all are on the *qui vive*. The males precede the females by several days, and, as the former are the songsters, their capture is most eagerly sought, but their shyness renders it most difficult to effect this; still, very many are taken in traps baited with meal-worms, or other insects, in the larva or grub state, and then if you go to Whitechapel or Seven Dials you may buy a charming feathered songster for about five shillings. Hear the bird sing before you buy, and bring it away with you. Except in the song there is little to distinguish the male from the female, and you may have a mute bird, instead of one to delight you with its melody, unless you take this precaution.

Very capricious birds are the nightingales: some have been known to remain obstinately silent when removed to a new house, and some to sing so incessantly as to be quite exhausted by the effort and die, thus literally singing themselves to death.

The nightingale's cage may be of any desired form, from twelve to eighteen inches long, nearly the same depth, and about a foot high; the roof should be covered with green baize or cloth, and also the three perches, two near the

bottom and the other half-way up, to preserve the feet of the bird; it is best to cover the bottom with a sheet of blotting-paper, which can be frequently removed with all impurities; the water-vessel should be of glass, made to project outside, and so placed that the bird can pass into it for the purpose of bathing, of which it is very fond; the cage should be painted green and overshadowed with leafy boughs, to imitate the shade which is so congenial to the nightingale.

In one or two instances only has it been known to breed in confinement, and seldom does it live long in that state. Ants' eggs and meal-worms are its favourite food, and when these cannot be procured, a little lean beef or mutton, cut very small, may be given, with, now and then, boiled carrots and other vegetables, soft pudding, stale white bread with milk, yolk of boiled egg, a little hemp and poppy, suet, spiders, crickets, earwigs, and maggots of the flesh-fly are all very acceptable to this sweetest of songsters.

Young birds of this species brought up in confinement seldom sing well; they want an old one to teach them.

The BLACKCAP is sometimes called the "Mock Nightingale," and its powers of song are almost equal to those of the real nightingale, which it sometimes imitates very closely indeed. In confinement it will often sing during the greater part of the year, and to this state it soon becomes reconciled. In the woods it may sometimes be heard as early as March 23rd, and as late as

October 15th, about which time it migrates to the south. The black cap, which gives the bird its name, is worn only by the male, and not by him until after the first moult, as the change of feathers is called; for all birds, it should be understood, have a new dress once a year: the old feathers fall off and new ones come in their places; but they do not fall off all at once, or the bird would be naked: it is a gradual process. This is a convenient arrangement, for however would Mr. Cock Sparrow or Miss Jenny Wren get the money for a new suit of clothes? It saves all trouble, too, about following the fashion: if our clothes grew on our backs we must take them as they came, and be thankful that we got so cheap a covering.

Sad to say, this is a greedy bird: he must be supplied sparingly, or he will eat more than is good for him. He should have the same kind of food as the nightingale; soft fruit he is very partial to, and a little will do him no harm.

The GARDEN WARBLER, or the WHITETHROAT, and the FAUVETTE, or the PETTICHAP, are both very pretty birds of this family, which are sweet songsters, but most difficult to rear and keep. They do best in an aviary where there are growing plants: if in a cage, it should be kept well shaded with green boughs. Like all the warblers, they require fine gravel, which they eat to assist digestion, and plenty of clear, fresh water. The food of all the members of this family may be pretty much the same as that recommended for those already described. When meal-worms, ants' eggs, and maggots cannot be procured, a little bullock's heart, boiled and grated, will not be a bad substitute.

The BABILLARD, or BABBLING WARBLER, the LESSER PETTICHAP, or ARBOUR BIRD, the latter of which builds a nest covered with a dome, are all interesting members of the same family, but they are very rarely kept. The country people call the last "chiff-chaff," because its cry resembles these words.

The WILLOW and REED WARBLERS.—These birds are sometimes called the Willow and Wood Wrens; they are both elegant birds, and much alike in their general appearance and habits: their song is shrill and tremulous, and is very constantly uttered. They are great at fly-catching, being very fond of these as of other insects. They sometimes become very tame and familiar with their feeder, taking flies out of the hand, and drinking milk from a spoon or cup while perched on the finger.

The COMMON and GOLDEN-CRESTED WRENS.—Every boy and girl knows the little Jenny Wren, with its round body and short cocked-up tail, and must have listened with pleasure to the low sweet warble of the bird, which in confinement is lively and engaging. It is very sociable, and should always have a companion in its cage, or be left at liberty to fly about a room or aviary with other birds. The gold-crest is the smallest of all British birds, and is as quick and restless as he is small. When at liberty, he lives chiefly amid the dark pine-woods, and his crest of flame-coloured feathers flashes amid the gloom like real fire. The closely-woven nest, like a little mossy cup, is suspended to the bough of a pine or larch, generally far up and hidden by the thick foliage; in it are eight or nine flesh-coloured eggs, no bigger than peas.

The REDBREAST seems out of place in a cage: he ought to be hopping about on the table, or under it, picking up the crumbs; coming to the window to be fed when the snow lies thick on the ground; or out in the woods, covering with leaves the two poor children who were there left to wander alone and die of hunger. Of course, every boy has read the old nursery story of the "Children in the Wood," and loved the Robin Redbreast all the better for the compassionate part he played in that sad drama. He is a bold, confiding bird, and has a sweet voice of his own, although it has not much power or compass in its melody. In the summer it is seldom heard, as the singer then keeps pretty much in the leafy woods, away from houses; but when the cold weather comes and there is a scarcity of food, then, too, comes Robin, to tune his pipes in the garden and ask to be fed. In at the open door or window he hops, gives a bright intelligent look all round, then two or three lively chirrups, as much as to say, "Here we are again!" and then proceeds to make himself at home. If you have an aviary, just put him in, and let him out again in February, that he may go away and help his mate to build her nest where he best loves to be,

"Flitting about from tree to tree."

Robins that have been placed when young under the tuition of a nightingale are said to make splendid songsters: their natural song, though soft and sweet, is not sufficiently powerful to attract much attention. They may be kept in almost any kind of cage; but care must be taken not to put two male birds together, as they will be sure to fight, Master Bobby being, I grieve to say, a very quarrelsome fellow: for that reason he is often troublesome in the aviary. He may be taught a variety of tricks, and is generally a very pleasant and amusing bird. Give him the kind of food recommended above for other warblers, and plenty of water to bathe in, and he will be as happy as a—what?—prince or a sand-boy, shall we say? taking our example from the two extremes of life, maybe the sand-boy has the best of it.

We have now done with the warblers, all of which, except the wrens and Robin, leave this country at the approach of winter, for more southern latitudes, because they require warmth and plenty of insect food; and this flying to and fro between one country and another, at certain regular periods, we call *migration*. It is wonderful how these seemingly weak and delicate birds can fly hundreds of miles over land and sea straight as an arrow to the places best suited for them, and how, at certain dates, which scarcely ever vary, they set off on these long flights. All we can say in explanation is that God teaches and strengthens them.

CROWS, &c.

Before we proceed to speak about certain birds of gay plumage and harsh discordant voices, which are all foreigners, let us finish with the natives, and say a few words about those that caw and croak, and hoot and scream, and otherwise disport themselves, in our own dear native land.

Among the commonest of these are several members of the *Corvus*, or Crow tribe, some of which are made household pets, and are valued for their talking powers or other amusing qualities: foremost among them is

THE RAVEN,

which is what the Scotch call an "uncanny bird," which we can best translate by the word "unearthly." There is something strange and mysterious about him: he is black, and all black; his cry is a dismal *cro-a-k*, coming, as it seems, from a sepulchre; his motions are odd and ungainly; he hops all on one side, and never looks directly at you, but, with his head awry, peers up in a very suspicious manner, so that he ever seems bent on mischief.

But why keep such a disagreeable creature about the house? Well, some people have a fancy for oddities, and the raven is one. He has great imitative powers: he will talk and whistle, crow like a cock, bark like a dog, mew like a cat, and make all manner of queer noises, and perform the strangest antics in the gravest possible manner. So, although he is a dirty, spiteful, and altogether unloveable bird, and frightens children into fits, by going up to them sideways, as if he did not see them, and then suddenly darting at their legs; although he steals all he can lay his hands—or rather beak—on, and hides it away; although he is greedy, and even blasphemous—for swearing he seems to learn most easily, and repeats with the greatest gusto—yet people keep and pet him, even while they are half afraid of him, and look upon him as something like an incarnation of evil. There are many mysteries in the world, and this is one of them. The raven has a wonderful history, too: we hear of him as far back as the Deluge; his great black wings went flap-flapping heavily over the wide waste of waters, in which floated so many ghastly corpses, on some of which he, no doubt, alighted to feast, for he is very partial to decomposed flesh; he fed Elijah, you know, at the time of the great famine in Israel; and in the sacred narrative, as well as in profane history, his name frequently occurs. Wherever there is a lonely, barren, desolate, and sin-cursed place upon earth, there is the raven sure to be: his croak has always been considered ominous of evil, and the shadow of his wings a foreboding of death. Such has been, and is, the notion of superstitious people; but we know better, and simply look upon the raven as a cunning, mischief-loving bird, with a hoarse voice, which he cannot help, and a desire to steal and hide anything that comes in his way; but then we know some people who are very like him in this respect. So, if you will keep him about you, let him have plenty to eat, and a sheltered corner to hide and sleep in; and, as he has such wonderful powers of imitation, be as careful as possible that he hears only words which are pleasant and proper. We had the honour of the acquaintance of one of these birds, who lived in a military hospital, where there was a guard-house, and when the sentry at the gate was aware of the approach of the visiting officer, or any person of distinction to whom the honour was due, he cried, "Guard, turn out!" and out rushed the soldiers from the guard-house, to stand in a row and give the salute.

Ralph had noticed these proceedings, as he noticed, without seeming to do so, everything that was going on, and he thought he would have a bit of fun; so one night he crept out of his corner and broke the stillness with his hoarse command, "Guard, turn out!" and out they came in the darkness, and stood ready; but there was no one to be saluted, so, after awhile, they turned in again, wondering what it could mean. It was afterwards discovered that the raven had played the trick. Poor Ralph died long since, and was gathered to his fathers. He lived to a great age, as ravens commonly do, and his loss was deplored, as he was a source of great amusement to the hospital folk.

THE JACKDAW

is another amusing bird of the crow family, which is easily tamed and taught to speak. If kept in a cage, it should be a large one; but it is best to let him have the run of the house. If taken when grown up, his wings should be cut about every six months, to prevent his flying away. Young birds should be taken from the nest in the church steeple, ruined tower, hole in the cliff, or hollow tree, when about half fledged, and fed upon bread and milk, with caterpillars, worms, and other insect food, or entrails: they will grow strong enough to take care of themselves, and, if brought up in this way, may generally be trusted, with uncut wings, to go where they please. They have the thievish propensity common to all the family, and there is a funny story, told by Thomas Ingoldsby, of one who stole "my Lord Cardinal's ring," and was excommunicated; but, having repented and made restitution, he was again received into the Church, became a very pious bird, and dying in the odour of sanctity, was canonized under the name of Jim Crow!

THE MAGPIE

is a very handsome and a very knowing bird. He is described by one of our old poets as "the cunning magpie, with his head awry," peeping and peering into every hole and corner. His black and white plumes give him a clerical appearance, which is not borne out by his habits, for he is a great chatterer and is by no means honest; silver spoons must be taken care of where he is,

for anything bright and glittering seems to have an irresistible attraction for him. The nest of a magpie is often a wonderful structure, built of sticks piled up to an amazing height; it has a dome at the top, and the hole for entrance is at the side; it is generally placed in some ruinous out-of-the-way place, and far up out of reach.

Young magpies should be taken when about a fortnight old, and fed as directed for young jackdaws. If carefully instructed they will become accomplished talkers.

THE JAY.

This is a very beautiful kind of crow, which is not unfrequently seen in a wicker cage, and heard uttering words and other sounds in a somewhat discordant manner, screaming, whistling, and making all sorts of curious noises.

One of its scientific names is *garrulus*—noisy or talkative. Its nest, like that of the magpie, is generally on a tall tree, or some other lofty place difficult of access. The young should be taken when about a fortnight old, and fed upon soaked bread, curds, and meat cut small, or worms, slugs, &c.

In Germany this bird appears to be more highly valued as a cage bird than with us, and great pains are taken with its education, so that it will imitate airs on a trumpet, and the songs of other birds. The jays seem to have a great antipathy for owls, which they persecute dreadfully; if they can but catch Mr. Goggle-eyes abroad in the day-time, or find out where he is hid, they chase and besiege him with a tempest of clamorous and discordant cries.

The Starling

is another accomplished talker, for which faculty he is no less valued than for his beauty of plumage and sociability: he is as sagacious as a dog—quite docile and affectionate. Country people sometimes call him the "Speckled Stare;" and his dark, glossy feathers, having white tips, give him a very peculiar and handsome appearance.

This is the smallest bird of the crow tribe resident in Britain: its nest is built in hollow trees, holes in chalk-pits, and out-of-the-way, ruinous places, generally in company with its own kind, or other members of the same family, with whom it may often be seen hunting for worms and insects on the pasture and arable lands, sometimes on the shore and adjacent marshes. The small meadow grasshopper is a favourite food, fruit and grain are not rejected—indeed, it is an omnivorous feeder. It likes to keep its glossy plumes free from defilement, and should have plenty of water to wash in. When properly taught the starling will talk like a parrot. It is subject to few diseases, and generally lives long in confinement. Its natural cry is rather melodious, having a harp-like sound. Old and young birds may be fed in the same way as the other crows.

PARROTS.

"Pretty Polls" of many sizes and colours are choice pets all over the world, although they are found in a wild or natural state only in the warmer latitudes. Their lively manners, gay plumage, and wonderful imitative powers have made them great favourites, and for the sake of them, their harsh voices and oftentimes spiteful and mischievous ways are put up with. In no birds is articulation so distinct, and this is because they have thick fleshy tongues, much like those of human beings; their bills are large, stout, and strong, as are also their claws, which have a peculiar arrangement, two projecting forward and two backward; this enables them to grasp tightly the branch or other object to which they cling when they climb and swing about among the trees, sometimes hanging by the toes, and sometimes by the bill, in an extraordinary manner. This arrangement of the toes is common to all the *scansorial* or climbing birds, of which we have remarkable examples in the woodpeckers of our own country.

The Macaws

are the largest birds of the parrot family, and of these there are three species only which are met with in confinement. First the Red and Blue, and the Blue and Yellow Macaws, each of which is about two feet eight inches long; they both come from South America, are birds of gorgeous plumage, and good talkers if instructed. It is best to keep them on a stand, with a small chain attached to one leg; but they should not be approached by children or timid persons, as they are apt to be spiteful, especially to such as fear them. They should have water to bathe in as well as to drink, for they are naturally dirty birds, and the oftener they can be induced to wash the better. They are frightful

GREY PARROT AND COCKATOO.

screamers, and their screeching, and laughter, and other noises keep the house in a perpetual tumult. Yet people will have them, and they must pay the penalty: the birds are not to blame: it is as natural for them to make a noise as it is to eat and drink. How they must wake the echoes in those thick Brazilian forests where the alligator floats like a huge log on the breast of the silent river, the deadly snake glides glittering amid the tall grass and reeds, and the monkeys swing amid the bright-blossomed creepers that throw their lithe stems from tree to tree! There the parrots and macaws hold their noisy parliament, glowing and flashing amid the dense foliage like coloured flame. There too dart and flash and quiver those little winged gems, the humming birds. What glorious feathered pets these would be, if they could be kept in confinement! but they cannot, so we must leave them in their native woods, and be content with our beautiful macaws, another species of which, also from Brazil, is the GREAT GREEN MACAW, which is less in length by seven or eight inches than those already mentioned; it is a much rarer bird too, and consequently fetches a higher price.

One of the distinguishing features of the macaws is their great length of tail, and in this one it is very remarkable, the two central feathers being considerably longer than the others, and finely variegated with red, blue, and green, which latter is the prevailing colour of the whole plumage. A docile and very beautiful bird is this, and he is a fortunate fancier who possesses it.

All the macaws may be fed alike on bread and milk and scalded hemp-seed, varied by broken biscuit, and ripe fruit when in season. Meat, sugar, or sweetmeats should be given sparingly, as they heat the system and cause the bird to pull its feathers out.

The Cockatoos.

These, like the macaws, are mostly large birds, and are very handsome, although they do not present the same variety of colouring, their plumage being light and of an uniform tint. Their imitative powers are not good; they seldom get beyond pronouncing with great distinctness the syllables of their own names, *Cock-a-too*, which is their natural cry or call. They are mostly found wild in Australia and the Indian Isles, where they breed in hollow trees, and feed upon fruits and nuts, which they are able to crack with their powerful beaks.

The Great White Cockatoo,

with the sulphur-coloured crest and tail, is the best known species in Europe: it is almost as large as the common fowl, and is valued no less for its docility and gentleness than for its beauty. Its native home is in the Molucca Islands, from whence we get cloves and other spices, and where the air is always soft and warm, so the bird should be carefully tended and protected against the severity of our climate in winter. It may be chained to a stand, or kept in a large bell-shaped cage, furnished with a movable ring, and at least two transverse perches. It requires the same kind of food as the macaws.

The Lesser White Cockatoo

comes from the same part of the world as the greater, which it very closely resembles in shape and colour of plumage, having, however, the beautiful silky crest which adorns the heads of all the cockatoos of a more decided sulphur tint. There is nothing particular in its habits or treatment to demand notice.

The Great Red-crested Cockatoo

is one of the noblest of cage birds, its white feathers having, here and there, a rosy tinge, and its long crest being of a brilliant orange. It is one of the largest of the parrot tribe, and has a bold defying aspect. Its scream is perfectly ear-splitting; it will sometimes crow like a cock, and make a noise like a trumpet, and seems to have greater powers of imitation than the cockatoos generally. It is apt to be rather fierce and intractable.

The Banksian Cockatoo

is the handsomest and rarest species: the plumage is mostly of a rich glossy black, about which tongues of fire seem to be flashing, many of the feathers being crimson with bright yellow; the tail is crimson and orange. This magnificent bird comes from New Holland, and, on account of its beauty and rarity, fetches a high price.

THE RED-VENTED COCKATOO

comes from the Philippine Isles: its feathers are mostly white with a sulphur tinge, the under parts red. Its cry is horrible, something between a scream and a yell.

THE LORIES

are all remarkable for the splendour of their plumage. The marks which distinguish them from the other parrots are obvious to naturalists only. The largest of them (which are brought from the East Indies) are about the size of a common pigeon; there are some smaller kinds found in Australia and the isles of the Pacific which are called LORIQUETS or LITTLE LORIES.

THE CREAM or VARIEGATED LORY

has generally a bright scarlet body, variegated with vivid green and rich violet, which play about the feathers like coloured light. This is a very tractable bird, and a great pet with those who are fortunate enough to possess one.

THE PURPLE-CAPPED LORY

has a red body, green wing-coverts edged with blue; the edges of the tail-feathers are orange, as is also the beak and a band across the breast. The German naturalist Bechstein describes it as the tamest, the most pleasing, and the most delicate of the lories.

THE BLACK-CAPPED and the SHELL LORIES

are two other birds of this kind which are highly valued; the latter especially is a beautiful little creature, speckled and marked in a sort of shell pattern, on crimson, purple, and gold, making a very rich appearance.

We now come to the Parrots proper: birds with short even tails. Of these there are several species kept in confinement.

THE ILLINOIS and ASH-COLOURED PARROTS

are two of the commonest of them. The first comes from the Southern States of America, and the last from Guinea and other parts of Africa. The one is of a rich green colour, fading into grey beneath, and lighted up by a brilliant orange on the forehead, cheeks, and throat; the other is a soft silvery grey, with a crimson tail and black beak. Both are docile, affectionate birds, and fluent talkers.

The GREY PARROT, as it is often called, is one of the few birds of this kind that may be trusted with children, the company of which it seems really to enjoy; and this is one of the few parrots that have been known to breed in confinement. It is extremely fond of the seeds of the sunflower, which it may have as a treat when they can be procured, but as a rule rich food is not good for it: swollen and gouty feet is a probable result of high feeding.

THE AMAZON and YELLOW-BILLED AMAZON PARROTS

are two South American birds, the first of which is not uncommon, but the last very rare. The plumage of both is chiefly green and yellow, with black markings; but the latter has the colours more decided and the markings more distinct.

THE CAROLINA and AMBOYNA PARROTS.

These names sufficiently indicate where the birds come from. The first is generally about twelve inches long, and has a most wonderful tail. The plumage is chiefly grey, with brown and orange markings; the front of the head is deep orange, fading off at the back to yellow. A very noisy bird this, and a poor talker, but it is tame and gentle. For richness of plumage the next species might well claim a place among the lories. The head, neck, and lower part of the body are a rich vermilion, the back is a fine green, turning to blue towards the tail, which is black, with blue and green stripes; the upper part of the bill is orange, and the lower black. And here it will be as well to mention that all the parrots can move both the upper and lower halves of the bill; with most other birds it is as with man, who can move the lower jaw only, the upper being fixed to the bones of the head. This arrangement gives to these birds a peculiar advantage in using, as they do, the bill as well as the claws to grasp with and support themselves.

THE WHITE-FRONTED and BLUE-FACED PARROTS.

The first of these comes from the West Indies, and is about the size of a pigeon. The plumage is chiefly green, with bright red on the cheeks, throat, and neck; the forehead and a circle round the eyes is generally white. It is a very amusing bird, having a particular aptitude for imitating the cries of cats, dogs, and other animals. It comes from the West Indies, like the blue-faced species, which is about the same size, and has also a green body, but the larger wing-feathers are blue, some of them tipped with red. The throat and front of the head are also blue, while the neck and upper part of the breast are red; the bill is remarkable for an orange stripe on each side of the upper mandible. The natural cry of the bird is very shrill, and it is not easily taught any other.

THE BLUE-HEADED and ANGOLA YELLOW PARROTS.

The first is an East Indian bird, very beautiful, and by no means rare. Its length of eleven inches is more than half occupied by the tail, the two centre feathers of which are much longer than the rest. The head is blue, and the throat violet, with a rich silvery reflection playing about it. A green hue, deepening into blue, there lightening into yellow, are its prevailing colours. The Angola kind is of about the same size, its colours are much the same, but it has a short tail, which its large wings almost cover.

THE GREY-BREASTED and BLUE-THROATED PARROTS.

The first is a South American bird, about ten inches long; green, yellow, and silvery grey are its chief colours. About the head it looks much like an owl, having a short bill, and the grey feathers of the cheeks being much puffed out. It is a docile bird, easily taught to speak, but rarely lives long in confinement.

The next species is very rare. It is chiefly of a fine indigo blue colour, deepening at places into purple; the tail-feathers are green shaded with blue and yellow, and lined with scarlet, of which colour it has a line along each side of the upper part of the bill.

THE MORETON BAY and GREEN TRINIDAD PARROTS.

Of the first of these two species but little is known. It is a splendid bird, with golden tinted plumage, and very valuable on account of its rarity.

The second has a dark green body, blue and red wings, and a scarlet head. It is not much of a talker, but is interesting on account of its beauty and engaging manners. It must be kept warm; and, indeed, this is essential for all the parrot family, although some require it more than others.

We now proceed to open our show of

PARRAKEETS,

or Paroquets as it is sometimes written. These are the little parrots, and they differ in no respect from the larger kinds except in size and in the possession of a long tail—although this is not always a distinction, for some of their bigger relatives have it also.

THE LONG-TAILED GREEN PARRAKEET.

This is, perhaps, the most curious bird of the group: it is found all through South America, and in the West Indies. It is about as large as a blackbird, having yellowish-green plumes, ornamented with bright yellow and red. It is one of the noisiest of feathered pets, talking, screaming, whistling, crowing, and uttering all sorts of discordant sounds.

THE PAVOUANE PARRAKEET

comes from Guinea, Cayenne, and the Caribbee Islands. It is rather larger than the preceding species, and has much the same colours, although differently arranged. The red spots on the cheek do not appear until the bird is upwards of four years old. It is not particularly rare, nor difficult to keep, and has great imitative powers.

THE RED AND BLUE-HEADED PARRAKEET

is a native of South America. The whole upper part of the body is grass-green, the under parts greenish-yellow; the forehead is scarlet, and the neck bright blue, which runs off into the green of the back. This is not a rare species nor a good talker. It is usually about ten inches long.

THE CARDINAL PARRAKEET

is a gorgeous bird, similar in size to the above, with a very remarkable tail, the two middle feathers being blue with white ends, and the rest green; the head is violet shot with blue; around the neck is a ring of glossy black, which is also the colour of the throat. The upper part of the body is a rich green, the lower parts yellow; the beak is a delicate peach-blossom, and the legs silvery grey. The female bird is very different in appearance, having a yellow beak, a blue head, no black colour, and but little beauty of plumage.

The Blossom-headed, the Rose-headed, Ring, and the Bornean Parrakeets.

What shall we say for them? They are all nearly related to my Lord the Cardinal—only varieties, some think. The first of them is sometimes called the Guinea Sparrow, which name tells us it is a small bird, and comes from Africa. The second sometimes also goes by the same name, although it is more commonly found in the Philippine Islands. Lovely birds, all three of them.

Pennant's, and the Two-spotted Parrakeets,

the first from Australia, and the last from the South Sea isles. The Australian bird is sometimes called the Purple Parrot: it is found chiefly about Botany Bay, and is about the size of a sparrow-hawk. See what a beautiful crimson dress he has, and how the black at the base of the feathers, and dark blue of the tail and some other parts, give to the whole a rich purple effect. This other is sometimes called the Palm-bird. It is as large as a turtle-dove, has a long drooping tail, a black band across the forehead, and a triangular spot of the same colour on each side of the head. Above, his feathers are all silky grey, and green, and blue, and yellow: beneath, all flame-colour.

The Lanated, and Little Gem, and Blue Parrakeets.

The first is sometimes called the Red-Crescented—both names having reference to a moon-shaped patch of bright red on the breast. The back is dark green, and the under parts yellow. A very pretty bird; lives long in confinement, and talks well. The other species is about as big as a sparrow, with an orange-coloured bill and circle round the eyes, and a green body with blue markings. He comes from South America.

Australian Ground Parrakeets,

severally distinguished as the Roselle, the Crimson-shouldered, the Blood-billed, Barnard's Parrakeet, and two others. Beautiful little birds, of all the colours of the rainbow: playful, gentle, and easily kept. Unlike most parrots, they are as much at home on the ground as anywhere else.

Love Birds;

charming little creatures, with crimson heads and emerald bodies, and variegated tails; so loving and affectionate, that if one dies the other pines away and dies too of grief. They are as tame as they are gentle and beautiful, and will come out of their cage to be fed with crumbs, &c. There is a variety of this bird called the Passuaria, which has no red on its plumage, but is all green.

PIGEONS AND DOVES.

A very curious and interesting family of birds are the Pigeons—*Columbidæ*, as naturalists call them, which signifies properly Doves; but in reality there is no difference in the meaning of the two terms Doves and Pigeons, only in this country we generally apply the latter name to those domesticated varieties which have been produced by cross breeding, and very funny as well as beautiful varieties some of these are. Among wild pigeons we see no such grotesque birds as Pouters, Fantails, Tumblers, Trumpeters, and the like choice breeds, on which fanciers set great store; their peculiarities are the result of peculiar modes of treatment, into which we cannot here enter.

Wild pigeons are found in all parts of the world except the very coldest, and often in prodigious numbers. They are swift and strong fliers, and when in flight from one place to another they sometimes literally darken the air, and break the boughs of the trees on which they rest. Some of these wild birds, especially those from the East, are magnificent and stately creatures, with most gorgeous plumage, crowned and crested like monarchs of the feathered tribes; but of these it is not our present business to speak. We may just mention the chief of them.

THE CROWNED GOURI PIGEON,

measuring nearly twenty-five inches in length. It is found in the Indian Archipelago and the Molucca Islands. Its general colour is a rich purple brown above and grey beneath; there are white bars across the wings, and the semicircular crest is light blue or delicate grey.

THE NICOBAR PIGEON

is another beautiful crested bird. Although smaller in size than the Gouri, it is equally worthy of admiration. The upper part of the body is a rich green, with bronze and steely blue reflections; the head is slate-coloured, with purple shades. On the neck are a number of long pointed feathers, glowing with resplendent colours that shift and change with every movement of the bird.

THE AROMATIC VINAGO

is a curious title, very suggestive of aromatic vinegar, and yet one member of the pigeon family is known to dealers by this name. A rich brown red shot with purple is the colour of its back and upper parts, the under are a pale green; the forehead is also green, the throat yellow, and the tail is a mixture of blue, grey, brown, and green; so that our friend with the quaint name is something of a harlequin as to dress. He comes from India, Java, and other parts of the East.

THE CARUNCULATED GROUND PIGEON,

sometimes called the Oceanic Fruit Pigeon, is about as large as the common dove. It is a bird of splendid plumage, and is very useful, for to it the dissemination of that valuable spice the nutmeg through the Moluccas and other tropical islands is mainly due. The bird swallows the nutmeg, with the whole of its pulpy covering, which is mace. The latter is digested, but the nut passes out whole, and so becomes self-sown; and, curiously enough, some such process as this appears necessary to its germination.

THE TOP-KNOT and the BRONZE-WINGED PIGEONS,

both from Australia, are two very handsome species. The first is a stout, powerful bird of a silver grey colour, with black markings; it is remarkable for a double crest, one on the forehead, and the other on the back of the head.

The other beautiful foreigner is not quite so large; brown, changing into deep plum-colour, and grey of different shades are its chief colours. There are bronze-green spots on the wing-feathers.

THE MAGNIFICENT PIGEON

comes also from Australia, and is worthy of the name: it is about the size of the common ring-dove. Silvery grey, rich metallic green, and golden yellow are its principal colours, which shift and change with every motion of the bird.

THE PASSENGER PIGEON,

of whose habits and manners in a wild state Wilson and Audubon have given most graphic descriptions, leads us by an easy step to the more common domesticated kinds. Throughout North America this bird abounds, migrating in immense flocks from one State to another in search of food. Their arrival is eagerly looked for by men and wild animals, and the pigeon *battue* that ensues is something fearful and wonderful: the cries of the birds render the reports of the guns, the shouts of the men, and barking of the dogs, inaudible. The dead bodies cover the ground, and are carried away in waggons and everything that is available for the purpose; the hogs feed on them until they can eat no longer, and yet their number is not sensibly diminished.

THE CARRIER PIGEON.

This is the most useful, celebrated, and in every way remarkable, of the domesticated pigeons: it has a history extending back to a period anterior to the foundation of Rome. The names of the victors in the Olympian games were made known through the Roman provinces by means of this bird, just as in our own times are those of the winning horses at the races of Newmarket and elsewhere. Keen of sight and strong of wing, the bird, which when released always flies straight to its home, no matter how great may be the intervening distance; so it is taken to the scene of the contest, and directly the result is known it is released with a message, which is eagerly received by those who are waiting the arrival of the messenger. The despatch so transmitted is written on a small piece of thin paper, which is rolled up, and fastened to one of the tail-feathers by means of a piece of fine wire, which is wound round the shaft of the feathers to make it secure: in this way it does not impede the flight of the bird. Sometimes it is fastened to the leg with worsted. The winged messenger flies with incredible swiftness. Forty-five miles an hour is not considered a very high rate: in the pigeon flights against time, which have frequently been flown from Paris to Antwerp, from London to Liege, and other places, it has exceeded this.

The Belgians are great pigeon-breeders, and one of the choicest birds of this kind is the true Antwerp Carrier, which is comparatively rare.

The *twelve points* which, according to the recognized rules, a thoroughbred carrier should possess, are these: *The Head*, straight, and long, and flat. *The Beak*, straight, and long, and thick. *The Wattle*, broad at the base, short from the head to the bill, and leaning forward. *The Eye*, large, round, and uniform. A bird with these qualifications, and being of one colour, dark blue, will be likely to take a prize at a pigeon show. "Cinnamon Birds," as those of a dun-colour are called, are not so much valued, although they may possess all the above-named good points, and have as much sagacity and power of wing as the others. A long lithe body, and a firm strong wing, a proud bold look, and great activity, are the characteristics of the carrier in the prime of his life: as he grows old, he becomes stout and inactive, his wattle increases in bulk, his eye loses its brightness and his feathers their beautiful gloss; he is then only fit for breeding purposes.

Since the introduction of the electric telegraph, pigeon expresses have not been so much used as they formerly were, consequently, the breeding and training of the birds is comparatively little practised. Still, the carriers hold a high place among the fancy kinds. They are not prolific breeders, nor attentive and affectionate parents: frequently they destroy their eggs and neglect their "squabs," as young pigeons before they are fledged are called—after that they are "squeakers."

With carriers, as with other pigeons, breeding "in and in," as it is called—that is, getting a stock from the offspring of a single pair of birds—is bad: they will generally be small and weakly. Any breeder will exchange eggs with another whose stock is good. The best and steadiest sitters are the common Dove-house, the Runt, and the Dragon, to one or other of which is generally deputed the task of hatching and bringing up the young carriers.

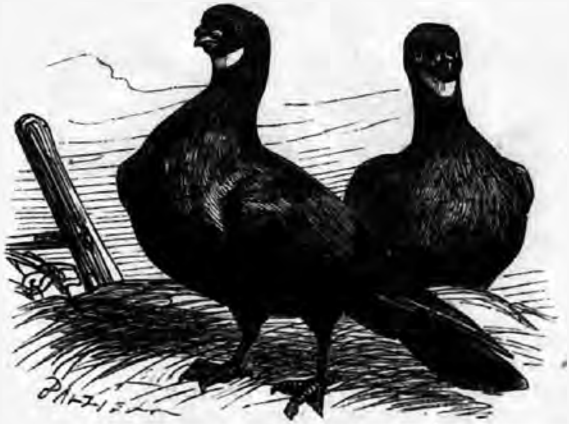
The Tumbler Pigeon

is one of the most amusing birds of this family, on account of its extraordinary motions on the wing. He is the most accomplished acrobat known, turning back-summersaults, and springing about in the air in the oddest fashion. His appearance when at rest does not give promise of such preternatural activity, for he has a plump little body, set firmly upon short, thickish legs, a round head, and a small beak; but his eye is bright, his look intelligent, and he seems to say, "Ah, I can do more than you think!" Then, off he goes, up, and head over heels, as though he were gambolling upon a tight rope or over an invisible *trapeze*.

There are several varieties of tumblers: the Old English, which is nearly extinct, the German Feather-footed, the common Flying, the Baldpate, and others. They are of all colours.

One of the most favoured varieties of what are called the Short-faced Tumblers is the Almond, which fanciers only consider perfect when it is of three colours, yellow, black, and white, the first predominating: the true colours are not attained until the bird is three years old.

A great variety of curious names are given to these pigeons, in accordance with their variations of plumage: thus there are Rocks, Blues, Chequers, Silvers, Duns, Kites, Reds, Yellows, Buffs, Drabs, and Mealies: these are all what are called "whole coloured." Among the mixed plumage or variegated birds are Grey-mottled, Blue-black, and Red-grizzles, the latter being



sometimes called a Strawberry bird, splashed or pied. A fancier will tell you that if you breed from a black with a cinnamon, you will get a cinnamon-splash; and if from a black with a cream-colour, you will get a magpie. But colour is really of little consequence, the great aim should be to produce well-shaped birds, such as have a full breast, a short body, slender neck, pearly eye, and straight beak.

Tumbler pigeons make a clapping noise with their wings as they rise in the air, and the louder this is the more highly is the bird prized: the old name, Smiter, was no doubt derived from this habit.

The Pouter Pigeon.

A very ludicrous caricature of the absurdities of fashion does this bird look, with its great crop puffed out like a frilled shirt-front, its legs seemingly encased in white trousers, and the long points of its wings reaching far down behind, like the ends of a swallow-tailed coat: he is altogether "a swell," there can be no doubt about that, and when he condescends to walk, it is upon the tips of his toes, with a mincing gait, like a fop of the olden time. If you want a personification of conceit and supercilious pride, there he is; and yet, probably, the poor bird thinks no more of himself than does the little sparrow which hops in the gutter. His natural peculiarities have been exaggerated by breeding until he has become a monstrosity, and the bigger he inflates his crop, the higher he pushes up his shoulders, the closer he keeps his legs together, and the more he walks upon his toes, the higher is the value set upon him.

Naturally the pouter is a tall, strong bird, and when his crop is not inflated he is very handsome. Buff, blue, and white, singly or intermixed, are his common colours. He is called Ring-headed, Swallow-tailed, Rose-pinioned, Bishoped, or Lawn-sleeved, in accordance with certain peculiar tints and markings which distinguish particular birds, and make them more or less

valued. But the crop, and the ability of the bird to inflate it, and control his motions when he is under full sail, is the great point with fanciers. Sometimes he is greedy, and fills it too full of grain, which will become bad before it can be passed into the stomach: the remedy for this is to put the glutton feet downwards into a worsted stocking, and after stroking the crop gently upwards, hang him up, and supply him occasionally with water only until he gets rid of his excess of food.

The female pouter has not so large a crop as the male, and she is less upright in her carriage. When the crop hangs about like an empty bag, be sure the bird is out of health. If confined in a place less than two feet high, he will probably contract a habit of stooping, which ruins him as a fancy bird.

The Runt

is a plain homely kind of bird, less valued by fanciers than most of the other varieties, but it is a prolific breeder, not given to range or wander away, and it may be kept without much trouble; so to boys who would commence pigeon keeping we say, get a pair of runts, give them an old rabbit-hutch, or anything you like, to live in, and plenty of food, they will increase and multiply wonderfully. Some of these are handsome birds, too, and all are pretty. The chief varieties are the Roman, the Leghorn, the Spanish, and the Friesland: the first is the largest, and the last the most curious, having the feathers set pointing forwards, so that, to smooth and caress it, you must begin at the tail. This peculiarity very much limits its powers of flight. The rarest, and therefore the choicest variety, is the Frill-back, which is always white or cream-coloured.

The Nun

is a pretty little bird, about the same size as the tumbler, like which, too, it has a tuft of feathers at the back of the head, by the size of which its value is very much regulated. The plumage of the body is sometimes pure white, but that of the head differs, and in accordance with this, the birds are Red, Black, or Yellow-headed Nuns. There is a variety termed by French amateurs the Death's-head Pigeon, and another the Bearded Pigeon. The most beautiful of all are those which are all black except the head and quill-feathers, which are white. The Dutch Shell Pigeon is also a much-admired variety: the crest at the back of the head assumes the form of a shell.

The Archangel Pigeon

is a large and handsome species, having a rich plumage of dark blue and copper-colour. It has a crest, is a good steady breeder, a strong flyer, and is altogether a very desirable bird in the pigeon-house; but somehow it seems to have been underrated, as the stock is not nearly so much cultivated as most other breeds.

The Fantail.

This is another "great swell" among the pigeons. He is sometimes called the Broad-tailed Shaker, from the habit he has of shaking or wagging his head as he walks, as though there were a great deal of wisdom in it, which there is not, or he would not strut about so, and spread out his enormous fan behind, to be looked at and admired. A long tapering neck, so that the bird can nestle his head among the tail-feathers, a full prominent breast, and a tail that shall never number less than twenty-four feathers, nor more than thirty-six, are among the points of perfection of this pigeon, which is perhaps the most elegant of all the fancy kinds. Its colour is commonly pure white; when bred with another species, the tails of the progeny become smaller, and they are called Half Fantails, or Narrow-tailed Shakers.

The Trumpeter

is another crested bird, which ought to be a great favourite, as it possesses almost every quality desirable in a pigeon. It may be easily recognized by the short silky feathers, like a moustache, on the upper part of the beak; its legs, too, are feathered to the very toes. Yellowish white is the ordinary colour, but sometimes the plumage is beautifully speckled and marked with black. A large round head and a full bushy moustache are two points insisted on by fanciers. Its coo is unusually loud, hence its common name.

The Jacobite,

otherwise the Jacobin, the Capuchin, or the Ruff, are names given to this bird on account of the frill of inverted feathers which encircle the head and neck, like the hood or cowl of a monk. The Dutch call these birds Cappers, and their value is greater or less in proportion to the size and completeness of the hood. With regard to colour, they may be white and blue, white and black, or mottled, and to be at all perfect in the estimation of fanciers, the head, tail, and flight-feathers must be white.

THE TURBET.

This pigeon is about the same size as the last-mentioned, but instead of being adorned with a hood, it has a fine frilled shirt-front, or what looks like one, the feathers of the breast standing out considerably, and falling contrary ways. As the nuns are classed according to the colour of their heads, so are the turbets of their shoulders—all the colour that the birds have being there—the rest of the plumage being white. A short bill, a full frill, and a small round head are the turbet's chief points of excellence.

THE OWL

is thought by some to be but a variety of the turbet: it, too, has a breast-frill, but it is not so large, and has a short beak, but it is more hooked, and the eyes are more staring. The general colour of the bird is white, with black bars across the wings; sometimes it has a black tail, and sometimes there is a yellow tinge over the white part.

THE LAUGHER

is a very rare kind of pigeon: it comes from the Holy Land and Arabia. In colour it is a grey-mottle, called a haggle; in shape and size it is like the common dove-house pigeon: it makes a noise like the gurgling of water poured out of a bottle, or suppressed laughter—hence its name.

THE BARB

came originally from Barbary: it has a short beak, a small wattle, and at a distance might be taken for a carrier. Its chief distinction is a wrinkled skin around the eyes, of a pink colour. Barbs which are wholly black are most valued; but dun-coloured are not uncommon. There is also a white or cream-coloured variety, which is said to be a cross-breed between the barb and turbet; it is called

THE MAWMET, OR MAHOMET,

a name which appears to have been applied somewhat loosely to more than one kind of pigeon, that commonly called the Scandinavian being sometimes so termed.

In old books on pigeon-breeding the Mahomet is described as having feathers of a cream-colour above, and of a smoke-colour underneath, with decided black bars crossing the wings; the bill is something like that of the bullfinch, and there is a small black wattle about it; the feathers of the breast are raised a little, so as to make a mark like a seam.

THE MAGPIE

is a variety of the tumbler which, for want of training or some other cause, has lost the art of tumbling, and so has sunk down to be merely what fanciers call a "toy bird," pretty to look at, but without any special recommendation. The body is white; the head, crop, and shoulders, black, blue, or yellow.

The Helmet

is a species now seldom seen in this country, although it was at one time not uncommon. Except the tail, only the top of the head, in a line with the corners of the mouth, is coloured, so that the bird seems to have on a cap or helmet.

One variety is feather-footed, and this has the leg-feathers also coloured.

The Spot

is another "toy pigeon," in size and form closely resembling the dove-house kind. An oval spot on each side of the head and tail are the only coloured parts, all the rest being white, with sometimes a creamy tinge. The birds are distinguished as Black, Blue, or Red Spots.

The Dove-house Pigeon

we have kept till the last, because it is the commonest of all, and with us, as with most persons, a great favourite. It is very close to the original type, if it be not the same species as that from which all our domestic pigeons come. It so closely resembles the wild pigeons of this and other countries as to leave little doubt of its being the same species, and, although the peculiarities of many of the fancy kinds are so very marked and distinctive, yet such astonishing changes and diversities are produced by cross-breeding and cultivation that we may well believe it possible for all these to have come from one common stock.

A very beautiful bird is the common pigeon, of a soft, silky slate-colour, relieved with white, and barred and mottled with black, with green and purple reflections playing about the neck: a beautiful, a gentle, and a very useful bird; and most prolific—a single pair will sometimes produce eight or ten pairs in the year. In pigeon matches, these birds are shot by thousands under the name of "Blue Rocks," "Rockies," or "Duffers;" and it is their red feet that generally stick out of pigeon pies, and their eggs are the dainties on which so many feed. Whether they yield the milk that April fools are sent to fetch we cannot say; but certain it is that those who go to fetch it must be themselves veritable "duffers."

It is very interesting to watch their pretty ways, and easy though somewhat pompous movements, as they strut about the enclosure, circle in the air, or sit cooing on the house-top, as their wild relatives do in the depths of the leafy woods.

We must now say a few words about

The Pigeon-House.

The dove-cot, or cote, as it was formerly called, was a building attached to most farm-houses in the country in the olden times, as well as to mansions and family seats, but we do not so commonly see it now. Often it was a solid structure built of brick or stone, and forming quite an ornamental feature in the landscape.

An old loft over a stable or outhouse, or a disused attic of a house, may be made available for the purpose; it only requires compartments fitted up for the different pairs of pigeons, which, if they have not separate resting-places, will be constantly quarrelling and fighting, breaking their eggs, and killing their squabs and squeakers. The window on the roof should not open to the east, and should be made so as to form a platform, for the birds to alight on when open, and to admit light and air when closed. We cannot here enter into very minute particulars of treatment, but would enforce the necessity of frequent cleaning, and fresh sand or coarse gravel on the floor, with a little chalk or old mortar, and a sprinkling of salt, for the birds to go to when they please: lime in some shape is essential to the formation of their egg-shells, and they will pick the mortar from between the bricks all around if they have not a supply provided for them. Rats, mice, and cats must be guarded against; the first are very destructive of both eggs and young, and the last of old birds as well. Near to the entrance of the pigeon-house should be a chimney or other conspicuous object, painted or washed with white, as a landmark for the birds when flying home.

A good and safe kind of pigeon-house is one made of wood, and fixed well up against the side of a building, with a separate entrance for each compartment, or it may be a round structure like a barrel, fixed on the top of a post or pole, and, by an arrangement of ropes and pulleys, made to draw up or down, or it may be made easy of access by a rope or other ladder. But whatever or wherever the house may be, it should always have an elevated position.

A pair of runts, or dove-house pigeons, if allowed to breed, will soon stock the house, and keep up a good supply of eggs and squeakers. If new birds are introduced, they should be young ones, as those fully grown, who have been used to another house, will be pretty sure to return to it. A barbarous practice prevails of plucking out the larger wing-feathers to prevent the flight of such birds; but this should never be done: the mutilated birds frequently become diseased and die, besides which, as soon as they recover their powers of flight, they will be the more likely to leave a place where they have been so cruelly treated.

Pigeon Food.

Grey peas, with an occasional change of wheat, oats, or barley, and the small beans known as pigeons' beans, which should be at least a year old, are the best food. Rape and hemp-seed are sometimes given as a stimulant; but the last is of too heating a nature, and should be given very sparingly, if at all. Both grain and seed should be clean and sound; if decayed, they will be full of mites, which are mischievous to the birds. A little green food is desirable: mustard and cress, lettuce or cabbage, if grown within reach, will be taken by pigeons if they are at large; if not, something of the kind must be put into their house or enclosure, taking care that the refuse is not left to decay.

Pigeons are said to be fond of strong odours; and to sprinkle the floor of their house with lavender, or assafœtida, or anything that smells powerfully, is thought to be a good means of inducing new-comers to remain. To fatten squabs, give maize steeped in water, and keep them under an inverted hamper, or where they can have air without much light.

DOVES.

The Turtle, the Ring, and the Stock-Doves are the kinds most usually kept: they do very well in large wicker cages, but better in houses built like those for pigeons, with which they will sometimes associate.

The first and third of the above-named are but summer visitors to this country in their wild state, the second is always with us, and is commonly known as the Great Wood Pigeon, the Cushat, or the Queen: it is the largest

of our native doves, and is a very handsome bird; it has a crescent-shaped mark of white, which nearly encircles the neck, and relieves the dark ashy grey of the rest of the plumage. The iridescent play of colours about the neck, which is observable in most of the pigeons, is very conspicuous in this bird.

Doves may be fed and treated like the pigeons generally.

RABBITS.

We have now got into a different division of the animal kingdom, and jumped from feathered to furred, from two to four-footed pets, creatures that live wholly upon the earth, and, being destitute of the organs of flight, cannot escape, as birds often can, from man and other enemies. Many of them are very useful to us: they yield us food and clothing, and in other ways minister to our numerous wants, and for this reason alone, but more for the higher motive of humanity, they demand our tender care and consideration.

But about rabbits, of which 80,000 are annually sold in London alone, these come chiefly from Ostend and other parts of France and Holland, where rabbit-breeding for the supply of the markets is chiefly carried on. In this country there are few large breeders who do it systematically for purposes of profit, as it has not been found to pay. Rabbit-warrens there are in a great many places where these animals burrow and breed, and from these we have a large supply of tender delicate flesh to eat, and of soft brown skins of which to make muffs and other articles of comfort and utility.

WILD RABBIT.

Varieties of Rabbits.

Great are the mysteries of rabbit-breeding, and strange the names given to some of the varieties. Rabbits are classed in four divisions: Warreners, Parkers, Hedgehogs, and Sweethearts. The first of these inhabit the sandy warren, where their burrows honeycomb the earth, and afford a rich spoil to the poacher as well as to the wild cat, the stoat, the weasel, and other "varmint," as the country people call all four-footed depredators. The

PERFECT LOP.

second are found in the gentleman's park, where they are more protected, and from whence they sometimes drive their near relatives, the hares. The third are vagabond rabbits, living in holes in banks and chalk-pits, and all sorts of out-of-the-way places, and wandering about the country in a very unsettled manner: they are the gipsies of their kind. The fourth are the tame rabbits so sleek and well fed, who live a life of ease and comfort, and have nothing to do but to eat and grow fat, that they in turn may be eaten and help to produce fatness on their devourers. But what are these? mere plebeians, that belong not to the aristocracy of rabbitdom, before we enter the sacred precincts of which we may mention one or two other kinds which are not strictly of the "fancy" order.

HALF LOP.

There is the Silver-sprigged rabbit, a modern introduction into this country, having a black coat mottled over with grey hairs; and there is a larger variety coloured much like a hare, with flesh of a deeper tint and more gamey flavour than that of most rabbits; and there are the large white and white and

OAR LOP.

yellow kinds, with delicate flesh on their bones, and plenty of it: these we often see in hutches, but then they are all flesh and fur, nothing more—mere brute weight, as a fancier would say. They may do very well for boys to keep, and people who want them to eat and clothe themselves withal; but the "club" would not look at them: they must have animals with ears, wonderful ears, of prodigious size, and of a certain shape and inclination, without which a rabbit is nought. Now these ears must not slope backwards as those of vulgar rabbits do, they must "lop," and they must both lop in an equal degree; some perverse creatures will insist on cocking one ear, and lopping the other: away with them! kill, skin, cook, and eat them! do anything you like with them; they are outcast pariahs, and do not belong to the "fancy." Then again these wonderful ears must lop in a particular way; the forward or "horn lop," which makes a droop over the forehead, will not do; neither will the "oar lop," on which the ears spread out like the wings of a bird, or a man's arms in the act of swimming. That, however, is the nearest point to perfection, which is the Real or Perfect Lop, which is so rare that our breeder thinks himself fortunate if he can rear twelve of these in a year out of the offspring of twenty of the handsomest and most perfect does he has.

HORN LOP.

In the real lop, the ears in their descent from the head describe the curve which we see in the neck of the swan when it swims with its head somewhat raised: the open parts of the ears turn inwards, and the tops touch the ground when the animals stand. The pair of ears are of an equal length and breadth, so as to be a perfect match. Another point of great importance in the fancy rabbit is the dewlap beneath the chin: it should be large enough to support the head of the creature like a cushion, when she lies on all fours.

Fancy rabbits may be of a slaty blue colour, or white, or a mixture of tawny and white, which is called tortoiseshell; but whatever the ground colour may be, they must have certain peculiar markings, in accordance with which they are distinguished as Blue or Black Butterflies, &c. Then there are marks called "the chain," and "the saddle," and the more distinctly these are made out, the more perfect is the rabbit considered.

Shape or "carriage," as it is called, is another point of excellence: a finely arched back, reaching at least two inches higher than the top of the head, is essential; and the head held so low that the muzzle may almost, and the ears quite, touch the ground. As much as ten guineas is sometimes given for a well-bred fancy rabbit, and some that have taken prizes at the rabbit shows which are held periodically throughout the country, fetch immense prices.

Hutches.

It is a common notion that anybody can make a rabbit-hutch out of anything, but this is a popular fallacy. True, an old tea-chest, or any kind of box, will do for the purpose, and rabbits will live and thrive in very incommodious places; but they will do best in a comfortable habitation, into which neither the wet nor the cold wind can penetrate. Unless the stock is very large, a portable hutch is better than a fixed one, in shape like the common dog-kennel, with the shelving roof on both sides overlapping considerably, so that small gimlet-holes for ventilation can be made along the top, protected by the lap of the roof. It should be high enough for a division into an upper and lower storey, the breeding-places being above. The floor should be of beech or some other hard wood, that will not absorb urine and soft matter, which make such places often smell so badly, and it should be frequently cleaned.

The lower floor should be raised by legs or some other contrivance several inches from the ground, and in this holes should be bored for drainage. Each doe in the breeding-room above should have a separate compartment, which can be got at without interfering with the others. The whole should have a latticed front, but, if in an exposed situation, there should be a shutter also, which can be put up in bad weather.

Food.

Rabbits will eat almost anything that is green, or, indeed, any vegetable food, and thrive upon it: they are voracious eaters, and are particularly fond of sow-thistle, carrots with the tops, cabbage, and lettuce-leaves; they should also have oat and barley-meal, corn, and hay. In the wild state they are animals that feed in the twilight, so the morning and evening are the best times for their supply of food. It is a disputed point whether they require water, and with plenty of green food, perhaps they may do well without; but when the food is mostly dry, they should be supplied with this great requisite of animal existence. The habit some does have of eating their young has been ascribed to a sort of frenzy, produced by excessive thirst: one cause of this is undoubtedly having more than the doe can well suckle, and her powers of sustenance should not be too highly taxed. If there are more than eight young ones in a brood, some of them should be destroyed. A doe will not unfrequently bring up as many as twelve, and even fourteen, but this should not be permitted. While she is suckling she should be well fed on barley-meal and milk, with a little green food. The young may be taken from her when they are eight weeks old; they will then be able to feed themselves.

Let none of my readers fancy they are going to make a fortune by rabbit-breeding: it may be pleasant, but, as a rule, it is not profitable—the animals eat too much, and skins and flesh fetch too little for this. Yet it is well for young people to have pets, and rabbits are about as easily managed as any.

SQUIRRELS.

We hardly like to recommend these pretty creatures as home pets, as it seems as if they could not be happy anywhere out of their native woods, where they lead a life of almost incessant activity, springing about from tree to tree, and playing among the leafy branches with their bushy tails turned up over their backs, their pointed ears quivering, and their bead-like eyes flashing, as it seems, with very joy. Wonderful are the leaps taken by them in their gambols in search for food, which consists chiefly of acorns and other nuts; they appear rather to fly than leap from place to place. They are very light in proportion to their size, and there is no doubt that their tails, which can be spread far out, greatly assists them by offering opposition to the air, and preventing their sinking too rapidly through it. They are great economizers of food, storing it carefully up for winter consumption, and forming several depots at different places, which their sagacity enables them to find although the change of season may have completely altered the aspect of the landscape.

The name Squirrel comes from the Greek *sciurus*, which is made up of two words signifying shade and tail, which is indicative of the creature's habit of shading its entire body with its tail when at rest. It is commonly about fifteen inches long, of a bright red-brown above, and white underneath. It has long pointed ears, large black and sparkling eyes, short legs, with long toes armed with very sharp claws; the upper lip is cleft or divided, like that of the hare; in each jaw there are two *incisors*, or cutting-teeth, very sharp; the rest are *molars*, or grinding-teeth. It is a shy timid creature, but may be tamed and rendered very familiar; it is naturally playful, and when domesticated affords great amusement by its gambols.

If you want to keep a pet squirrel, the best time to make your purchase is in September, when the animals are in their best condition. See that the fur is sleek and glossy, the feet clean, the eyes bright, and the teeth white: if the latter are yellow, the creature is old, and would be difficult to tame. Put your captive into a good roomy cage, a portion of which only is made to revolve, so that he can take his treadmill exercises when he likes; give him plenty of nuts of any kind, the less oily the better, acorns, wheat, stale bread, a little boiled potato, and now and then cooked meat, a small piece only. Be gentle in all your doings with him, and he will soon come to know and love you. Beware of squirrels brought about by men who say they have caught and tamed them: if they look stupid and inactive, the chances are that they have been drugged to make them seem tame, and if they recover they will be wild and intractable.

HARES.

If taken quite young, when they are called "leverets," as juvenile rabbits are termed "conies," these animals often become quite tame and attached to their keepers. The poet Cowper had three of them, which used to sport about him as he sat in the summer-house at Olney. We have seen a tame leveret gambolling through the house, on good terms with the dog and cat.

Hares have even been brought to breed in confinement, like rabbits; but instances of this are rare. Naturally wild and timid, they will generally, even when brought up in confinement, take the first opportunity of escaping to the woods. They require the same food as rabbits.

HEDGEHOGS.

If any of my young readers should feel inclined to keep an exaggerated walking pincushion, with the points turned outwards, he had better get a Hedgehog—which is not a hog at all, and only resembles one in having a snout fit to grub among the loose earth and decayed vegetation, where he picks up a living, extracting sustenance from rubbish like a scavenger, as he is. Snails and beetles, worms—almost anything that can be eaten—he eats; he sucks eggs, neatly biting off the smaller end, and taking care to spill none; he is fond of milk—no doubt of that; but that he empties the udders of the cows, as they lie ruminating in the meadows, we altogether deny—he could not get a teat into his mouth: when the milk is trickling out, as is often the case, he scents it, and prevents waste by licking it up. He does *not* climb fruit trees in order to bite off the fruit close to the stalks that they may fall to the ground, and he, by rolling himself among them, may carry them off on the points of his spines, and feast on them at leisure, with his young. All these are calumnies, which those who have observed the habits of the animal know to be such. But ignorance and prejudice are strong, and so the harmless and useful hedgehog gets classed among the "varmint," and killed whenever his persecutors can catch him. The gipsies, too, catch and roast him for his flesh, which is said to be very delicious.

The hedgehog is a great destroyer of troublesome and noxious creatures, and any one who is troubled with rats, mice, or cockroaches, should get one of these English porcupines, which, as we said before, eats almost anything, and does not appear to suffer from the bite of the most venomous snakes. It is a nocturnal or night-feeder, and, when shut up in the kitchen, makes a tremendous clatter among the pots and pans in its search for creatures to devour. All the day it sleeps in some snug hole or corner, and when all is still sallies forth. Some animal food should always be left out for it, as without this it will pine and die. When danger approaches, it assumes the form of a prickly ball, which it is disagreeable, if not dangerous, to touch or handle. Rover may cautiously touch it with his foot and bark at it ever so furiously, the globe of sharp spines defies him; and presently, when he is gone, the globe will begin to unroll; the snout will come out first, then the head, then the feet, and the creature will go grunting and shuffling off triumphantly, to potter about in a hide-and-seek sort of fashion during the summer, and, on the approach of winter, to dig a hole in the earth, and bury himself there, or to creep into a rat-hole or rabbit-warren, or under a pile of leaves or other vegetable matter, and await the return of spring and genial weather.

MICE.

People have made pets of spiders, lizards, snakes, even rats—all sorts of living creatures—why not of Mice? They are very pretty, lively, and interesting animals, are not very difficult to tame, and evince great attachment to their keepers, or feeders, we ought to say—for, after all, the way to the affections of any animal is through the stomach.

There are several kinds of mice which are sometimes kept, but the most common is the *Mus domesticus*, as naturalists call the little sleek grey-coated creature which is the terror of thrifty housewives. If you wish to tame it you must take it when quite young, and place it with others of the same brood or same size in a cage with a wire front, but a solid back and sides: let the little prisoners have something warm and soft to lie upon placed in a covered corner, and give them bread and milk to eat. If you whistle or make some other noise whenever you take them their food, they will soon learn to associate the sound with the pleasures of eating, and come forth at the summons. When they have got beyond childhood, they will eat grain, stale cheese, and almost anything you like to give them. If you mean to breed them, there must be a division in the cage to separate the mamma from the papa, who has an ugly trick of eating his offspring if he has access to them when they are young and tender. The nursery should also be separated from the common apartment, which should be in the front, and here should be placed a revolving cylinder of wire, for the performance of mouse gymnastics, which will be greatly facilitated also by a number of bars and brackets, fixed in the corners and elsewhere. It is very amusing to watch the antics of the little climbers and leapers, who are wonderfully agile and graceful in their movements. Their cage should be kept very clean, and water should be easy of access.

White and parti-coloured mice are generally more valued than the common sort: they can be obtained without much difficulty by those who are willing to purchase, and from them the fancy sorts may be bred.

Several instances are recorded of mice that emitted musical sounds, something like a soft low warble, and it has been thought by some that this musical power might be cultivated, so that they might become really "singing mice." But we much doubt this: their vocal organs are very different from those of birds. We are more inclined to believe that the whiffling or piping noise is the result of disease in the lungs or air-passages.

The DORMOUSE is by some naturalists classed with the squirrel, which in many of its ways it resembles very closely. It is about the same size as the common species, but has a rounder body and a more blunt nose; it is of a reddish-brown colour above, and white underneath. The life of this animal is passed chiefly in the woods—a very active one in summer, but quite the reverse in winter, through the greater part of which it sleeps in some snug hole, lined with soft substances, and carefully prepared beforehand. As soon as the weather becomes mild it wakes up, and visits one of its magazines of nuts, of which it usually has several in different places. When in its somnolent state it may be captured easily if it can be found; but in the summer, when wide awake, it is one of the most difficult animals to catch. When taken, it should be wrapped up warm, and kept in a box lined with flannel or cotton wool, and fed upon nuts, grain, bread, &c. It will become tame, and may be let out to play about the room when there is no cat near. It requires water or milk, like other mice.

The SHREW and the HARVEST MOUSE are both tiny creatures, the latter especially, it being the smallest of British quadrupeds, or four-footed animals. These two species scarcely come under the denomination of Pets, being rarely, if ever, kept in confinement.

GUINEA PIGS.

It has been said that if you take a Guinea Pig up by the tail its eyes will drop out; but whether this is a "fact" in natural history we cannot say, never having tried the experiment: if any of our readers do so, we shall be glad to know the result. Another puzzle connected with this animal is the name: it is not a pig at all, and it did not come from Guinea, but from South America; perhaps a guinea was given for the first specimen brought over, and its general shape being something like that of a miniature swine, this name was given to it. Whether that be so or not, domestication has very much altered the appearance of this creature; in the wild state it is much less plump, and mostly of an uniform grey or slate-colour, with a reddish tinge, not variegated as we see it now. Then again, in its native wilds it breeds but once a year, and produces but one or two little ones, whereas a tame guinea pig is wonderfully prolific, five or six litters of eight each being by no means unusual. It seems to be a connecting link between the mice and the rabbits. It was formerly believed that no rat would come near the place where it was kept, and for this reason those who had rabbits generally had guinea pigs also; but as the rats have frequently eaten them and the rabbits too, they have lost their value as protectors of the hutches, and what other use they are nobody knows. Yet they are among the most popular of children's pets. Let them be kept warm, have plenty of vegetable food, and they will do very well.

TORTOISES.

If you buy a Tortoise, or have one given to you, leave it alone as much as possible; let it have the run of the garden, or any place where there is plenty of juicy vegetation, and it will take care of itself. You need not be afraid of treading on it, for its beautifully constructed shell, so strongly protected is this curious animal, that a loaded waggon might pass over without crushing it. This is Mr. Slow-and-sure, who, you know, beat the hare in a race, because he kept steadily on at an even pace, while she run a little way and then slept, thinking she could easily make up for lost time. Although no great traveller, the tortoise often disappears for awhile as though he had gone on a long journey, but he is all the time close at hand down in the earth, or under a heap of dead leaves or rubbish, lying in a torpid state, as do lizards, snakes, and other cold-blooded animals, as they are called, for this creature belongs to the class of reptiles, which are wonderfully tenacious of life: some of them have lived and moved with their brains taken out, and even with their heads off; as to the loss of a limb, that seems a mere trifle to them. The turtle of which the famous soup is made, is a Water Tortoise, or rather, we should perhaps say, that shelly pet is a Land Turtle. Although the shell is so thick and strong, yet it is very sensitive: the slightest tap on it, or even the pattering of a few drops of rain, will make the creature draw in its snake-like head and scaly legs. It will live an immense time without food, and live to an extraordinary age, some say hundreds of years.

FERRETS,

THEIR MANAGEMENT, AND THE SPORT TO BE DERIVED FROM THEIR USE.

To those of our young friends who reside in the country the keeping of these animals will be found to be a source of the greatest amusement, and as the cost of them is but trifling (a good ferret averaging in price from 5*s.* to

10s. or 12s.), we can strongly recommend their being included in the list of live stock connected with every country house.

Before, however, alluding to the sport to be derived from them, we will briefly draw attention to the miserable way in which these poor creatures are usually treated, and endeavour to point out how they may be successfully managed with really but very little trouble.

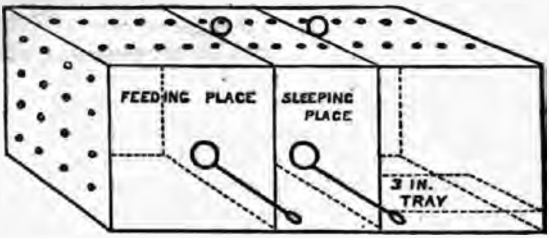
The ferret is naturally a very clean animal, and *cleanliness* is the principal thing to be attended to. If this be disregarded, ferrets are a source of constant anxiety to their keeper and of misery to the poor creatures themselves. More disease is engendered by neglect of it than by anything else, and as it is so very easily avoided, it is most unpardonable to subject a poor animal to the misery it entails.

It appears to be considered by most people that any place in which a ferret can be confined without the possibility of escape is all that is requisite, and an old tub is the commonest form of domicile selected for the poor brute. In it

is thrown a handful of straw, which is seldom or never changed, and in this wretched place (rendered positively putrid by the remains of garbage of all kinds thrown into it, and the consequences of its having no means of exit) it is doomed to pass the greater part of its horrible existence.

We will now endeavour to describe what a ferret-hutch ought to be, and we feel certain it will amply repay our young friends for any trouble or expense they may go to in its construction. The plan is that of Captain Darwin, whose experience in game preserving, trapping, &c., is as well known as it is deservedly appreciated. It is made as follows:

The hutch should be 4 ft. long, 18 in. wide, and 22 in. deep, having two partitions dividing the box into two compartments of 18 in. each, one at each end, and one, 1 ft. wide, in the middle. These partitions should be made to lift up and down, sliding between small fillets of thin wood. Each of the partitions should have near its bottom a hole 3 in. in diameter, to allow the ferrets to pass in and out, and to each should be a small sliding door capable of adjustment by means of a stout wire, so that the ferrets can be confined at pleasure in either compartment during the process of cleaning, feeding, &c., by simply drawing the wire, which should be carried through the front of the hutch. The centre compartment should be filled three parts full of clean wheat-straw, which need only be changed occasionally. The compartment at one end should be used exclusively as a feeding-place, and that at the other devoted to purposes of cleanliness, and should be fitted with a wooden tray lined with zinc or lead, with two handles to lift it out by, and should always have in it a layer of dry sand or sawdust about an inch thick, and *should be* *thoroughly cleaned out and washed every morning.* The hutch should have three separate lids (one for each compartment), so that they can be opened or closed independently of each other. By this means, and by making use of the sliding doors, the ferrets can be confined in any compartment while the other



two are being cleaned, &c. All the lids should be bored with holes at intervals of about 3 in., ½ in. in diameter, and it is as well to have a few bored all round the sides of the hutch.

Having thus described the hutch, we will proceed to give a few hints as to the management of ferrets. They should be fed regularly every *evening* at one stated hour, and no better food can be given them than birds of any kind, and they should be as fresh as possible. Give them also bread and milk (the milk should be first boiled), but take care that it is not in the slightest degree sour, for it is very apt to "scour" them; and be particular in seeing that the saucer in which it is placed is constantly scalded.

It need scarcely be remarked that ferrets should never be fed *before* working them, but they should be placed in their hutch directly they are brought in from their work, and fed as soon as possible. If fed before they are used, they will, in the first place, work very badly, and what is worse, will "lie up," and go to sleep in the burrows, and in all probability be lost.

When ferreting for rabbits, they should always be muzzled; and we would here call the attention of our young friends to the barbarous practice adopted by some keepers, of sewing up their mouths, in the confident hope that they will never lend themselves to such revolting cruelty, particularly as it is quite unnecessary, and as an easier, a simpler, and more efficacious plan can be made use of, which we will now endeavour to describe.

Take a piece of whipcord, about 18 in. long, and double it, and at the doubled end tie a knot, so as to form a small loop; then (another person holding the ferret) place this loop on the upper part of the neck just behind the ears, allowing the two ends of the string to fall one on each side of the neck; then tie them together in a double knot under the throat sufficiently tightly to prevent the string slipping forward over the head; then pass the two ends forward, and tie another double knot even with the corners of the mouth; pass the two ends upwards, and tie another double knot above the nose, and finally, pass one of the ends through the loop on the neck, and tie the two ends tightly together. This, if properly done (and it is very easy), makes the best and most effectual muzzle, and can be removed with a knife in an instant. We are aware that there are small muzzles made of thin leather straps to be had at some of the gunmakers', but we much prefer the above plan.

It is a bad plan to begin to handle young ferrets until they are nearly half grown: if handled too young, the mother is apt to destroy them. They should at first only be handled occasionally, and this should be done boldly; and on no account should the hand be snatched away from them: nothing is more likely to make them bite. As a matter of precaution, it is advisable, perhaps, at first to wear a thick dog-skin glove; and it is a curious fact, that although a ferret may probably seize your fingers if presented to him, he will seldom or never attempt to bite your *fist* if the knuckles are pushed boldly towards him. As they get older they may be frequently handled, and they will soon learn to be perfectly harmless. If one should unfortunately seize your hand, you may make him loosen his hold by pressing him tightly with your thumb under the throat, or, as we have found equally effectual, by taking a long breath, and then blowing steadily but strongly into his nostrils: this prevents his breathing, and in gasping for breath he releases his hold. This plan may, of course, be adopted when, for the purpose of getting him out of a burrow, you have allowed him to seize a rabbit, &c.

You will find that the generality of keepers, &c., carry ferrets in a bag: nothing can be worse, as by their own weight they are squeezed together, and if more than one, the stronger gets uppermost, and the weaker, of course, becomes much distressed. They will keep lively double the time if carried in a small box, with a piece of perforated zinc in the lid.

The only two diseases that we are aware of to which ferrets are liable is what is called the "sweat" and "foot-rot." The former may be prevented, and, indeed, cured by perfect cleanliness, and the latter by an application of creosote to the part affected with a feather.

Should either of such diseases attack your kennel of ferrets, they should at once be transferred to a new hutch, and the one they have left well scalded, purified with whitewash, and again scalded and dried before being again used.

Having, we think, described all that is necessary for the management of ferrets, we will now give a few hints that may be of service as regards their use, and the sport that may be derived from it.

From the fear of losing them when "working" for rabbits, it is the usual plan to "run" them with a line attached to a small leathern collar round their necks. No better plan can be adopted on a sandy soil, where there are no roots of trees or rocks; but if such be present, the line is nearly certain to get entangled among them, and if such should be the case, you have the choice of two alternatives—that of leaving your ferret to die a miserable death, or of digging down and following the line until he is rescued; and in many situations, such as in woods, hedgerows, &c., this expedient is simply impossible. You had far better, therefore, in such situations, "run" your ferret loose, and trust to the chance of his coming out of the burrow, than incur the risk of his being strangled. We remember a laughable incident which occurred to us some years ago. We had been using a very favourite ferret, which was as tame as a kitten, in a hedgerow by the side of a wood, and after shooting four or five rabbits which had "bolted," we could hear nothing of poor "Pug." We sat watching most anxiously for her return, but there were no signs of it. The boy who was with us was sent to a farm-house close at hand for a bundle of straw and a lantern, for we were determined to make ourselves as comfortable as circumstances would permit, and remain all night on the spot rather than lose poor Pug. The straw was placed in a hollow a few yards from the burrow by which she had entered, and a rabbit pegged down at its mouth, with the lantern placed so as to cast a light upon it. Burying ourselves in the straw, for it was a cold October evening, we watched hopefully and patiently, and at length, as it appeared, fell asleep. On awaking somewhere about midnight, and excessively cold, we found the greater part of the neck and shoulder of the rabbit eaten away, and Miss Pug comfortably asleep amongst the straw on which we were lying. We were amply repaid for the loss of our dinner, and all the discomfort we had undergone, by the recovery of poor Pug.

Ferreting for rabbits may appear to the uninitiated a very simple and easy operation; but in this, as in almost everything else, there is a right and a wrong way of going to work, and the hope of sport and success is dependent almost entirely upon the way in which it is practised. In approaching a sand-bank—where there are sure to be burrows if there are any rabbits in the neighbourhood, or, indeed, in any situation—the principal thing to be observed is quietness and silence, and whether it is the intention to shoot rabbits as they "bolt" from the burrows, or to catch them in nets placed over the mouths of the burrows—which we shall presently describe—this is equally essential. If any noise—caused either by walking about more than is absolutely necessary, or by loud talking—is made, but very small chance of success may be looked for; for in such a case rabbits will rather allow themselves to be scratched to death (for ferrets will do this if prevented from biting by their muzzles) rather than bolt; but if the operation is carried on noiselessly, and on a fine day, they will leave the "earths" very freely, and present capital shots as they go away. Endeavour, if possible, to allow them to get some yards clear of any earths or burrows before firing; for if a rabbit has a minute's life left in him after he is struck, he will crawl into a burrow, and there die. Take up your position above the earths if on a bank, and if on flat ground at one side, behind a bush or tree, or in any situation most likely to screen you from view from the rabbits as they first emerge from their holes. If they see you (and rabbits generally stop for a moment at the mouth of a burrow before they make their bolt), they frequently return, and are difficult to move afterwards. In this situation, unless tolerably near them, do not attempt to fire; for unless killed dead on the spot, they will most certainly return into the hole, and offer a greater temptation to your ferrets to "lie up."

When not using a gun, recourse must be had to nets. They are easily made of stout string, and meshes about 2 in. square, and should be about 18 in. long and 9 wide. The meshes at each end should be looped round a piece of wood, having a hole at each end of it, as shown in the drawing. A piece of stout string should be laced through the meshes at each side of the net, and passed through the hole in the wood, and the two ends tied together. When in use the net is stretched out so as to cover the mouth of the burrow, and the "bend" of the string at A and B is slightly pegged down to the ground, or passed over a twig or root that may offer. It will be seen that directly a rabbit bolts into it, the two pieces of wood slide up the string, and he is at once confined in a bag. He must be taken out as quietly as possible, and the net set again. The string need not be pegged down tightly; all that is required is that there should be sufficient resistance to the bolt of the rabbit to ensure the pieces of wood being drawn together.

If a ferret lies up, it is generally because he cannot compel a rabbit to bolt; and if after waiting some time he does not make his appearance, the only course to be adopted is to dig him out, and much time and labour may be spared if this be done in a proper manner. The first thing to ascertain is the exact spot as near as possible where he is, and by a little practice this may be easily done. First, by means of a long thin twig, discover the direction the burrow takes; then lie on the ground face downwards, and by holding the breath and applying your ear to the ground, you will soon perceive the rumbling noise a rabbit makes in his endeavour to avoid the attack of a ferret; then by shifting your position, guided by the sound, you will soon come directly over it; then at once dig down. By placing a dead rabbit into the hole, your ferret will, as soon as you come to the burrow, be at once induced to follow it, and he is then easily secured.

We do not advocate using the same ferrets for rats and rabbits, and we need scarcely add that, when "working" for rats, ferrets should never be muzzled or run with a line. A large old rat is a formidable antagonist, and it would be an act of cruelty to deprive your ferret of his means of defence.

For rabbits we prefer the white ferrets, but we consider the polecat ferret the best sort for rats.

When a ferret has young ones, care should be taken that she is well and regularly fed. Don't give her much meat, but a plentiful supply of new milk, warm, with bread sopped in it, and be particularly careful that the saucer in which it is placed is kept perfectly sweet by being regularly scalded.

Avoid all acts of cruelty in feeding your ferrets. It is by many people considered necessary that their food, whether birds, young rabbits, &c., should be given to them alive. This is a mistake. Let their food be as fresh as possible, but avoid inflicting unnecessary torture, and kill as quickly as possible any bird, &c., with which they are fed.

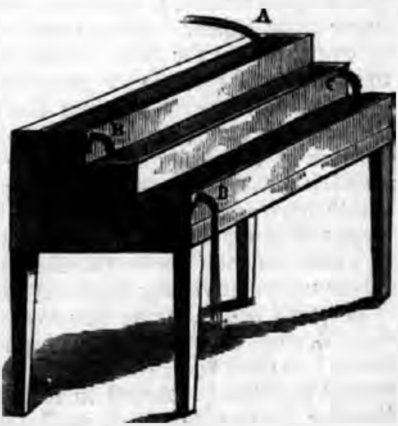
Pisciculture.

ARTIFICIAL FISH-HATCHING AND CULTURE.

Amongst the numerous and varied discoveries of modern times, that of fish-hatching by artificial means has undoubtedly and most deservedly commanded its share of public attention, and it is certainly a matter of wonder that, among the many keen observers of the nature and habits of the inferior animals who have added to the stores of science in bygone days, and even in our own times, the idea should have remained so long undeveloped. It has, however, at last been turned to account, and whether the process may be pursued by our young friends with a view to its utilization in stocking rivers, &c., or simply as a source of amusement and instruction, we feel sure that their attention to the method of accomplishing it, which we shall endeavour to point out, will not be in vain.

Before proceeding, however, to give instructions as to spawning the fish, &c., it will be necessary to explain the apparatus required for the purpose, and the simplest method of arranging it.

In the first place, it must be borne in mind that it is indispensably necessary that there should be a continual supply of *running water;* for so sensitive are the young fry when first hatched, that we have known several instances of them dying in consequence of some trifling circumstance having occurred which for two or three hours had stopped the supply of water, and thus rendered it stagnant in the troughs in which the young fry were placed. Proximity to a river or pond supplied by a spring, provided a sufficient fall can be obtained, is most desirable if it can be commanded, although the supply of water afforded by a cistern will answer the purpose. Mr. Frank Buckland, whose name and reputation are world-wide as a practical naturalist, and who has recently been appointed one of Her Majesty's Inspectors of Fisheries, and who has done more for the advancement and protection of our fisheries than any man, has hatched and brought to maturity many thousands of ova, both of the salmon and trout, with no other supply of water than that from the ordinary scullery cistern, the mode of adapting which we will now describe. The best troughs in which



the ova are placed are made of slate, but for all practical purposes they are equally good if constructed of wood: the number of them will, of course, depend upon the extent to which the operation is carried on. These troughs should be made 36 in. long, 6 in. wide, and 5 in. deep, and should be placed on a stand, arranged like a staircase, the bottom of one trough on a level with the top of the next, as in the woodcut.

A *continual* stream of water must be conveyed into the upper trough, as at A. A short piece of leaden or zinc pipe must be fixed in the upper trough, as at B, and similar ones at C and D, so that the overflow of the upper trough supplies the lower. The stream of water need not be larger than an ordinary drawing-pencil. The bottom of each trough should be evenly covered with a layer, 2 in. deep, of fine shingle, which should be boiled before being used, in order to destroy any insects or their larvæ which might be amongst it. The depth of water above the shingle should not exceed 2 in. It is also indispensably necessary that both the ova and the young fish in their first stage of existence should be kept in darkness; the troughs, therefore, should have thin boards fitted to them, but movable, with a small hole at one end, in which the supply-pipe must be inserted. The supply-pipe at A had better be fitted with a small tap, so that the stream of water can be regulated to a nicety. Between the cistern and the troughs it is a good plan to have a small cask nearly filled with alternate layers of small shingle and charcoal, which thoroughly cleanses the water in its passage. The pipes from the cistern should, of course, be carried to the top of this cask, and that supplying the troughs from the bottom of it.

When the ova are procured they should be placed evenly on the shingle in the troughs, and the water allowed to flow *incessantly* over them.

The only care that need be bestowed upon the ova until they are hatched is to prevent the accumulation of dirt of any kind, and to remove all eggs in which there is no vitality, which are easily distinguishable by their opaque white colour. This may be done either with a glass syphon or with a thin piece of wood with a small brass ring at the end of it, like that at the bottom of an ordinary fishing-float. There is one maxim which it is advisable should be adhered to: it is one than which nothing is theoretically more easy, but which, practically, it is found few things are more difficult: it is simply to *leave them alone!* More than half the young fry which are lost are killed by an over anxiety for their well-being, which would in all probability have come to maturity if this simple prescription had been adopted.

In order to guard against the escape of the young fry from one trough to the other, a small piece of finely-perforated zinc should be placed across the corners of the troughs where the water passes through the pipes, which will also have the effect of preventing the egress of any accumulation of dirt, &c., which may accidentally have got into the water. It is also advisable to have pieces of slate, tile, &c., supported by stones, &c., in each trough, with a space of about an inch above the shingle, as the young fish delight in hiding themselves under anything that will thus afford them shelter.

It would appear from this that in this early stage of existence the action of light is most offensive, if not injurious, to their delicate organs of vision, and, indeed, to their life; for it must be remembered that in their natural state the young fry remain buried in the gravel at the bottom of the river until they become perfect fish: *i.e.*, until they lose the umbilical vesicle or sac, which contains the only sustenance they require up to a certain period. When this is no longer necessary it is absorbed, and the little stranger emerges from his gravelly bed, which he is obliged to do in search of food, with which he is no longer provided.

Our young friends, having followed the directions we have endeavoured to give, will now be in a position to commence operations. It must be borne in mind that trout spawn at different seasons of the year in different rivers, varying from September to February. We will suppose, then, that they have obtained the permission of the owner of a trout stream, and that the apparatus, as above described, is in good working order.

A light and portable drag-net, a large shallow tub, filled with water, to receive the fish when caught, and a shallow tin dish, in which to impregnate the ova, and a good-sized fish-kettle, to carry home the ova when impregnated, will complete the apparatus necessary at the river-side.

The plan adopted by Mr. Buckland (and we cannot do better than follow the example of so experienced a practitioner) is to have two nets, and having selected a spot in the river in the shallows where the trout congregate to spawn, fix our net across the stream; then commence dragging the stream with the other net slowly towards it. When the net is drawn ashore, remove the fish from it as soon as possible, and place them in the large tub.

When the fish are caught, examine them one by one. If the ova of the female be ripe, they will pour out from the abdomen at the slightest pressure of the hand. Handle the fish very tenderly. If the milt of the male fish be ripe, it will also upon the slightest pressure be observed to flow out like thin milk.

Fill your tin dish three parts full of clean water from the stream.

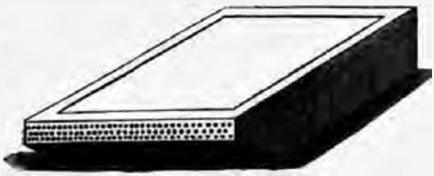
Return all unripe fish to the river.

Take a female fish that is ripe; hold her head with your left hand; get an assistant to steady the tail; gently submerge the lower part of the body into your bowl; then gently and carefully pass your right hand downwards from the head to the tail, the thumb and forefinger gently compressing the abdomen, the other fingers following. You should also slightly bend the fish backwards in a bow-shaped form. If the eggs are quite ripe, you will see in an instant that they will all pour out into the water, following each other in most rapid succession. Continue the downward pressure as long as the eggs continue to come out, and take the greatest care that the vent of the fish, during the operation, is *kept the whole time under water.* The eggs should run out quite freely. No force is necessary: if it be found to be requisite to dislodge the eggs, you may feel quite sure the parent fish is not ripe enough to spawn.

The eggs being collected at the bottom of the shallow tin vessel, take a male fish. Press the abdomen in the same way as you treated the female, and if he be quite ripe, the milt will instantly escape and discolour the water, giving it a milk-white appearance. Stir the eggs and milt gently together with the hand, and leave them quiet for three or four minutes, then pour fresh water into the tin, allowing the discoloured water to escape, until that in the tin is perfectly clear. If this be neatly and properly done, the eggs will have been sufficiently impregnated. Then pour the water, eggs and all, into the fish-kettle in which they are to be taken home, and let them be placed with as little delay as possible in the troughs. If you have any distance to carry them, they should be taken as gently as possible. If per railway, it is a good plan to suspend the can by its handle on a stick placed between the seats.

Although it is quite possible to wash the eggs in an open shallow dish or pan, yet it is by no means an easy operation to any but those who have had considerable practice; we will, however, describe it, and afterwards give directions for making a simple apparatus, which may be used by the most inexperienced person without the possibility of failure. The usual plan is to place the ova as soon as they are impregnated in a shallow tin dish with a small quantity of water (for it must be borne in mind that the eggs must never even for a moment be exposed to the air, but kept constantly immersed in water). The operator must then stand in the water looking "up stream," and, holding the dish with his hands one on each side, must slowly and steadily lower the end of the dish farthest from him, so as to allow the water to flow gently into it, keeping his eye on the end of the dish next to him, in order to see that none of the eggs flow out; the fresh water flowing in will drive out the dirty water, and in a minute or two the eggs will be found to be perfectly clean; they must then be at once poured, water and all, into the can in which they are to be conveyed to the troughs.

We have designed a can for the purpose, which, while it will most effectually cleanse the ova, will entirely prevent the possibility of their escape. It can be made by any tinman. Its dimensions are as follow: 12 in. long, 9 in. wide, and 3 in. deep, with a piece of thick plate glass let into the lid, as shown in the drawing. The upper half of each end should be made of a piece of perforated zinc, and one end at which the water will enter should be made quite flat and square with the top, and the other slanting off, as shown. The piece of zinc at the slanting end should be made to slide out by being pulled *upwards*. The glass in the lid will admit of the eggs being examined to see if they are sufficiently washed before placing them in the can for conveyance home. To wash the eggs, all that is necessary to be done is to open the lid, pour them into it, close the lid, and immerse it in the stream with the flat end against it; the water will then, of course, flow through the perforated zinc at one end and out at the other, and the eggs will then be perfectly cleansed without any loss. When the operation is complete, the piece of zinc at the slanting end should be lifted up and the contents poured into the can.

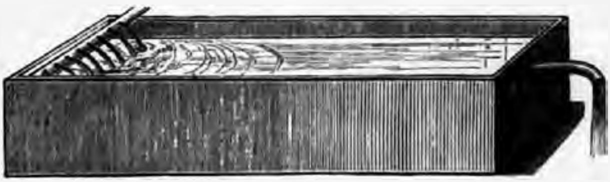


Very little of the milt of the male fish is sufficient to impregnate the ova of many females.

The eggs or ova being placed in the troughs in the manner before described, they should be allowed to remain quiet and undisturbed, excepting so far as it is necessary to remove the dead eggs, &c.

If the eggs be carefully examined from about thirty to thirty-five days after they are taken from the parent fish, two small dark spots will be discovered: these are the eyes of the future fish; and about the same number of days after the eyes appear the young fish may be expected to burst out from the shell, and as they have been taken from the parent fish on the same day, their arrival may be looked for about the same time. No further care is necessary than that which has been bestowed upon the eggs, nor is it requisite to do anything more than to see that the water is supplied in a continuous stream, that all dirt and scum is carefully removed, and that water-insects of every kind are expelled from the troughs. An inspection once or twice a day is all that is required, and, with this exception, the little family may be left entirely to itself until its members are entitled to the denomination of fish, and, indeed, until they have become so for some little time. It is, we believe, the general practice to transfer the young fish from the troughs in which they were hatched to a small stream prepared for the purpose adjacent to a river; but we are inclined to think that it is advisable to have a trough made on a larger scale, but exactly on the same plan, and fed with water in precisely the same way, in which they should be deposited for some two or three weeks before being transferred to the stream before mentioned. The trough for this purpose should be made 9 ft. long, 18 in. wide, and 9 in. deep. The shingle at the bottom of it should be of the same depth as in the smaller troughs; but the depth of water above the shingle should be about 3 in.; this will leave about 4 in. above the water, and will prevent the loss of many young fish, as they will occasionally jump out of the water, and, but for this precaution, would fall over the sides of the trough and come to an untimely end.

The only alteration necessary in the arrangement of this larger trough is in the supply of the water. Instead of allowing it to flow directly into the trough through the small pipe, the better way is to plug up the end of the pipe entirely and carry it *across* the end of the trough, and perforate it at intervals of half an inch with a number of small holes, as shown in the cut. The reason of this is that the fall of water makes a greater splash, and therefore aërates the water to a much greater extent than if it simply flowed into the trough through the end of the pipe in one stream.



As soon as the umbilical vesicle or sac on the young fish has been absorbed, it, of course, derives no other nutriment than that which it is able to find in the water, and although no doubt the minute animalculæ in the water itself afford a certain amount of nourishment, it has been found in practice that something more is required; and, if one watches attentively the greedy way in which the young fry rush at and devour every particle of food which is given them, it is evident that what is thus provided for them is not altogether needless. At first, of course, it must be given in very minute quantities; a little of the finest biscuit powder, the yolk of a hard-boiled egg scraped very fine, and boiled liver allowed to get cold and then grated or scraped, is found, we believe, to be the best food that can be given.

After the young fish have been some five or six weeks in the larger trough, they should be advanced enough to be turned out, and, if it be practicable, it is advisable to monopolize some twenty or thirty yards of a small natural stream for the purpose of completing their education, before being turned out on the wide world to shift for themselves. When the spot has been fixed upon, we should recommend a dam of brick or woodwork being thrown across it, so as to create, if possible, a mimic fall of some two or three inches, and the upper part of the dam should have a piece of finely-perforated zinc placed upon it, which will keep the water clean and free from scum, weeds, &c.; and to protect this, it is as well to place a faggot or two across the stream above it, which will relieve the zinc from too great pressure. At the lower end of the *nursery* a similar dam should be placed, in order to prevent the escape of the fish. In the stream itself some large stones, roots, &c., should be placed, under which the young fry can shelter themselves.

If it be practicable, the best situation for the nursery is close to a waterfall. Send your supply-pipe from the stream above the fall, and allow your waste-pipe to discharge itself below it. You will thus insure a constantly running stream; whereas, if your nursery be made by the side of a stream without this fall, it will have no stream of itself, but be simply dead water, and very soon that adjective may be applied to your fish. Supposing your nursery to be all that is desirable, the young fish from the trough should be turned into it as soon as they are about $1\frac{1}{2}$ in. long, care being taken to protect them from the tender mercies of kingfishers, herons, &c., by having a piece of net stretched over them. As a rule, they will generally find food enough in the shape of insects, but it is still advisable to feed them, and there is no better plan than to suspend at the end of a stick fixed in the ground, and overhanging the water, the body of any animal or bird you may be able to procure; for as it decomposes, the gentles or maggots will fall into the stream, and keep up a supply of food for many days.

We regret that our necessarily limited space will not admit of our going more fully into detail, but we trust that the foregoing instructions, acquired as they have been by actual practical experience, may be found sufficient at least to enable our young readers to practise successfully artificial fish-hatching and culture.

CHEMISTRY.

Chemistry is the science which teaches us the nature of the component parts or elements of the earth, and especially the relations which these elements bear to each other.

Formerly it was considered—and the notion is not yet quite exploded—that there were only four elements, viz., earth, air, fire, and water; and these were called elements because it was supposed that they were simple bodies, that is, bodies which could not be produced in their apparent form, except by the hand of Nature. Now, this being the true meaning of the word *element*, chemistry has discovered that none of these four things are elements; for she has, so to speak, dissected them all, and can not only exhibit in a detached form the true elements of which they are made, but can also unite the true elements in such proportions as to reproduce the substances which erewhile she split up.

The chemistry which splits up a combination of elements is called *analytical* chemistry (resolving any substance into first principles); and that which reproduces broken combinations, or builds up others, is called *synthetical* chemistry (joining elements into a compound). To both of these the student will be introduced.

To account for our forefathers not reckoning the metals amongst elements, it must be borne in mind that they made a distinction between base and noble metals—a sort of House of Commons and House of Lords amongst minerals—and believed that, by a process which they called transmutation, the members of the lower class could be changed into members of the upper class, so that iron might become gold, and lead silver, and so on. Some cunning men, working on the avarice of their fellows, pretended to a knowledge of this process, and to be able, by means of the "philosopher's stone," to enrich without stint the man who would only spend enough money to defray the cost of their operations. The histories of the Middle Ages are full of the records of chemical rogueries of this kind, which would have been impossible if folks had only known, as we know now, that all metals are elements, unchanging and unchangeable in their nature, entering into many different forms and combinations, but ever in themselves the same, and utterly incapable of conversion.

An element, therefore, is a body constituted of perfectly identical particles, and incapable, so far as chemistry hitherto knows, of being resolved into components. Of this kind of element chemistry at present numbers sixty-three, which are stated in the following table:

TABLE OF ELEMENTS.

(The names in italics are those of the elements commonly met with.)

Name of Element.	Symbol.	Name of Element.	Symbol.	Name of Element.	Symbol.
Hydrogen — Gaseous at common temperature	H	Glucinum	Gl	Tungsten	Tn, or
Oxygen	O	Thorium	Th	(Wolfram)	W
Nitrogen	N	Yttrium	Y	Molybdenum	Mo
Chlorine	Cl	Zirconium	Zo	Osmium	Os
Bromine	Br	Lanthamium	La	Tantalum	Ta
Fluorine	F	Cesium	Ce	Niobium	Nb
Sulphur — Solid at common temperature	S	Didymium	Di	Ilmenium	Il
Phosphorus	P	Erbium	Er	Pelopium	Pe
Carbon	C	Terbium	Tr	*Copper* (Cu-	
Iodine	I	*Manganese*	Mn	prum)	Cu
Boron	B	*Iron* (Ferrum)	Fe	*Lead* (Plum-	
Silicon	Si	*Nickel*	Ni	bum)	Pb
Selenium	Se	*Cobalt*	Co	*Bismuth*	Bi
		Chromium	Cr	*Mercury* (Hy-	
METALS.		*Zinc*	Zn	drargyrum)	Hg
Potassium (Kalium)	K	*Cadmium*	Cd	*Silver* (Argen-	
Sodium (Natrium)	N	Vanadium	V	tum)	Ag
Lithium	Li	Uranium	U	*Gold* (Aurum)	Au
Barium	Ba	*Arsenic*	As	*Platinum*	Pt
Strontium	Sr	*Tin* (Stannum)	Sn	Palladium	Pd
Calcium	Ca	*Antimony* (Sti-		Rhodium	R
Magnesium	Mg	bium)	Sb	Iridium	Ir
Aluminium	Al	Titanium	Ti	Ruthenium	Ru

It is quite possible that as chemical knowledge becomes greater, some of these bodies may be struck out of the list, and others yet to be found may be added; but, as far as we know now, the above list contains all the elements.

The letters put against each element signify the name by which it is known in chemical language, a language highly necessary, as will be shown, and without a knowledge of which the real student of the science cannot advance a step. He may play at chemistry, and, under direction, produce certain effects with the chemicals at his disposal; but he will understand nothing of what he is about, nor will he perceive the "reason why" of the changes wrought before him. He should learn the language of the region in which he is about to travel, or he will meet with nothing but misadventure; and the language is so simple that there is no excuse for his not mastering it thoroughly.

By the use of symbolical letters to represent the words, and by the use of little figures placed to the right of the symbols, the names of the elements in any combination of elements can be seen at a glance, together with the proportion in which the elements are combined. Thus Cu, as will be seen by reference to the table, is the symbol for cuprum or copper, O is the symbol for oxygen, and S is the symbol for sulphur. These three elements combine in certain proportions to make sulphate of copper (blue vitriol); but to write the words "sulphate of copper" conveys no idea of what elements, or how much of them, are contained in this substance. Let us see how it looks in chemical language: CuO,SO_3. Here we see that in order to make up this salt, one part of copper unites itself with one part of oxygen to form what is called the *base* of the salt, and that one part of sulphur unites with three parts of oxygen to form sulphuric acid, which is the acid of the salt; so that at a glance we see —written in a smaller compass, too, than is the common name of the salt—the exact nature and composition of sulphate of copper.

But this is not the only advantage of symbols. By their aid we are enabled to work out on paper, without seeing the chemicals, the changes which two substances will work in each other when brought intimately together. Indeed, but for them it would often be impossible to trace the operation of causes to their final results. With them, there is no chemical process so delicate or difficult but it may be followed, detective-like, to the end.

The student should not attempt to practise with his chemicals and apparatus till he has well drilled himself in the use of the symbols; and when he sees in practice any fresh combination brought about by the means of any of his processes, he ought invariably to account for it on paper, and ascertain, through the symbols, what that new combination is.

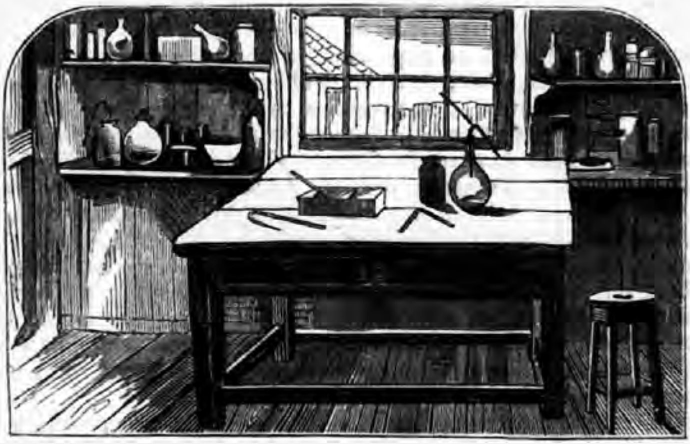
Acids not containing oxygen will not unite with bases containing oxygen; so that, whenever there is an oxygen acid, as nitric (NO_5) or sulphuric (SO_3), oxygen must be derived from somewhere or other among the elements to join with the base before a salt can be formed. The reverse is the case with hydrogen acids, as hydrochloric (HCl) or sulphuretted hydrogen: any oxygen in the base must be got rid of before union can be effected.

In order to understand the operation of the symbols in accounting for chemical changes, it must be borne in mind that even amongst chemicals there are strong likes and dislikes, one element preferring another above its peers so strongly that, when possible, it will always hasten to make a combination with it, even at the cost of a previous combination. Thus, if a solution of sulphate of copper (CuO,SO_3) be introduced to a solution of nitrate of lead (PbO,NO_5), a precipitate of sulphate of lead (PbO,SO_3) will be thrown down, because the lead, having a stronger liking for the sulphuric than the nitric acid, hastens to form an alliance with it, giving its former uncongenial acid to the copper, with which it unites (still in solution) to form nitrate of copper (CuO,NO_5).

The law by which these likes and preferences—ascertained in the course of long chemical experiences—are regulated is called the law of chemical affinity, that is, "chemical relationship." A knowledge of it will come gradually. To assist in acquiring the knowledge, let it be remembered what is said above as to the unions of oxygen acids and hydrogen acids with bases to form salts.

The student should practise writing the names of his chemicals in chemical language. Let him also express any chemical he has to mention in the like way. Study the composition of the chemically written names of the reagents on p. 588 with reference to the table of elements already given; and exercise by supposing, on paper, the introduction of the reagents to some previously existing combination of elements, as in the following examples, where the actual changes are worked out:

Substances added.	Substances formed.
HCl (Hydrochloric acid). AgO,NO_5 (Nitrate of silver).	Ag,Cl (Chloride of silver). NO_5 (Nitric acid). HO (Water).
NH_4O,SO_3 (Sulphate of ammonia). Ba,Cl (Chloride of barium).	BaO,SO_3 (Sulphate of baryta). NH_4,Cl (Chloride of ammonium).
HS (Sulphuretted hydrogen). PbO,NO_5 (Nitrate of lead).	Pb,S (Sulphide of lead). NO_5 (Nitric acid). HO (Water).



THE LABORATORY.

The construction of such a laboratory as will be amply sufficient for the wants of a beginner need not—indeed, should not—be an expensive affair. It will require the exercise of some ingenuity and the proper application of such hints as are here given; but the outlay of money need be only trifling.

First, a bench or table, which may be wholly devoted to the purpose, is to be got. An old bed-room table, the commoner the better, will do admirably;

or, failing this, three deals, sawn to a length of 7 ft. and supported on trestles, will answer. A packing-case, perhaps, is best of all; but, whichever is chosen, it must be devoted to chemical work and nothing else.

The bench or table should be put against a wall, so as to get side support for bottles and apparatus. Shelves, which a very little skill in carpentry will enable the student to make for himself, can be added if wanted, being made fast to the wall. They are handy, but not essential, and should not be added till the growing requirements of the student suggest them. A lock-up box, to keep delicate apparatus in, will be useful.

The best place for a laboratory is a stable loft or garden shed—some place out of the dwelling-house, in order to prevent a conflict between the student of science and the lovers of comfort and haters of smell.

These conditions being satisfied, it will be necessary to stock the laboratory. There are some things that *must be bought*, such as the chemicals themselves; and where it is necessary to buy it is cheaper to buy *the best*, that is to say, not necessarily the dearest that can be procured, but the best that a respectable operative chemist can furnish. Cheap chemicals are worse than useless, for they are impure, and impurity in the working materials of chemistry can lead only to confusion. For a few purposes, which will be specified, certain cheap articles will do, but, as a rule, the purest should be obtained. Some apparatus must be bought, but much that is often bought can be made by the student himself, and this will be described.

It is of necessity that the laboratory be furnished with the following things: those in the first division must be bought, those in the second may be made by the student.

	s.	*d.*	
2 evaporating-basins	1	0	Hydrogen gas-making apparatus,
Wedgwood pestle and mortar	1	0	Sulphuretted hydrogen-maker,
Test-tubes (1 doz.)	1	0	Washing-bottle,
Deflagrating-jar and spoon	2	6	Test-tube stand,
Spirit-lamp	2	0	Pneumatic trough,
Glass funnel	0	7	Gas-jar,
Blowpipe	0	9	Syphon,
Glass tubing (1 lb.)	1	6	Retort-stand,
2 funnel-tubes	0	8	Filter papers,
			Florence flasks (those in which Italian
	11	0	oil has been will do if cleansed).

The above constitute the entire stock of apparatus which the student will find to be indispensable to beginning his work. The cost of chemicals necessary to the same end will not exceed £1 more, so that for the sum of 31*s.* a student may really make an excellent beginning, if he only spend his money prudently, and be not enticed to extravagance by the alluring catalogues of the operative chemists.

Before I go on to state what chemicals will be wanted, and to what uses they should be put, let me say how the apparatus included in the second column can be made.

1. *Gas-making Apparatus (for Hydrogen).*— Get a small pickle-bottle, with a sound tightly-fitting bung. Bore the bung in two places. Through one hole thrust a thistle-headed tube (4*d.*), and through the other pass the short end of the glass tube, which you have previously bent into this shape

(Fig. 1.) Having done this, put four or five pieces of zinc into the bottle, get the bung tightly home in the mouth of it, and then pay over the top surface of the cork with a solution of sealing-wax in naphtha, so as to make it air-tight. Let the naphtha evaporate, and the apparatus, Fig. 2, is ready. When wanted for use, half fill the bottle through the funnel-tube with water; add enough common sulphuric acid to set up action on the zinc, and receive the hydrogen gas under water, as directed at paragraph 4.


FIG. 1


FIG. 2.


FIG. 3.


FIG. 4.

2. *Sulphuretted Hydrogen Apparatus.*—An apparatus constructed in the same way as that just described, but with the addition of a little bottle of water in which to clean the gas, will be wanted. The annexed figure will show what it is. Care must be taken that the surface of the corks in both bottles be thoroughly air-tight, by means of the solution of sealing-wax, for the smell of this gas is so foul that it ought to be kept strictly to bounds. Indeed, the apparatus ought to be kept in some place away from the house—as at the bottom of a garden, or in a yard—and when sulphuretted hydrogen is wanted, the student should take the solution through which the gas is to be passed to the apparatus, and not bring the apparatus to the solution. It is unfortunate that this reagent is indispensable to conducting chemical analysis.

The little bottle should be two-thirds full of water, and into the larger bottle sulphide of iron should be placed, instead of the zinc as in the first experiment. In other respects act as in that case.

3. *A Washing-Bottle*, which is used for washing filtrates when draining in their filter papers, may be made thus. Get any sort of pint bottle (white glass if possible), clean it thoroughly, bend two pieces of glass tubing into the shapes shown in Fig. 4, pass them through a good cork that fits the bottle, and the washing-bottle is made. The end of the long tube, pointing downwards, is drawn out to a fine point, so as to give increased force and diminished volume to the stream of water blown out. In order to draw the tube to a point, it must, when quite dry, be exposed to the flame of the blowpipe until red hot. When it is so, another piece of tubing, also heated, should be applied to it, till the two stick together; then draw the assistant tube gradually away, and it will attenuate its adherent till that comes to a point. If the point be blind, nip off the extreme end with the teeth. To use the bottle, fill it with water (and all water used in analysis must be distilled water), and put in the cork with its tubes. Blow in at the smaller tube, and a strong penetrating stream of water will be ejected from the pointed end of the outletting tube.

4. *Test-tube Stand.*—With some copper wire take four turns round an object a little larger than the test-tubes, allow an inch of wire at right angles to the coil, and then repeat the coil, continuing until enough holders have been made. Secure the two ends of the coil to nails against the wall at such a height that the tubes will hang by their lips.

5. *Pneumatic Trough.*—Any pan or tub, 6 in. deep, with a flat bottom, will do, and need not be kept on purpose, but may be borrowed from the house. When wanted for use, fill it with water, and put in, bottom upwards, a flower-pot saucer in which a hole has been made in the centre and another at the side (Fig. 5). Upon this the gas-jar will stand, the bent tube from the gas-maker will pass underneath through the side hole, and the gas to be received will pass into the jar through the hole in the centre.

FIG. 5.

6. *Gas-jar.—Except for making oxygen gas*, any stout, wide mouthed glass bottle will do. When wanted for use, immerse the jar in the trough sideways till it is quite full, then turn it upright, bottom upwards, taking care that the mouth does not come above water. Move the jar, mouth under, to its place on the saucer, and it is ready to receive the gas, which will displace the water contained.

7. *Syphons*, which are useful for drawing off fluids from vessels which it is desirable not to shake or disturb, may be made as required by bending glass tubing before a blowpipe flame. They are of various shapes. The two handiest are Figs. 6 and 7. In order to use them, steep the long end in the liquid to just past the bend, then, putting the thumb over the mouth of the small end, so as to hold the liquid in the tube by excluding the air, adjust the syphon as wanted, and remove the thumb. There will be a continuous flow through the syphon till the level of the long arm has been reached.

FIG. 6.

FIG. 7.

8. *Retort-stand.*—This is a most useful article. A good one will cost at least half a crown to buy it; but a serviceable one can be made very cheaply. Fix an iron rod, 15 in. high, into a flat piece of hard wood. Take two turns with some stout copper wire round the rod, allow 2 in. at right angles to the rod, and then round an object of the circumference of the desired ring take another turn, fastening off before removing the object. Any number of rings, and of any size, can be made in this way. To hold them at the required place on the rod, tie a piece of cord firmly round the rod just underneath them. (Fig. 8.)

FIG. 8.

9. *Filter Papers.*—Get some fine white blotting-paper; cut it into strips of the breadth of the required filter (opened and laid flat); cut these strips into squares, and fold each square to its quarter; then, with scissors, cut the open edges of the fold, so as to make the quarter square take the shape of a quadrant of a circle. The filter is then ready to be placed in the funnel. It should be kept quite clean and dry till wanted for use.

I have spoken of bending glass tubing before the blowpipe flame. It may be well to mention how it is done, and at the same time to explain the use of the blowpipe, and the composition of the blowpipe flame.

The spirit-lamp being alight, rest the nozzle of the blowpipe on the wick-holder, the mouthpiece of the pipe being in your mouth. Blow gently through the pipe till the flame of the lamp is blown out at right angles to it, and you will have two distinct bodies of fire, the inner one of a violet colour, the outer of a yellow. The properties of these two will be explained presently. Having secured a continuous blast, get that part of the tube which is to be bent at the point of the violet flame. Move the tube in the fire, so as to heat the parts near the part to be bent, and when the glass is at red heat it will be flexible to any curve. Care should be taken not to expose the hot tube too suddenly to the cold air, or the joint will probably crack.

Some practice will be required before the blowpipe can be properly used. Do not blow from the chest or throat; *distend the cheeks, and keep them full* without making any effort; the process of breathing will go on through the nose. The air in this mouth-receiver will be ample to feed the blowpipe, and unless it be fed in this way it will be found impossible to feed it—and that not regularly—for more than a few seconds.

As regards the properties of the two flames of the blowpipe—which are very important properties—they are mainly these: the violet-coloured flame, caused by the combustion of the carburetted hydrogen (which has come from the wick) in conjunction with the oxygen of the air blown into the flame, is the hottest part of the whole flame, and is called the reducing flame, because any oxidized body—*i.e.*, body containing oxygen—being brought before it, is compelled to give up its oxygen in order to promote the burning of the carbon which is there; whilst the outer or yellow flame, where combustion is not so perfect, notwithstanding it is in contact with the outer air, is less hot, and is called the oxidizing flame; because a body, being heated at the point of it, comes into contact with the oxygen of the outer air, and is oxidized by it.

The blowpipe is a most valuable help to the analyst; metals and their salts showing individual characteristics when exposed to its action, which they will be slow to exhibit in any other way.

CHEMICALS.

These should be of the best. For a very few purposes only, second quality *acids* may be used.

The beginner will need to furnish himself with the articles enumerated in the following list. If possible, glass-stoppered bottles should be had for all the liquids; but as this would increase the expense of setting up, I have marked with an *S* those reagents which it is absolutely necessary should be kept air-tight. The substances to be experimented on can be obtained from time to time in small quantities as required.

ACIDS.

(s) Sulphuric, common, SO_3	(s) Nitric, NO_5
(s) „ best, SO_3	(s) Hydrochloric, HCl

Oxalic, ¼ oz. dissolved in water.

(s) Ammonia, NH_4O	(s) Carbonate of ammonia, NH_4O, CO_2
Chloride of ammonium, NH_4,Cl	(s) Potassa, KO
(s) Sulphide of „ NH_4,S	Carbonate of soda, NaO,CO_2
Chloride of barium, Ba,Cl	Phosphate of „ NaO,PO_5
Chromate of potassa, KO,CrO_3	(s) Cyanide of potassium, K,Cy
Oxalate of ammonia, $NH_4O,\bar{O}$	Sulphate of magnesia, MgO,So_3
(s) Naphtha, 1 pint.	

Distilled water as wanted.

SOLIDS.

Borax, $NaO,2Bo_3$	Sulphide of iron, FeS
Peroxide of manganese, MnO_2	Chlorate of potassa, Ko,ClO_4

The chemicals included in the above list are called reagents, because they react in a certain known way upon the substances exposed to them. Experiments have been tried with each of them upon all sorts of substances, and the result has been noted as an invariable one. With some things they form chemical combinations, which change the character and form of the reagent and the thing acted upon; with others they make no alliance, but, though mechanically intermixed, are chemically as distinct as they were before they were put together.

And here note the difference between a chemical and a mechanical combination. If you take some undiluted sulphuric acid and add water to it slowly, you will see that there is not any disposition on the part of the two to unite. If the water be added cautiously and quite slowly, it will be seen lying on the top of the sulphuric acid, as distinct from it as oil would be if poured upon water under like circumstances. But though the two liquids have no inclination to mix, they will not refuse to do so as oil and water will. Shake the bottle, or stir its contents with a glass stirrer, and you will compel a union, but the heat that will be evolved will be so great that in a minute or two you will not be able to bear your hand on the bottle or vessel. The heat is due to the friction of the particles of the acid with the particles of the water as they try, under compulsion, to intermix. When the intermixture has taken place, the liquid will gradually cool, and you will have in the bottle diluted sulphuric acid, that is, sulphuric acid and water. But they each retain the same nature and characteristics which they had before they were mingled, and by evaporation the water could be driven off, leaving the acid as it was before: the two liquids were only mechanically combined, just as the leg and seat of a chair are mechanically combined.

Dissolve some common salt in water. The salt disappears, but it is only held in suspension, hidden, as it were, in the pores of the water. Pour the solution into an evaporating-dish, and put that on one of the rings of the retort-stand; place the lighted spirit-lamp underneath and evaporate all the water in the dish; the dissolved salt, unchanged in character, will remain behind. Here, too, there was only a mechanical combination.

But pour into a test-tube a few drops of, say, acetate of lead, dilute them with a little distilled water, and then add a drop or so of ammonia. A white precipitate will be thrown down, and the result of the addition will be fresh chemical combinations, which no amount of mechanical means will suffice to destroy. In obedience to the laws of affinity—that is to say, the laws under which reagents show their preference for some bodies over their fellows: laws which I will try to explain, because they *must* be understood—acetic acid, which was united with the lead, has given up its union with it, and formed an alliance with the new-comer, the ammonia, causing the liberated oxide of lead, which is insoluble in water, to fall down to the bottom of the test-tube. Here there has been a chemical change, which will be seen by the symbols:

$$PbO,\bar{A} \quad + \quad NH_4O.$$

$$\left.\begin{matrix}Pb\\O\end{matrix}\right\} \qquad PbO.$$

$$\left.\begin{array}{l} O \\ \bar{A} \\ NH_4 \end{array}\right\} \qquad NH_4O,\bar{A}.$$

Now, as stated above, the action of the various reagents upon chemical substances has been strictly observed, and from their behaviour a set of laws has been made, by observing which the analyst is enabled to detect the presence, or declare the absence, of particular elements in the subject of his analysis.

Thus, a stream of sulphuretted hydrogen gas, on being passed through a solution of, say, a dozen elements, will throw down six of them in an insoluble form, having made fresh combinations with them, and will leave the other six as they were before. Here at once is a medium for the separation of certain elements from certain other elements; and there are other reagents, which will be spoken of later on, under the head of analysis, by which further subdivisions can be made, so as eventually to disintegrate the whole compound. Certain reagents, acting upon certain sets of elements in a special way, are noted as the special reagents for the elements in those sets, distinguishing them from other groups; and therefore it has been the practice of some chemists to divide the bases into groups (five), each one of which is marked by some particular reagent. I will specify these groups presently, but in the instructions which will be laid down for guidance in making analyses, I shall follow the rule of the Giessen Laboratory (Baron Liebig's), which, taking advantage of the distinctive reagents which will be mentioned, yet works upon a broader basis, prescribing the application invariably of the most general reagent (sulphuretted hydrogen) first, and then applying in order successive special reagents, till the analysis has been pursued to the end.

The following instructions must be observed strictly in the conduct of the analyst:

First, thorough cleanliness of all apparatus. Many an experiment has failed, and many a test has proved deceptive, because some remains from former experiments, or some impurity contracted elsewhere, has been allowed to be in the test-tube, or whatever apparatus is in hand. The table cannot be free from stains, but it can and should be kept dry and quite free from chemical or other refuse. Common water may be used to rough-wash apparatus, but test-tubes should always have a final rinse with distilled water before being used.

Secondly, playing with the chemicals, by which I mean using them without some distinct object in view, should be looked upon as unworthy of a student of chemistry.

Thirdly, patience and perseverance must both be largely drawn upon by the student. He cannot expect to arrive at perfection suddenly in the pursuit of this most patience-taxing, as well as most interesting, study, any more than he can expect to do so in any other matter whatever. But the operations of chemistry are so delicate, so very little (an impurity in a test-tube) will throw its working machinery out of gear, that it is above all things necessary that he should not be disheartened, but persevere, even if he finds himself foiled after having taken all the precautions he thought he could to prevent such a result. *One thing he must never do:* attribute his want of success in any experiment to chemistry, and not to his own fault. Provided with good chemicals and truthful information how to use them, he cannot but see that any coming-short of the expected result must be due to himself, and not to the science. He should ever remember the Virgilian advice, "*Tu ne cede malis, sed contra audentior ito!*" and, with regard to his chemicals and apparatus, he should bear in mind that it is not the good workman who complains of his tools.

Fourthly, it is never to be forgotten that many of the chemicals are rank poison, so that the greatest care must be used to prevent their getting into the hands of those who do not understand the nature of them.

Before proceeding to the subject of analysis, as applied to the separation of metals and earths from each other, let us go through a few experiments of a simple analytical character in connection with gases, which are not only instructive but highly amusing. And first let us try some with the lightest of gases, hydrogen, two parts of which unite with one part of oxygen to form water. To form water? Two invisible gases make up by their union that immense volume of liquid which washes the globe of the earth, in ocean, sea, river, and lake? Yes; two gases, invisible, odourless, only to be felt through effects, combine to do all this, and to make a solvent for those millions of tons of chemical salts which are found in sea-water and river-water, and to get rid of which, by distillation, lest they should confuse the investigation, is so necessary before using the water in the process of analysis. Fire is the medium by which they are united so as to form water; but fire will not suffice to disunite them when once joined, unless at a very high temperature. Electricity dissects watei into its two elementary gases, and the same result is obtained in the manner already indicated when describing the hydrogen gas-maker, and is incidental to several other chemical operations.

HYDROGEN (the water generator) may be made either in the manner already indicated, or by heating water till it rises into vapour, when it is passed through a gun-barrel, heated red hot and filled with nails. The steam is decomposed by the heat, and the oxygen of the water unites with the iron to form oxide of iron, while the hydrogen passes through the pipe, and may be secured on its exit. But this will require more apparatus than we are supposed to have; besides, hydrogen is more quickly and conveniently prepared by the zinc and diluted sulphuric acid in the machine.

Having filled the gas-jar in the manner pointed out when describing that article, remove it from the shelf in the water-bath into the air. The gas will not escape so long as the jar is kept mouth downwards, because hydrogen, being lighter than air, will press against the interior sides of the bottle, remaining there until displaced by the atmospheric air. Invert the bottle containing the gas, and apply a lighted taper or match to the mouth of it. It will then be seen how very inflammable this gas is: it will immediately take fire with an explosion, and in course of burning will re-unite with the oxygen of the air, from which it seems not to like to live apart, producing, as will be found on inspection of the sides of the jar, drops of water, which will gather and roll down to the bottom. This experiment is both analytical and synthetical. In the first place, an analysis of the water was made through the action of the acid and zinc upon it, and then a reunion of the elements was made, resulting in the production of water.

This is the *rationale* of the first process as shown by the use of symbols:

$$\left.\begin{array}{l}\text{Zn (Zinc)}\\ SO_3\text{ (Sulphuric acid)}\\ HO\text{ (Water)}\end{array}\right\}\begin{array}{c}ZnO,SO_3\\ H.\end{array}$$

The zinc has undergone a change at the expense of the water, which it has robbed of its oxygen to make oxide of zinc, and with the sulphuric acid this oxide of zinc has united to form a salt of sulphate of zinc. The only element which has not been called upon to play its part in this act is the hydrogen of the water, which is given off and received into the jar.

The reverse process, which is accomplished by means of fire, is so by virtue of some force, the characteristics of which are not yet known. One thing only is certain, that by its aid and nothing else, the two elements, oxygen and hydrogen, are re-united in the form of water.

Water will not extinguish the flame of hydrogen. Repeat the experiment of filling the gas-jar with the gas, stand the jar on its bottom, ignite the gas, and immediately pour water into the bottle. The effect will be, not to put the fire out, but to make it more fierce; for the water being poured in displaces the gas, which, running out, brings additional fuel to the flame.

A small balloon, made of goldbeater's skin (it costs half a crown to buy it), when filled with the gas, will rise to the ceiling of the room. This is an interesting experiment; but the cost of the balloon makes it an expensive one, and it is doubtful if the student would be able to make an efficient balloon for less money than it would cost to buy it.

Hydrogen is found so largely distributed in nature, that between five and six per cent. of it is found in all animal and vegetable substances. It is not found in combination with the metals. Coal gas, the common illuminating gas, is a compound of hydrogen with charcoal gas, and is called carburetted hydrogen. Combined with chlorine gas (which is obtained from common salt, and is a most dangerous poison when not in combination), it forms the strong solvent and reagent known as hydrochloric or muriatic acid.

OXYGEN.—This gas unites with hydrogen, in the proportion of one measure of oxygen to two of hydrogen, to form water. It is the element most largely distributed throughout the world. It is indispensable to life and to combustion, and the poorer the air is in this element, the less healthy it is, and the richer, the more healthy. The benefit of change of air from that of an inland place to the sea-side lies in the greater amount of oxygen in the atmosphere of one place than the other, and the increased appetite which comes on change of residence to the sea-side is caused by the increased combustion, or quicker living, brought about by the larger amount of oxygen with which the subject is in contact. The atmosphere of crowded towns, being loaded with many impure gases, becomes impoverished in respect of this life-giving element; at sea, and near the sea, the atmosphere is not so loaded, but contains a full amount of this most essential article.

To man it is literally the breath of life. The blood which is in man's veins is of a dark red colour, and very impure by reason of its lack of oxygen. Before it can exert that influence over the body which has acquired for it the name of the "life of the body," it must be purified; so it is poured into the heart, in a stream never ceasing till death, and by that little organ is pumped up through the lungs, where, becoming exposed to the air, it is instantaneously purified by the contact: the carbonic acid gas, which made it so dark in colour and so unprofitable, is there breathed out, and the oxygenated blood, bright red, bounding, lively, is pumped into the arteries all over the body, imparting vigour to the whole frame.

Suffocation, whether by strangling or the inhaling of foul air, is no more than the exclusion of oxygen. The life-giver being withdrawn, the life destroyer carbonic acid gas, is allowed to have sway; the lungs, instead of receiving a supply of oxygen, are choked with an accumulation of carbonic acid—a poison fatal to man (though it is the life of plants)—and death is the result.

To prepare this gas on a small scale, put some binoxide of manganese (MnO_2) and some chlorate of potassa (KO,ClO_5) into a Florence flask, mixing them well together, and taking care that the flask is quite dry both inside and outside. Into the neck of the flask put a cork with a bent glass tube through it, support the flask on the retort-stand, and put the lighted spirit-lamp at the bottom of the flask; a large quantity of oxygen will be given off, in a sufficiently pure state for our purpose, and it may be received in the stout deflagrating-jar, which will be safer than the pickle-bottle in conducting experiments.

FIG. 9.

Oxygen is heavier than air, so that, after removing the jar from the trough (which may be done by sliding it off its shelf *under water* on to a plate with water in it), the mouth of the jar may be opened without fear of the gas escaping.

Into the jar, by means of the iron spoon, introduce a piece of glowing wood, not alight, but red from recent burning. It will burst into a brilliant blaze, so bright as scarcely to be looked at. Heat a piece of charcoal before the blowpipe, and do the like. Put a little piece of sulphur into the iron spoon, ignite it, and put it into the jar of oxygen: a wonderfully beautiful light of dazzling brightness will be the result. Care must be taken not to remove the top of the jar in this case till the fumes have subsided, for they are fumes of sulphurous acid, a very troublesome and poisonous gas. Repeat the experiment with iron filings, heated before the blowpipe in the iron spoon; and, *taking great care not to touch the phosphorus with the fingers*, but only with a pair of scissors or nippers, with a small piece of ignited phosphorus.

FIG. 10.

These experiments are among some of the most beautiful that can be imagined, and may be safely tried, so care and ordinary prudence be exercised.

NITROGEN.—Roughly stated, five volumes of common air contain four of nitrogen and one of oxygen. It is also the principle of fat, and is a constituent of all plants and animals. It is also called *azote* (α and ζωή), because it deprives of life animals wholly subjected to its influence. It is not ready to combine with other elements. In forced combination with oxygen it forms nitric acid (NO_5), and it is also largely distributed throughout nature as nitre, or saltpetre, or, more correctly speaking, nitrate of potassa.

It is thus prepared: dip a small piece of sponge in naphtha or spirit of wine, the sponge being fast to a piece of wire, which must be supported in water, so that the sponge shall project 4 in. above the surface. Ignite the naphtha, and at once clap an empty bottle (the pickle-bottle will do) over the burning spirit. After a while (that is, when all the oxygen of the air in the bottle has been consumed by the operation of combustion) the flame will be extinguished, and a quantity of water, proportionate to the quantity of oxygen consumed, will enter the bottle, which else contains nitrogen gas.

Nitrogen will not alone support either life or combustion, the essential of which is oxygen. A lighted taper put into the jar of nitrogen prepared as above will be instantly extinguished, and animals subjected to its influence will die. Few experiments can be made with this gas, on account of its uncongenial nature. It runs exactly counter to oxygen in respect of combustion, and, unlike that gas, avoids all combination whatever.

CARBONIC ACID.—This most deadly poison, when applied to the lungs to the exclusion of all other gases, is widely diffused throughout nature. To plants it is life, as it is death to man; through all their millions of pores the trees suck in this their food, clearing the air of that which to all animals is so noxious. Carbon is in wood, coal, turf, the bodies of all animated creatures, the yield of the earth in the shape of crops; it is in small quantities in the air; and diamonds are pure carbon in a crystallized form, such as Nature only possesses the secret of making. Carbon is, next to oxygen, the most important element in the world.

It may be prepared by pouring any acid on to chalk, which is carbonate of lime. Carbonic acid is very ready to sever any combination it may have entered into, and in this case it will give place to the strange acid, which will make a new compound with the lime, while the carbonic acid is given off. Care should be taken not to inhale this gas, for, if taken exclusively into the lungs, it is a rank poison, not that of itself it has any deleterious qualities, but because it excludes the one thing needful to life, viz., oxygen.

It is considerably heavier than air, and may be poured from one vessel into another, though it is colourless, odourless, and invisible. Put a lighted taper, or even a piece of charcoal that has just been burning in oxygen, into the reservoir of carbonic acid gas, and it will be immediately extinguished. Put a small piece of lighted candle at the bottom of a bottle or jar, and then take the jar with the fire-killer in it and invert it gradually, just as though you were pouring water from it. As soon as the gas reaches the level of the flame, it will extinguish it suddenly and thoroughly.

To show that the breath expired by animals is very fully charged with carbonic acid gas, put some water in which lime has been soaked and then filtered into a glass; blow through a glass tube into the lime-water, when a thick white precipitate will be thrown down—a precipitate of carbonate of lime or chalk. The carbonic acid gas (CO_2) of the breath has united with the lime (CaO) in the water to produce the salt thrown down.

CHEMICAL ANALYSIS.

Analysis is the highest function of chemistry, and has for its object the separation of compounds into their component parts. The importance of a science which can teach how to examine any substance whatever, so as to pronounce exactly what is contained in it, will be at once apparent. But chemistry can do more than this. She can not only separate the elements of a body, but she can also declare the quantity of each element contained, even to a fractional part of a grain.

The analysis which determines what elements are combined is called *qualitative* analysis, and that which declares also the proportions in which they are combined is called *quantitative* analysis. I do not propose to deal with the second branch at all. It is only to be attempted after the other branch has been thoroughly mastered; it requires the utmost nicety of operation, much skill and experience, and costly apparatus. Qualitative analysis will occupy as much time and space as we have to fill, and even that will be pursued only so far as the means which I have supposed to be at the disposal of the student will admit.

In order to perform such operations as the analysis of the contents of organs of people who have died from poison, the analysis of earths, guano, and such like, it will readily be believed that long practice and laborious study are indispensable, and I cannot hope to teach in a few pages—or in any number of pages, without practical demonstrations—how to do these things; but as Rome was not built in a day, so do not skilful analysts become skilful all at once; and it is to that preparatory course, through which they, as beginners, have to go, that I propose to introduce my readers, hoping that they will see so much of the beauty of the science, and be so far interested in those operations of it which will be shown to them, that they will go on further with the study, pursuing it far beyond the bounds of this treatise.

I have already stated that by their identical behaviour with certain special reagents, certain elements mark themselves out as distinct from all other elements which do not behave in a similar manner, these others again marking themselves out into distinctive groups by reason of their identical behaviour with certain other special reagents. There are, according to the division of Dr. Fresenius (whose two fine works on Qualitative and Quantitative Analysis are well known), six of these groups, viz.:

1. Potassa, soda, ammonia . . . . . ($PtCl$, and $\overline{T}$).
2. Baryta, strontia, lime, magnesia . . . (NH_4O,Co_2, and So_3).
3. Alumina, chromium . . . . . . (Ko, and NH_2,Cl).
4. Zinc, manganese, nickel, cobalt, iron . . (NH_4S).
5. Silver, mercury, lead, bismuth, copper, cadmium (HCl,HS).
6. Gold, platinum, antimony, tin, arsenic . (HS).

The special reagents attached to these groups are marked against each of them, and it will be well for the student to try the behaviour of *each element in the six groups*, not only with these distinguishing reagents, but with the following general reagents, applied separately and successively in the order in which they are placed. Sulphuretted hydrogen or distilled water saturated with the gas; sulphide of ammonium; ammonia; potassa or soda; carbonate of ammonia; sulphuric acid; hydrochloric acid.

He should ascertain for himself, by actual trial, how the different elements behave on being brought into contact with the above-mentioned reagents. He should ascertain in what liquids precipitates produced by any of them are soluble; and for this purpose he should first try cold water, then hot water boiled with the precipitate in a test-tube over the spirit-lamp. Should the precipitate not yield to this treatment, he should add a few drops of nitric acid, and boil again, continuing to add acid until he has found means of dissolving the solid. He will find all precipitates, with the exception of one or two rare ones, yield to this method; but he must be careful not to put in too much acid—it should be added in a few drops at first, and then additions made drop by drop. Some of the precipitates are soluble in an excess of the reagent that threw them down. This is especially the case with the oxides of most of the metals when thrown down from their solutions by ammonia or potassa; it is also the case with some of the sulphides thrown down from solutions by sulphide of ammonium. Carbonate of lime (CaO,CO_2) is soluble in an excess of carbonic acid, as will be seen if—in the experiment already described, where chalk is thrown down from a solution of lime in water, by blowing with the breath into it through a glass tube—the blowing be continued. In this case, when the lime-water is so saturated with the carbonic acid gas blown into it from the lungs as to throw down all the lime contained, in the shape of carbonate of lime, it yields to the pressure of a continued in-draught of the gas, and takes up again in acid solution the salt to which it gave birth.

The behaviour of each element in the six groups, being manifested by the tests, should be carefully noted in a memorandum book. There should be stated whether a precipitate follows upon the introduction of a reagent, and if so, the colour and general characteristics of it should be described; its solvent should also be ascertained and mentioned.

By careful comparison of the results thus obtained, distinctions may be noticed, which will serve as means for the separation of the bodies so distinguished. To take a very simple case, suppose a solution which is to be tested contains salts of silver, lead, and protoxide salts of mercury. To this solution, diluted with water, add hydrochloric acid drop by drop, shaking the test-tube after each addition, so as to mix the reagent and the test solution thoroughly. When no more white precipitate is thrown down, add to the mixture a large quantity of water, which must be decanted as the precipitate settles. Repeat this washing several times, and after the last time throw the contents of the test-tube on to a filter, catching the filtrate (the fluid that runs through is so called) in a test-tube for further examination. By means of the washing-bottle, wash well the residue on the filter, so as to free it from lead, and then dissolve the soluble part of the precipitate still remaining with ammonia. Ammonia will dissolve all the silver contained, and will convert the subchloride of mercury into the black suboxide of mercury, which will remain on the filter. The filtrate will contain all the chloride of silver, which can be again thrown down from solution by the addition of nitric acid in such quantity as to neutralize the ammonia and overcome its power over the silver chloride. In this way, then, the three members of the fifth group, which are similarly acted upon by hydrochloric acid (this acid will not so act upon the salts of any other elements), are distinguishable from the members of all other groups and may be distinguished from one another.

After the student has thus observed in practice the behaviour of the elements with the various reagents I have mentioned, he may proceed to the analysis of any inorganic matter, no matter how many substances there may be in combination; that is to say, he may analyse the bases of the substances, the analysis of the different acids being a delicate and difficult operation, to be undertaken only after repeated trial has perfected the student in his method of detecting the bases. It is not possible, either, to give directions for the detection of them within the limits of an elementary treatise.

The following instructions being strictly and perseveringly attended to, will be a sure guide to the detection of any of those elements enumerated in the lists of groups. The reagents should be applied in the order in which they are arranged, that order being founded upon their observed effect upon the bases they are designed to detect. Let us suppose a mixture to contain all the elements, in some shape or other, which are included in the six groups. The first thing to be done is to pass through the slightly acid liquid a stream of sulphuretted hydrogen gas, which will be done through the medium of the gas-generator already described.

SULPHURETTED HYDROGEN throws down as sulphides precipitates of antimony (orange), arsenic, tin (yellow), gold, and platinum (black), *which are soluble in sulphide of ammonium, and again thrown down from that menstruum by the addition of hydrochloric acid.* It also, at the same time, throws down as sulphides: mercury, silver, lead, bismuth, and copper, in black or brownish black precipitates, and cadmium as a yellow precipitate. These latter are all soluble in sulphide of ammonium, so that here are two divisions already. We will deal with each of them presently.

SULPHIDE OF AMMONIUM.—To the filtrate from the precipitates thrown down from the acid solution by sulphuretted hydrogen add sulphide of ammonium; there will be thrown down as sulphides: nickel and cobalt (black), manganese (flesh-coloured), iron (black), zinc (white); as oxides: alumina and sesquioxide of chromium; and, in combination with certain acids only, baryta, strontia, and lime; and, in combination with phosphoric acid, magnesia—but these last four as salts. These precipitates we will also deal with presently.

To the filtrate from the precipitates thus thrown down by sulphuretted hydrogen and sulphide of ammonium add an excess of chloride of ammonium, and then add carbonate of ammonia. Baryta, strontia, and lime will be precipitated, leaving magnesia, potassa, soda, and ammonia to be looked for in the residue in the filtrate.

Let us now take in order the different results we have obtained.

The solution made by sulphide of ammonium is to be treated with a slight excess of hydrochloric acid. If a white cloudiness appear, it is probably due to sulphur, freed by the acid; but if a yellow or orange precipitate is produced, it may contain antimony, arsenic, or tin; if darker still, it may contain gold and platinum; but as these latter bodies are not likely to be in the beginner's experimental stock, I will leave them out of the question for sake of the others. Should antimony, arsenic, and tin be suspected, the precipitate obtained as above should be dried, and then fused in a crucible with nitre and carbonate of potassa, by which means they are converted into the oxides of their respective metals.

The fused mass, on being treated with cold water, will yield arseniate of potassa, sulphate of potassa, and a small quantity of antimoniate of potassa, and stannate of potassa; while insoluble antimoniate of potassa and stannate of potassa will remain behind. In order to precipitate the small quantity of these two latter salts dissolved, neutralize the solution by the addition of nitric acid, when they will fall down. The filtrate is to be tested for arsenic acid by the addition of nitrate of silver. The residue which remains after exhausting the fused mass by water contains binoxide of tin, or antimonic acid, or both. It should be mixed with cyanide of potassium, and reduced to a globule on charcoal before the flame of the blowpipe. If the globule is brittle, it is antimony; if ductile, it is tin.

But if the globule contain both tin and antimony, it should be reduced (by nitric acid) to the oxides of those metals. On boiling these oxides with tartaric acid, teroxide of antimony is dissolved, and may be detected by sulphuretted hydrogen. Binoxide of tin is not affected by tartaric acid.

These metals, in consequence of their closely similar behaviour under the influence of the same reagents, are very difficult to separate, excepting after much practice. It will be seen from the foregoing that the task is no easy one. The student is advised not to try the *analysis* of them till after he has mastered the other branches; but he may note their behaviour separately with the various reagents.

Boil in nitric acid the precipitate thrown down by sulphuretted hydrogen, but insoluble in sulphide of ammonium. A black residue is sulphide of mercury. Should there be a whitey precipitate floating in the liquid, it is of lead. Dilute with water, and add hydrochloric acid. The precipitate in this case will consist of chlorides of silver and lead, and subchloride of mercury. They should be treated as already described.

The filtrate from this solution may contain oxide of lead, the oxide of bismuth, oxides of copper and cadmium; and to it is to be added ammonia in excess. The precipitate thus obtained may be oxide of lead and teroxide of bismuth. It should be re-dissolved, and tested for lead with dilute sulphuric acid, and for bismuth by evaporating the solution to a small size, and then adding water. The filtrate from the excessive addition of ammonia, if of a blue colour, will indicate the presence of copper, which may be thrown down by ferrocyanide of potassium. On the ammoniacal solution being neutralized by hydrochloric acid, carbonate of ammonia will throw down the cadmium.

The precipitate produced by sulphide of ammonium is to be dissolved in a mixture of nitric and hydrochloric acids (*aqua regia*), after which potassa in the cold is to be added in excess, and the mixture well shaken. The filtrate in this case will contain oxides of zinc and alumina, and sesquioxide of chromium. Boil this solution continuously, and sesquioxide of chromium will be thrown down; filter, and to the filtrate add sulphuretted hydrogen, sulphide of zinc will be thrown down; and the filtrate from that may be tested for alumina by saturating it with hydrochloric acid, adding ammonia, and digesting with carbonate of ammonia.

The precipitate left on the filter after the addition of potassa in the cold, as above, should be well washed, and then dissolved in *aqua regia*. To the solution add chloride of ammonium and ammonia. The oxides of cobalt, nickel, and manganese will remain in solution, and sesquioxide of iron will be thrown down, together with baryta, strontia, and lime if in combination with oxalic, phosphoric, or boracic acids, and, if in combination with phosphoric acid, magnesia also.

Add a few drops of acetic acid to the filtrate, pass sulphuretted hydrogen through it, and heat gently. The sulphides of nickel and cobalt will be thrown down, and if to the filtrate from them an excess of ammonia be added, and then sulphide of ammonium, sulphide of manganese will be precipitated.

The sulphides of nickel and cobalt should be dissolved in *aqua regia*, and thrown down as cyanides by cyanide of potassium, which will re-dissolve both precipitates; but (except under exceptional circumstances) hydrochloric acid added to this solution will throw down the nickel but not the cobalt. Borax dipped into a solution of cobalt, and fused before the blowpipe flame, gives a beautiful blue glass. In the outer flame, borax similarly treated with nickel makes a red-coloured bead, in the inner flame a grey bead.

The precipitate remaining when the oxides of nickel, cobalt, and manganese are dissolved out is to be dissolved in hydrochloric acid, and tested for iron with ferrocyanide of potassium, with which it will form Prussian blue.

The detection and separation of the alkalies and the alkaline earths then remains to be accomplished, and this brings us to deal with the result described four paragraphs back, where, by the use of carbonate of ammonia in the presence of an excess of chloride of ammonium, baryta, strontia, and lime have been precipitated; while magnesia, potassa, and soda were to be looked for in the filtrate. A portion of this filtrate, tested with phosphate of soda, will, if magnesia be present, throw down insoluble phosphate of magnesia.

To detect potassa and soda when in conjunction with magnesia, all the magnesia must be got rid of by adding a solution of baryta, or sulphide of barium, till a precipitate is no longer formed; filter and get rid of any excess of baryta by addition of dilute sulphuric acid; filter again and test for the alkalies.

Antimoniate of potassa (KO,SbO_5) produces a white precipitate of antimoniate of soda (NaO,SbO_5); and chloride of platinum ($PtCl_2$) produces in salts of potassa, in the presence of HCl and alcohol, an orange crystalline precipitate. In the outer flame of the blowpipe potassa salts impart a violet tint when soda is not present; soda imparts a distinctly yellow-coloured flame, by which it can always be recognized.

To separate baryta, strontia, and lime, precipitate with *dilute sulphuric acid* the two former, neutralize the filtrate with ammonia, and throw down the lime with oxalic acid.

When baryta is in company with strontia, the carbonates of them should be dissolved in HCl, the solution evaporated to dryness, and the residue digested with *strong alcohol*. Chloride of strontium is dissolved and may be detected by burning the alcohol, the flame of which will be of a beautiful red colour.

I have thus laid down rules for the guidance of the student founded in the main upon the rules of Dr. Fresenius and Dr. Will, of the Giessen Laboratory. That they are good guides I can gratefully testify, and the student cannot do better than submit himself wholly to their direction. There is no doubt they are intricate, and must be followed with much patience and perseverance, the only forces which will overcome the difficulties of this most interesting branch of chemistry; but, intricate as they are, they are as simple as such rules can be. Let the student test the truth of them by applying them to his practice in his own laboratory; but I would advise him to begin with the separation, according to these rules, of two or three bodies, gradually increasing the number until even so many as are above prescribed for can be mixed and analysed.

OPTICS.

Optics is the science which treats of the laws of light. Light may be defined as the agent which, operating through the eye, produces the sense of sight. This is no longer believed to be due to the impact of luminous particles on the retina of the eye, but to a wave motion communicated by luminous bodies to an ethereal medium which pervades all space. Bodies through which light passes, as air, glass, &c., are named *transparent;* those through which light does not pass, as wood or iron, are said to be *opaque*. Light travels in a uniform medium in straight lines. When a sunbeam is admitted into a darkened room through a small opening, the rays may be traced across the room in straight lines by means of the floating particles of dust, which reflect a portion of the light. When light radiates from a centre, its intensity diminishes as the square of the distance from the luminous point. This may be illustrated by Fig. 1. Suppose the light of a candle to illuminate, at the distance of one foot, the surface of a screen one foot square, the same amount of light, at a distance of two feet, will spread itself over a screen four times as large, and at a distance of three feet, nine times as large. Since at these distances the same amount of light is diffused over areas respectively of four times and nine times the extent of the unit area, its intensity must diminish four times and nine times, or will vary inversely as the square of the distance.

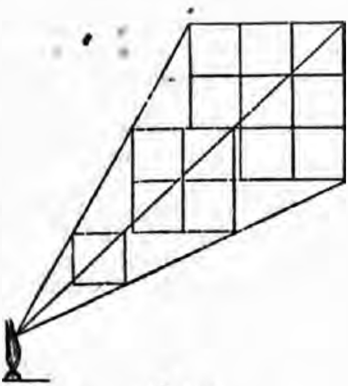


FIG. 1.

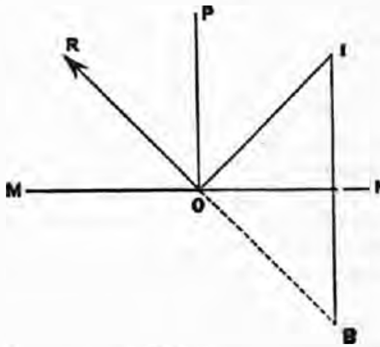


FIG. 2.

When light falls upon a body, it may be disposed of in three ways. First, either *reflected*, that is, bent back; secondly, it may pass through the body in an altered direction, *refracted;* or thirdly, it may be *absorbed.*

In speaking of the properties of light, frequent use is made of the term *ray*, which must be understood to mean a single line of light. A *pencil* of light is a collection of rays diverging from or converging to a point. Mirrors are bodies of glass or metal with polished surfaces, which cause bodies presented to them to be seen by reflection.

REFLECTION FROM A PLANE SURFACE.—If a ray of light fall perpendicularly on a mirror, it is reflected back in the same line towards the point whence it came. When a ray of light, I O, falls obliquely on a plane mirror, M N, the incident ray is reflected in the direction O R, so that the angle P O R, formed with the perpendicular P O at the point of incidence, is equal to the angle, I O P, made by the incident ray with the same line. P O R is the angle of reflection, I O P the angle of incidence. The two laws of reflection are the following: First, the incident and reflected rays are in the same plane; secondly, the angle of reflection is equal to the angle of incidence. A candle placed in front of the mirror, as at I, would be seen by an eye placed at R as if at B, at a perpendicular distance behind the mirror equal to the perpendicular distance of the candle in front of it. The image is always seen in the direction the ray is travelling when it enters the eye. (Fig. 2.)

If a diverging pencil of light fall upon a plane mirror, the focus of the reflected pencil will be at the same distance behind the mirror as the focus of the incident pencil is in front of it.

Let I be the incident focus of a diverging pencil of rays, I O, I O′, I O″, any incident rays. Draw I P perpendicular to the mirror; taking the ray I O, make P F equal to P I, and join F O. At O draw the perpendicular O X. From this construction it follows, from simple geometrical reasoning, that the angle D O X is equal to the angle I O X, and therefore F D must be the direction of the reflected ray. It can be shown in the same way that all the reflected rays proceed from F, which will thus be the focus of reflected rays. (Fig. 3.)

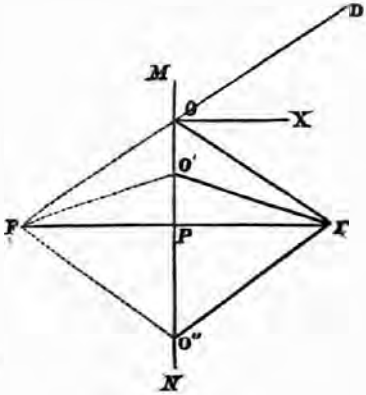


FIG. 3.

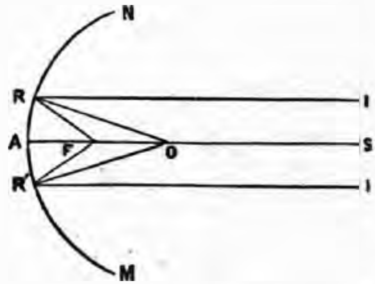


FIG. 4.

REFLECTION FROM CURVED SURFACES.—When a pencil of light is reflected from a curved mirror, each ray follows the ordinary laws of reflection. If three parallel rays, S A, I R, I′ R′, fall upon the concave mirror M N, the middle ray will be reflected in the same direction, A S, I R, and I′ R′, in the directions R F, R′ F, so that the perpendiculars R O and R′ O divide equally their angles of incidence and reflection. Every line drawn from O to the surface of the mirror is perpendicular to the mirror at that point. We see that, in order to make the angles of incidence and reflection equal, the parallel rays I R, I′ R′ must cross each other at a point, F, on the axis of the mirror. All other parallel rays cross at the same point. This point, F, is called the principal focus of the mirror. It can be proved by geometry that the distance, A F, of the principal focus from the mirror is equal to half the radius, A O, of the mirror. (Fig. 4.)

When the incident rays are not parallel to the axis of the mirror, but proceed from a point, Q, on its axis, F is no longer the focus, but some point, *q*, *on the axis*, whose position changes with that of Q. By making the angles of incidence and reflection equal, its position in every case can be fixed. It will be found on trial, that when Q lies between F and A, *q* will pass to the back of the mirror. The focus is then said to be virtual. A *real* image or focus is that formed by the reflected rays themselves, a *virtual* image or focus that formed by the prolongation of the reflected rays. In Figs. 4 and 5 we have examples of real foci, in Fig. 6 of a virtual focus. When the mirror is convex, as in this case, the focus is always virtual. It is necessary, to be able to find the distance of *q* from the mirror (focal length), which can be done by the following rule: multiply half the radius of the mirror by the distance of the incident rays from the mirror; divide the product by the difference of the distance of the incident rays and half the radius (if concave), and, if convex, divide by their sum. Example:—If the distance of incidental rays be 36 in., diminishes as the square of the distance from the luminous point. This may be illustrated by Fig. 1. Suppose the light of a candle to illuminate, at the distance of one foot, the surface of a screen one foot square, the same amount of light, at a distance of two feet, will spread itself over a screen four times as large, and at a distance of three feet, nine times as large. Since at these distances the same amount of light is diffused over areas respectively of four times and nine times the extent of the unit area, its intensity must diminish four times and nine times, or will vary inversely as the square of the distance.

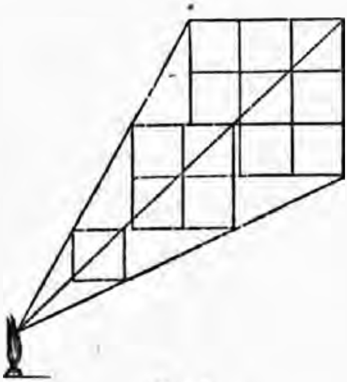


FIG. 1.

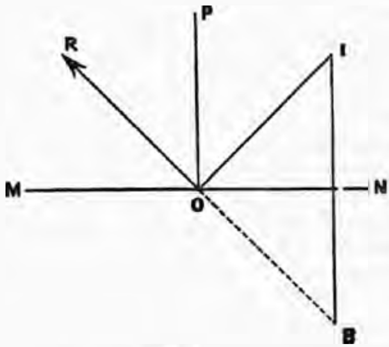


FIG. 2.

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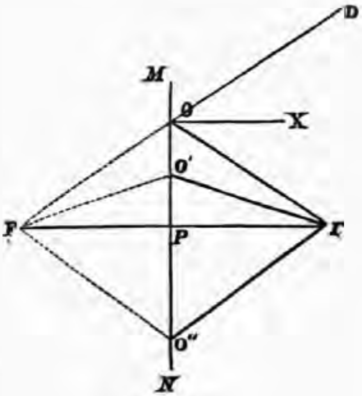
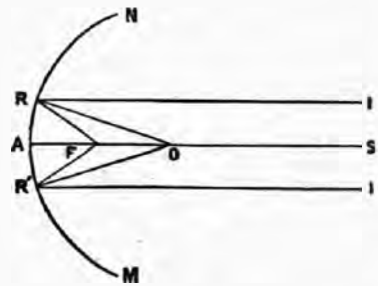


FIG. 3.



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IMAGES IN MIRRORS.—When an object is placed before a mirror, every point of the body sends out a pencil of light, which falls upon the mirror and is reflected. The foci of all the reflected rays form the image. The relative size of the image and object is proportional to their respective distances from the mirror if plane, or from the centre of the mirror if curved.

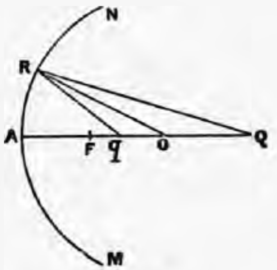

FIG. 5.

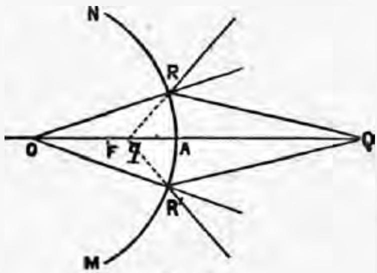

FIG. 6.

1. When the mirror is plane, as in Fig. 7, by the laws of reflection already stated, a is the focus of all the rays coming from A. Similarly, b is the focus of all the rays from B. Rays from all the points between A and B have their foci between a and b. Thus a complete image of A B is formed in a b. The

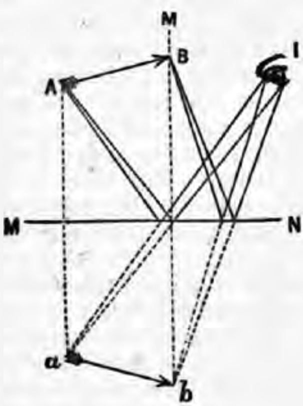

FIG. 7.

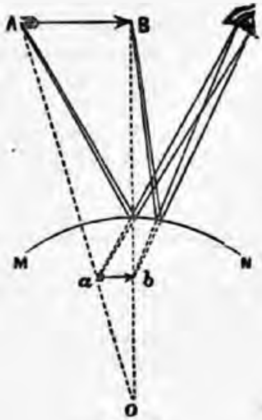

FIG. 8.

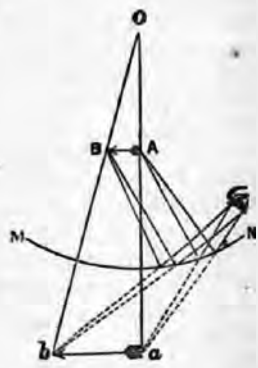

FIG. 9.

image is virtual, of the same size as the object, and at a distance behind the mirror equal to A B in front of it.

2. When the mirror is convex, the image will be placed as in Fig. 8, and is less than A B in the proportion b O to B O. It is here virtual.

3. When the mirror is concave (Fig. 9), and the object, A B, placed between the principal focus and the mirror, the image, a b, is virtual, erect, and enlarged in the proportion of b O to B O.

4. When the mirror is concave, and the object placed at a distance from the mirror greater than its focal length (Fig. 10), the image is real, inverted, and diminished. Conversely, if we suppose *a b* an object, A B will be the image, in this case real, inverted, and enlarged.

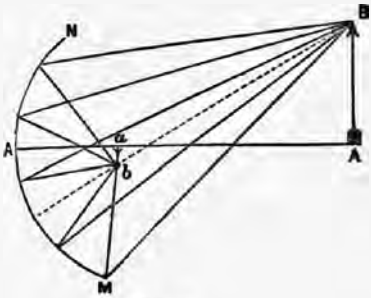

FIG. 10.

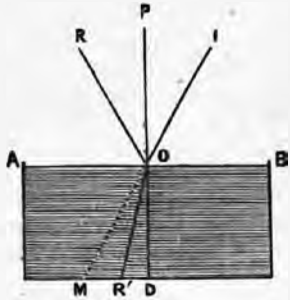

FIG. 11.

REFRACTION.—If a ray of light, I O, Fig. 11, fall obliquely on the surface of a dense medium, such as a plate of glass, A B, a portion of the ray is reflected in O R, and a portion transmitted. The transmitted portion, instead of going straight on in the direction O M, is bent towards the perpendicular to the surface in the direction O R′. This change in the path of the ray is termed *refraction.* It occurs when light passes from a rarer to a denser medium. In

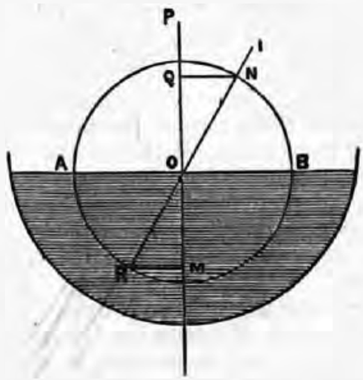

FIG. 12.

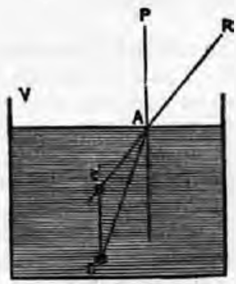

FIG. 13.

the latter case the ray will be bent away from the perpendicular. Here, as in reflection, the angle of incidence, I O P, and the angle of refraction, R′ O D, are in the same plane. Again, if a ray, I O, Fig. 12, fall upon the surface, A B, of a refracting medium, such as water, and points, N R, be taken in the incident and refracted rays at equal distances from O, the perpendiculars, N Q, R M, from these points on P M have a constant ratio for all angles of incidence. The ratio of A N to R M $\left(\frac{QN}{RM}\right)$ is called the index of refraction. The object in introducing a circle into the figure is to enable us to measure off equal distances, O N and O R.

Many facts of common observation receive an easy explanation from the law of refraction. Bodies placed in a medium more highly refracting than air appear nearer the surface of this medium than they really are. Let a body, C, be placed in a vessel of water, V, Fig. 13. A ray of light from C, on leaving the water, will be deflected from the perpendicular in the direction A R. The body will, therefore, be seen as if at C′, the direction in which the ray is travelling when it enters the eye at R. It is for this reason that the eye is deceived with regard to the real depth of water. The rays of light appear to proceed from a point nearer the surface, and cause the bottom to appear more elevated than it really is. The index of refraction for water is $\frac{4}{3}$, so that the eye is misled to the extent of one foot in every four; in other words, if water appear to the eye *three* feet deep, its real depth is *four* feet.

As long as the two surfaces of the refracting medium are parallel, the rays which pass through it emerge parallel to their original direction. The path of a ray of light through a triangular piece of glass, called a prism (Fig. 14), will

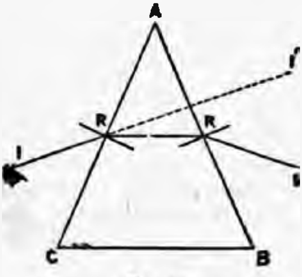

FIG. 14.

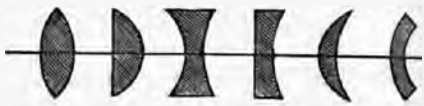

FIG. 15.

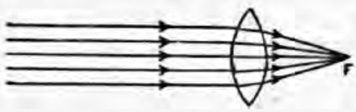

FIG. 16.

show the altered direction of the ray when the faces of the medium are not parallel. The ray is always bent towards the thick part of the prism. A combination of surfaces may be so arranged as to cause all the refracted rays to converge towards one common line; such a combination forms a *lens*. A lens is a portion of any transparent medium adapted to magnifying purposes by having both surfaces spherical, or one spherical and the other plane. There are six forms of lens (Fig. 15). Those which are thickest at the centre are convex; those which are thinnest, concave. Rays passing through lenses are bent towards the thick part of the lens, so that the rays converge in a convex lens, and diverge in a concave. The focal length of lenses may be determined experimentally as follows: if convex (Fig. 16), expose the lens with its principal axis parallel to the sun's rays. By receiving upon a screen of polished glass the emergent pencil, we can easily ascertain the point where the rays converge. The distance of the lens from the screen is its focal length. In a concave lens the focal length may be found by projecting upon a screen the image of two points, *a b*, Fig. 17 (the rest of the surface being blackened). When the distance between the points in the image is double the distance *a b* on the lens, it is placed at its focal length.

The following consideration renders evident the use of a lens in magnifying objects. The apparent size of an object depends upon its distance from the eye. If, then, an object could be brought indefinitely near the eye, its apparent size might be increased to any extent. It is found, however, that objects brought nearer to the eye than a certain distance, which varies with different individuals, cannot be distinctly seen. This limiting distance is on an average about 10 in. If we wish to examine an object placed nearer to the eye than 10 in., we use a lens (Fig. 18) which will cause the rays from the object A to have their foci in *a b* at the ordinary distance of vision. In order to get the magnifying power in any case, divide the distance of distinct vision by the focal length of the lens used. Lenses are also used for correcting defects of vision. It is necessary for correct vision that the images of objects should be formed exactly on the retina. If the lenses of the eye are too convergent, the rays converge too soon, and the image is formed in front of the retina. This defect—known as short-sightedness—is corrected by the use of a concave lens, which renders the rays more divergent. In long-sighted persons, the eye has not sufficient power to cause rays from near objects to converge on the retina. In this case the image is formed behind the retina. By using a convex lens, the rays are made to converge more rapidly.

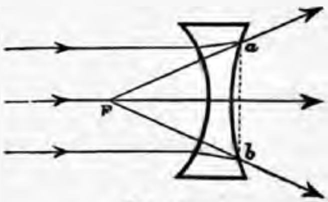

FIG. 17.

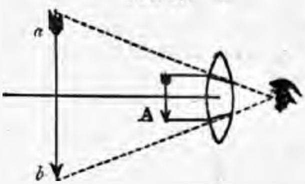

FIG. 18.

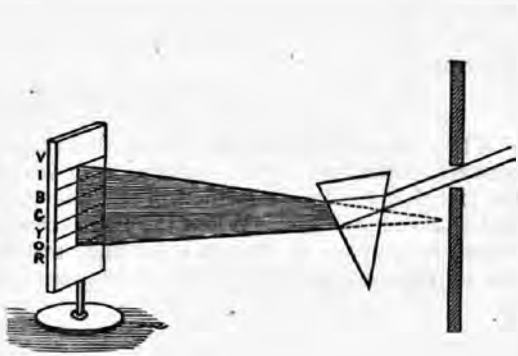

FIG. 19.

SPECTRUM.—When a beam of light is admitted into a darkened room, and passed through a prism, as in Fig. 19, it is not only changed in direction, but, if received upon a screen, is found to be divided into rays of seven different colours, violet, indigo, blue, green, yellow, orange, red. The violet is bent farthest from the original direction; the red least. White light may, therefore, be regarded as a combination of these seven differently-coloured rays. To show this, divide a circular disc of cardboard into seven compartments, the size of each corresponding with the extent of the colour in the spectrum. Paint each compartment its appropriate colour. On revolving the disc very rapidly on an axis through its centre, the paper appears white.

Another phenomenon of great interest in connection with the spectrum is the occurrence of fixed lines in it. The solar spectrum is not continuous, but crossed at right angles to its length by a number of *dark* lines. The spectra of gases and vapours consist entirely of *bright* lines. These lines form a most delicate test of the presence of any substance whose spectrum is known, since the position of the lines is sufficient to indicate its nature. In this way several new metals have been discovered. The explanation of the origin of the dark lines in the solar spectrum is due to Kirchhoff and Bunsen, and forms one of the most important scientific announcements of modern times, as we are thus made aware of the existence of substances in the atmospheres of the sun and stars with which we are familiar in our own planet. We have discovered that the spectra of metallic vapours consist of bright lines; that of sodium, for example, consists of two such lines in the yellow. If through the flame giving the sodium spectrum rays from a strong source of white light (such as an electric lamp) be transmitted, the spectrum due to this last flame will be continuous, with the exception of two dark lines where the bright lines from the sodium originally appeared. We thus see that the sodium vapour has absorbed the rays which would occupy the same position on the spectrum as its own bright lines. Other vapours would absorb different rays, causing dark lines to appear in other parts of the spectrum. The sun is supposed to be a body of extreme brightness, which would emit a continuous spectrum, but that, surrounding the solid portion, is an atmosphere of incandescent metallic vapours, which cut off rays of the same refrangibility as their own light. The dark lines show where certain bright ones would occur if the solid nucleus of the sun were removed. In this way many well-known metals have been detected in the sun's atmosphere.

OPTICAL INSTRUMENTS.

When two mirrors are placed parallel to each other, and an object is placed between them, an endless succession of images is formed. This arises from the fact that the image formed in one mirror becomes the object for the other, and so on alternately. When the two mirrors are inclined at an angle to each other, the number of images is limited, and depends upon the angle at which the mirrors are placed. The instrument known as the KALEIDOSCOPE is

FIG. 20.

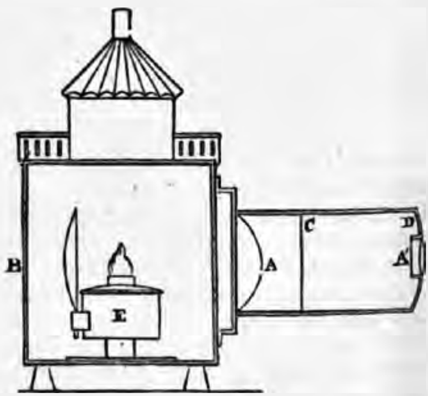

FIG. 21.

founded upon this property of inclined mirrors. It consists of a tube of cardboard (shown in section in the figure), in which are placed along the whole length of the tube two mirrors, M N and M' N, inclined at an angle which is an aliquot part of 180°, and hinged together along one edge. One end is fitted up with an eye-glass, the other end is closed with two glasses placed at a small distance apart. Between these are placed small fragments of glass or other variously-coloured objects. On looking through the other end, the images of these are seen symmetrically arranged, and one less in number than the angle at which the mirrors are inclined is contained in 360°.

MAGIC LANTERN.—This is an optical instrument, by means of which magnified images of small pictures are thrown upon a screen in a dark room. It consists of a lantern, in which is placed a lamp in the focus of a concave reflector, C, placed behind it. In the side of the lantern is inserted a horizontal tube on a level with the flame. The rays reflected by C are thrown upon a converging lens, A, which concentrates the rays upon the figures traced on the slide S. In front of these figures (now strongly illuminated) is another converging lens, placed at a little more than its focal length from the slide. According to the principles explained in the formation of images by convex lenses, an inverted and greatly magnified image will be thrown upon the screen. In order to obtain an erect image, care must be taken to introduce the slides in an inverted position.

The STEREOSCOPE (Gr., *steros*, solid, and *skopein*, to see) is an instrument by means of which the projections of solid bodies, on a plane surface, are seen in relief, as in the ordinary vision of the objects themselves. In viewing a near object with both eyes where there is a sensible convergence of the optic axes,* the retinal pictures differ in their perspective for each eye, thus giving the idea of solidity. The first conception of the instrument is due to Prof. Wheatstone, and, as modified by Sir David Brewster, is the instrument now in general use, and represented in the figure. It consists of a small wooden box, the upper side of which bears two tubes the same distance apart as the two eyes. In the tubes are fastened two semi-lenses used as eye-pieces.

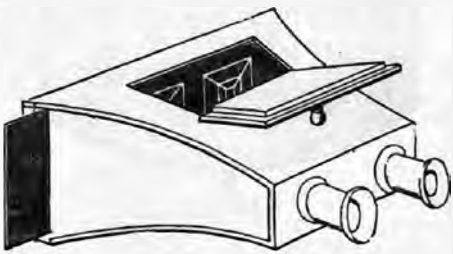

FIG. 22.

The pictures to be used are taken from two different points of view, and mounted side by side upon a piece of cardboard, and being placed in the stereoscope, are viewed through the two semi-lenses in the tubes. The lenses are so constructed that, on looking through them, the two pictures appear to occupy the same part of space. The principle upon which this depends may be stated as follows: When an object is viewed through the centre of a convex lens, the eye, the centre of the lens, and the actual place of the object are in one straight line. If the lens be moved to the right or left, the object will appear to move to the left or right, the displacement of the object being in a direction contrary to that in which the lens is moved. Let such a lens be cut transversely into two semicircular pieces, and placed side by side, with their thin edges adjacent, so that the two plane edges formed by the section are parallel. The left half of the lens now forms the right eye-piece, and the right half the left; and it will follow from what has been said, that the picture placed under each lens will appear in a position midway between the two

* The diverging pencils which fall upon the eye from every point of an object, are of the shape of a cone, the base of which rests upon the pupil of the eye. The axis of this cone is called the optic axis.

lenses. By this arrangement the objects are magnified as well as made to coalesce.

ZOETROPE, or Wheel of Life. (Fig. 23.) This instrument is so named from its exhibiting the pictures of objects as if possessed of life. It consists of a cylinder of cardboard of about 12 in. diameter and 7¾ in. in depth, with a rim of metal at the top and fastened to a circular piece of wood at the bottom. An upright inserted into the stand, S, forms the vertical axis upon which the box may be made to rotate with any desired speed. There are thirteen apertures, each 3 in. long and $\frac{3}{16}$ in. wide, at equal distances round the circumference.

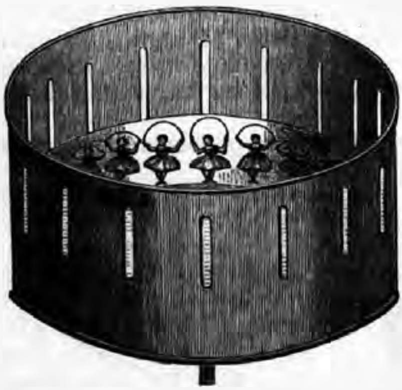

FIG. 23.

FIG. 24.

Each set of pictures is printed on a strip of thick paper, 36 in. long and 3½ in. broad. In using the instrument the picture strip is placed inside the cylinder immediately below the apertures. Light it well from above, and on revolving the cylinder look through the apertures at the pictures on the opposite side. The appearances observed depend upon the fact that vision lasts for a short interval of time after the exciting ray has been removed. The pictures, it will be observed, represent the different attitudes successively assumed by the object in contemplating a certain movement. The mechanical arrangement is such that the visual impression of each picture remains until the incidence of the next following it. The object is thus constantly in view, and appears to execute the movements delineated by the pictures.

In the THAUMATROPE, represented in Fig. 24, the attention is confined to a single group, instead of to a number of groups, all performing the same movement. The cylinder turns upon a horizontal axis. The groups are arranged on the strips one above another, and not side by side as in the zoetrope. They are perforated with apertures corresponding to those in the cylinder. By an opening at the bottom of the hood the view is confined to a single group on the opposite side of the cylinder. Both eyes are here used at once, which renders the illusion more distinct and pleasing.

ACOUSTICS.

When a bell, or other elastic body, is struck, we feel a sensation, to which the name *sound* is given. The question is, What is the cause of this sensation? It is this: on striking the bell, its particles are thrown into a vibratory motion; the same motion is transmitted to the air, and propagated through it to the ear, producing the sensation of sound. That the particles of the bell have been actually thrown into this tremulous or oscillatory motion, you may feel by putting the finger gently to it; but if the finger be pressed against the bell, the vibratory motion of its particles will be stopped, and consequently the sound destroyed. So we silence a bowl or glass that has been accidentally struck at table.

We have now to consider how this sonorous motion is propagated or transmitted through the air. This will be the more readily understood by taking a case in which the sound results from the transmission of a single pulsation or wave, as it does in the following experiment:

Fill a bladder with a mixture of hydrogen and air, or of hydrogen and oxygen; thrust into it a red-hot skewer: the gases explode, and a sharp loud sound is heard. What has taken place? This: when the mixture of gases exploded, an intense heat was given out from their chemical union; the heat caused a great and sudden expansion of the air at the place of the explosion, which, forcing away the air immediately around, produced a condensation at a little distance: this condensed layer or shell of air gave up its motion to the next layer of air, condensed it, and at the same time came to a state of rest itself; each layer acted in the same manner, imparting its motion to the next succeeding layer, and coming itself to rest: the motion was thus propagated like a pulse or wave through the air. When the wave reached the ear, the air in its cavity was thrown against the membrane of the *tympanum*, or drum of the ear; this membrane transmitted the motion to the auditory nerve, which conveyed it to the brain, where it produced the sensation of sound. Sound, then, till it reaches the brain, is merely motion; and when we speak throughout this article of sound being propagated, transmitted, or conveyed through bodies, we mean by *sound* the *motion* which produces the sensation of sound when it reaches the brain. This sonorous wave is propagated through the air at the common temperature of 59° F., at the speed of 1,120 ft. per second. We must be careful not to confound the velocity of the wave with the velocity of the particles of air which constitute it at any instant; for while each particle of air makes a small excursion about its point of rest, forwards and backwards, the wave is propagated for a considerable distance.

Now to return to our experiment with the bell. The continuous sound produced on striking it was simply caused by a succession of waves being propagated through the air, which impinged against the ear with such rapidity or frequency as was sufficient to produce the sensation of a continuous sound. It is with the sonorous wave as with a wave of water—motion, not matter, is transmitted; and this is the distinguishing character of all wave motion. Of the truth of it the reader may further satisfy himself, by observing how a pulse runs along a rope, when it is fixed at one end and receives a jerk at the other.

In both our experiments above mentioned, namely, the striking of the bell and the explosion of the bladder, the sound was transmitted through the air; but other gases are also capable of transmitting it, so are liquids and elastic solids, and these even with greater facility than air. A bell struck under water was heard across the whole breadth of the Lake of Geneva, a distance of nine miles, which shows that water has a great facility for propagating through it sonorous motion. If a poker be suspended by a string, and the end of the string pressed into the ear while the other end of the poker is struck, a loud tolling sound is heard; this arises from the vibrations of the poker which are transmitted through it to the ear; or if the end of a long log of timber be scratched with a pin, a person having his ear at the opposite end will hear the sound distinctly.

We have now had examples of sound being transmitted through gases, liquids, and elastic solids: *some medium* is essentially necessary. Sound cannot be transmitted through a vacuum. This is shown by ringing a bell under the exhausted receiver of an air-pump: though the hammer pound against the bell, no sound is heard. The less dense the air in which the sound is produced, the less intense the sound: this is shown in the last experiment, for as the receiver becomes more and more exhausted of air, the sound of the bell becomes more and more feeble. If the receiver were now filled with hydrogen (which is fourteen and a half times lighter than ordinary air), and the bell rung in it, the sound would be found to be still more feeble than if air of the same density as the hydrogen were used. When a pistol is fired on the top of a mountain where the air is light, the report is very slight. If a sound be made on the bank of a river, it is greatly weakened to a person immersed in the water: this is an example of the general law, that when sound is transmitted from a light to a heavy body, it is enfeebled. The same thing is exemplified when a bell is rung first in the open air, and then under a glass vessel; the sound in the latter case is much lessened, for the vibrations have in this case to be transferred from the air to the glass, and thence to the outer air.

When a gun is fired we see the flash before we hear the report; it has taken this time for the sound to reach us. The rate at which sound travels through air has been determined by experiment. At a station whose exact distance from an observer is known, a sound and flash of light are produced at the same instant; from the great rapidity with which light travels, we may consider that the observer sees the flash the moment it is produced, so that whatever interval there is from the time he sees the flash till he hears the sound, it has taken this time for the sonorous wave to travel to him: this being noted exactly, and the distance known, the velocity is determined. After neutralizing the influence of the wind, and taking into account the barometric pressure, temperature, and hygrometric state of the air, 1,120 ft. per second is given as the velocity of sound through air at the temperature of 59° F.

The speed with which sound is transmitted through any medium depends on two things: the elasticity of the medium and its density. The greater the elastic force compared with the density, the greater the velocity of sound. If we could diminish the density of the air while its elasticity remains the same, we should increase the velocity of sound through it. This is exactly what is done when our atmosphere is heated by the sun—it expands, becomes lighter bulk for bulk than before, while its elasticity (which is measured by the height of the mercurial column it supports in the barometer) remains the same. Through this heated air sound travels more rapidly than through cold, and the increase in velocity is found to be $1\frac{1}{7}$ ft. per second for every degree of increase of temperature measured on Fahrenheit's scale; so that the velocity of sound through air at the freezing-point (32° F.) is 1,090 ft. per second.

From knowing the elasticity and density of air, the velocity of sound through it can be determined from theory. The velocity obtained by experiment is found to be 173 ft. per second more than that obtained from theory; this increase is due to the effect of heat disengaged from the compression of the air by the passage of the sonorous wave through it. That heat is given out when air is compressed, the following simple experiment well shows. Take a good

FIG. 1.

stout glass cylinder, A B, closed at the end B, and having a piston, C, fitting it perfectly air-tight; attach a bit of gun-cotton, E, as in the figure, press the piston forcibly down the cylinder so as to compress the air in it: as much heat will be disengaged as is sufficient to kindle the gun-cotton.

From knowing the rate at which sound travels through the atmosphere, we can tell the distance of the place where it originates. Thus, suppose we see a flash of lightning, and five seconds afterwards hear the thunder, we know that the cloud at which the discharge took place is distant five times 1,120 ft., that is, 5,600 ft., or rather more than a mile. It is only when the interval between the flash and the peal is short that there is danger.

The time that it takes sound to travel, explains many of its phenomena. Thus, if a long line of musketry fire at the same moment, and two persons be stationed at a distance, one in front of the line and the other at the end, the one in front will hear a sharp loud report, while to the person at a distance from the end the sound will continue for some time, diminishing in intensity. Now, the reason of this is, that the person in front was nearly at an equal distance from each of the muskets, and consequently the sound of each of them reached his ear at nearly the same moment, producing a sudden bang; while the other person, being much nearer the muskets at one end than the other, hears the report of those nearest him first, and the sound will continue during the time that it takes to travel through the whole line, diminishing in intensity as it comes from a greater distance. Similar considerations explain why thunder is sometimes heard as a sudden clap of deafening loudness, and at other times as a prolonged rolling.

The velocity of sound is greater in liquids and elastic solids than in air: in water it is four and a half times, in cast iron ten times, and in different kinds of wood from eleven to seventeen times as great as in air. The cause of this is, that in these the elasticity compared with the density is greater than the elasticity of air compared with its density. An experiment of Biot beautifully illustrates how much better iron transmits sound than air. Fix a bell to the end of a long iron tube; when the bell is struck, a person having his ear at the other end of the tube will hear two distinct sounds, one after the other, the first transmitted through the iron, the second through the air in the tube.

When sound strikes a hard or elastic surface—plane or curved—it is reflected, and in this respect follows the same laws as light and radiant heat—*the angle of incidence being equal to the angle of reflection.* Fig. 2 shows an experiment which exemplifies the reflection both of radiant heat and sound. A and

B are two mirrors, made of any hard polished substance, and fixed 10 or 15 ft. apart. If a heated ball of iron be placed at F (the focus of the mirror A), a piece a gun-cotton placed at *f* (the focus of the mirror B) will be exploded; though at any other place much nearer the mirror this would not happen. For the rays of heat from the ball, falling on the mirror A, are reflected in

FIG. 2.

FIG. 3.

parallel directions; but on striking the mirror B, they are all reflected into the focus *f*, as shown by the direction of the lines in the figure. If a watch be now hung at F, instead of the ball, to a person having his ear at *f* the ticking will be distinct and loud, and will be heard coming from the mirror B.

Curved walls and roofs act upon sound in the same manner as we have seen the mirrors act, and on this principle whispering galleries are constructed: a whisper uttered at one of the foci of an elliptical building will be heard distinctly by a person at the other focus, though quite inaudible to persons situated midway.

When the reflecting surface is at such a distance that the reflected sound is heard distinct from the direct, the reflected sound is called an echo. The reflecting surface may be at so great a distance as to repeat distinctly words of several syllables: at Woodstock is an echo which is said to repeat twenty syllables. A single sound may be repeated several times, the successive echoes still becoming feebler: of this we have good example in the echo at the Gap of Dunloe, at Killarney.

Sounds are either musical or non-musical, or, in other words, are either notes or noises. A musical sound or note is produced when the impulses of the air, &c., against the ear occur at equal intervals, and with such rapidity as to produce a continuous sound—as when a tuning-fork is made to vibrate. When the impulses are irregular, noise is the resulting sensation.

Two sounds of either class may differ in intensity or loudness, in pitch, and in *timbre*, that is, the quality of sound peculiar to each instrument, and by which we distinguish, for instance, the sound of a violin from that of a clarionet.

The intensity or loudness of a note depends on the amplitude of the vibrations that produce it, the amplitude of a vibration meaning the space that a particle moves through in making a vibration: the greater this space, the more intense the sound. Thus, when the tuning-fork, F, is made to vibrate, as in Fig. 3, the amplitude of the vibrations, at first, is from the dotted line *a* to the dotted line *b*; as the fork continues to vibrate, the amplitude will be *seen* to become less, and at the same time the sound will be *heard* to become weaker; when the motion ceases, silence prevails.

A sound becomes less intense the greater the distance of the sounding body, and the diminution is proportional to the square of this distance; that is, at double the distance the intensity is only one-fourth, at treble the distance it is one-ninth, at four times the distance it is one-sixteenth, and so on. Thus, if a bell be placed at a certain distance, and four other similar bells be placed at twice the distance, the sound coming from the one bell should be as loud as the sound coming from the four. It must be borne in mind that the above law is only true when the sound is transmitted freely in the open air; but if the sound be transmitted through the air in a tube, it is conveyed to a great distance without losing much of its loudness: in this way communication may be maintained between very distant apartments in a house.

The acuteness of a musical sound or note is called its pitch, and this depends entirely on the number of vibrations per second required to produce the note, as the following experiment shows. By turning the handle H, Fig. 4, each tooth of the smaller wheel, C, is made to strike the card, D, in passing it.

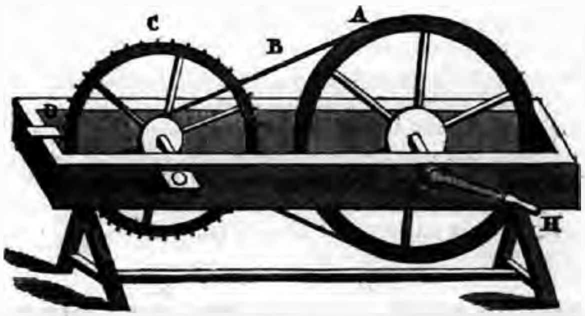

FIG. 4.

When the wheel revolves slowly each tap is heard separately, but when the speed is increased, these link into a continuous sound, which *rises in pitch* the *more rapidly* the wheel revolves.

This apparatus was invented by Savart, and may be used not only as we have done, to show that the pitch of a note rises as the rate of vibration increases, but also to find the number of vibrations per second due to any particular note. To do this, we have simply to turn the wheel till the required note is attained, and then, maintaining the same speed for some time, we find from an index the number of revolutions the wheel has been making per second; multiplying this by the number of teeth in the wheel, the result gives the number of vibrations per second due to the note in question. In England a vibration means an excursion *to* and *fro* of the vibrating body; but in France a vibration consists of an excursion of the vibrating body in one direction, that is, *to* or *fro*. It is found by an experiment similar to the above, that the least number of complete vibrations capable of linking together, so as to produce a continuous sound, is sixteen per second. The Syren is an instrument, invented by M. Cagniard de Latour, for determining the vibrations due to any note; in it the musical sounds are produced by a succession of puffs, but a full description of it would be too long to introduce here. A series of notes, whose vibrations are in the ratios denoted by the following numbers: 1, $\frac{9}{8}$, $\frac{5}{4}$, $\frac{4}{3}$, $\frac{3}{2}$, $\frac{5}{3}$, $\frac{15}{8}$, 2, forms the natural or diatonic scale; multiplying these ratios by 24 to avoid fractions, we get the following series of whole numbers which express the same relations: 24, 27, 30, 32, 36, 40, 45, 48. The notes of the diatonic scale are denoted by the letters, C, D, E, F, G, A, B, C′, or by the syllables, do, re, me, fa, sol, la, si, do′. It has been agreed that the note produced by 435 complete vibrations per second shall be denoted by A on the second space of the treble;* the vibrations due to the other corresponding notes are, therefore, as follows:

Names of the notes . . .	C,	D,	E,	F,	G,	A,	B,	C′.
Relative rates of vibration .	1,	$\frac{9}{8}$,	$\frac{5}{4}$,	$\frac{4}{3}$,	$\frac{3}{2}$,	$\frac{5}{3}$,	$\frac{15}{8}$,	2.
Number of vibrations per second	261,	294,	326,	348,	392,	435,	489,	522.

We observe that C′, the octave of C, that is, the eighth note on the scale from C, is produced by twice the number of vibrations due to C. The scale is continued both ways, each note being produced by twice the number of vibrations due to its lower octave, or half the number of vibrations due to its higher octave.

When two notes are sounded together, they produce a pleasing effect called *harmony*, if their notes of vibration bear a simple relation to each other; thus C produces harmony with its octave C′, their notes of vibration being as 1 is to 2. Also C sounded with G produces harmony, though not so perfect as in the last case, their vibrations being in the proportion of 2 to 3. When no such simple relations exist, the notes when sounded together produce an unpleasing effect called *discord*. From C to G is called an interval of a fifth, on account of their relative positions on the scale; other intervals are named in the same way: thus from C to E is an interval of a third, and so on.

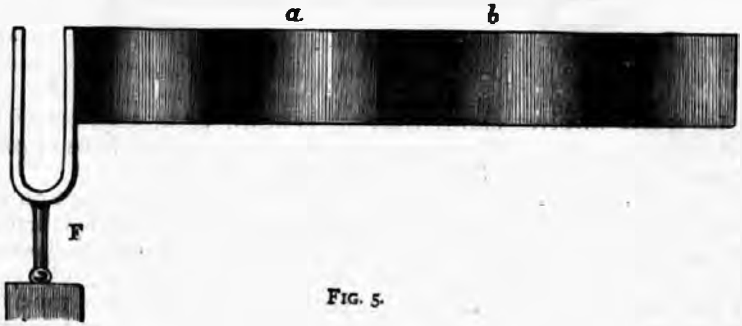

FIG. 5.

Fig. 5 shows the condition of the air when a musical sound is passing through it: when the prong of the fork advances it produces a condensation of the air, and when it retreats it leaves a partial vacuum behind it. Thus every complete vibration of the prong, that is, an excursion forwards and backwards, sends forth a complete wave, which consists of a condensed part and a rarified part; these two parts form the length of the wave. In Fig. 5

* This is the "Diapason Normal," or French pitch, formally established by law in 1859: the English concert-pitch is higher, but many musicians are anxious to have it lowered, which it is soon likely to be.

the dark spaces represent the condensed parts, and the light spaces the rarified parts of the waves; from *a* to *b* is a wave length. It would appear from this that we should be able to tell the length of the waves that produce any particular note. And so we can. Suppose the fork in Fig. 5 performs 435 vibrations per second, and that the velocity of the sound is 1,120 ft. per second. Now, when the fork is made to vibrate, in one second the front of the first wave sent forth will be 1,120 ft. ahead; but during this one second the fork will have sent forth 435 waves; so that this space of 1,120 ft. is made up of 435 waves, therefore the length of each wave is 1,120 ft. divided by 435, that is, rather more than $2\frac{1}{2}$ ft. Thus the length of the waves corresponding to any note is found by dividing the velocity of the sound per second by the number of vibrations per second due to the note. It follows that the higher the pitch of a note, the shorter the waves: if one note be an octave higher than another, the waves producing the higher note are just half the length of those producing the lower.

In a large class of musical instruments the sound is produced by the vibration of highly stretched strings, the intensity of the sound being increased by the vibrations being communicated to suitable sound-boards, as in the

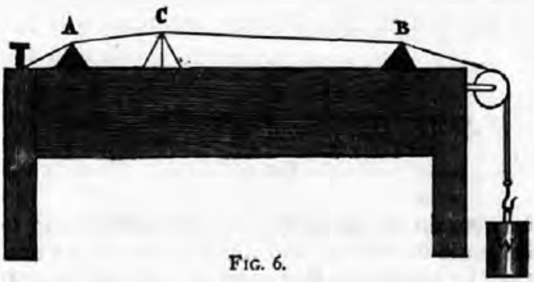

FIG. 6.

violin, piano, harp, &c. From experiments made with the simple instrument (Fig. 6) called a monochord, in which, by means of the movable bridge, C, any length of the string may be vibrated, it is shown that the vibrations of a string depend on the following laws:

1. The shorter the string the more rapid the vibration, and consequently the higher the pitch of the note: with half the length of the string the vibrations are doubled, and produce the octave of the whole string; with one-third the length of the string the vibrations are trebled, and produce a note a fifth above the octave of the whole string. *In general terms, the number of vibrations is inversely proportional to the length of the string.*

2. The more tightly the string is stretched, the more rapidly it vibrates, and it is found that *the number of vibrations is proportional to the square root of the stretching weight.*

3. The vibrations depend also on the thickness of the string; the length and stretching weight continuing the same, we find that *the number of vibrations varies inversely as the thickness.*

4. All other things remaining the same, *the number of vibrations is inversely proportional to the square root of the density of the string.* The two last laws may be expressed in one, thus: the length and stretching weight continuing the same, *the number of vibrations is inversely proportional to the square root of the weight of the string.* In the violin and other stringed instru-

ments, we avail ourselves of *thickness* instead of *length* to obtain the grave notes.

We can make any length of string vibrate without using the bridge C, Fig. 6. If we remove the bridge, and touch the string in the middle, while a fiddle-bow is drawn across one of its halves, the two halves will vibrate separately, as represented in Fig. 7, in which only the string of the monochord is shown. The note produced is an octave of that produced by the string vibrating as a whole, as shown in Fig. 8.

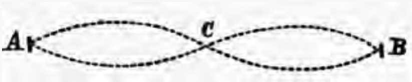

FIG. 7.

FIG. 8.

The point, C, between the vibrating segments remains at rest, and is called a *node*. By touching the string in the proper place and then drawing the bow across it, we can divide it into three, four, or five, or any number of vibrating segments, separated by the corresponding number of nodes. The position of these segments and nodes is readily observed by putting riders of paper along the string; those situated at the vibrating segments will be unhorsed, while

FIG. 9.

those at the nodes remain on, as in Fig. 9. The same thing takes place when plates of glass are made to vibrate, and the position of the nodal lines in these is beautifully shown by scattering fine sand over the plates; the sand assumes a curious rapid motion, and finally settles along the nodal lines. If a square piece of glass be held at the centre by a suitable clamp, and fine sand scattered over it, when a violin bow is drawn across its edge near one of the corners,

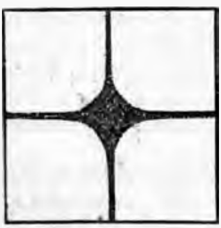

FIG. 10.

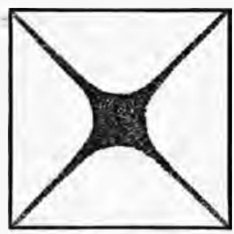

FIG. 11.

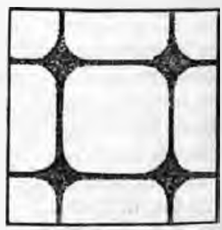

FIG. 12.

while the middle point of one of its sides is touched with the finger, the sand is tossed about and settles along the nodal lines (Fig. 10) which divide the plate into vibrating segments. The note produced by this division is the lowest note of the plate.

If one of the corners be touched, and the bow drawn across the middle of one of the sides, the sand arranges itself as in Fig. 11: the note produced this time is a fifth above the last. If the plate be held near one of the corners, and the bow drawn as in the last case, the sand assumes the form shown in Fig. 12, and we obtain a note higher than either of the former. By thus agitating and touching the plates in different parts, Chladni was able to obtain an immense number of beautiful figures.

In organ-pipes the sound is produced not by the vibration of the material of which the pipes are made, but by the vibration of the air in the pipes. The lowest or fundamental note of a pipe, open at both ends, is that whose semi-wave equals the length of the pipe; and if the pipe be closed at one end, its lowest note is that whose semi-wave is half the length of the pipe. From this it follows that if two pipes be the same length, and one be open and the other closed, the fundamental note of the former is an octave lower than that of the latter. Since the longer the wave the deeper the note, the longer the pipe the deeper is its fundamental note. Higher notes may be got from a pipe by increasing the velocity of the current of air passing over its mouth; for then the air in the pipe divides itself into vibrating segments. The rates of vibration of the notes that can be got from an open pipe are as the numbers 1, 2, 3, 4, 5, &c., and from a pipe closed at one end, as the numbers 1, 3, 5, 7, 9, &c. Thus with an open pipe, the next note that can be produced above the fundamental note is its octave; but with a closed pipe, the first note above the fundamental is a fifth above its octave.

MECHANICS.

Composition of Forces.

In Mechanics we treat of the effects of forces on bodies; a force being anything which produces or tends to produce motion in a body, or which changes or tends to change the motion of a body. If *one* force *alone* acts on a body, only *one* effect can take place—the body must move in a straight line; for whenever a body at rest *appears* to be acted on by a single force, a little consideration will show that one or more others are in play. And when a body is subjected to the action of *two* or *more* forces, some *one* of *two* effects must take place: either the body must continue at rest, or it must begin to move in some definite direction and at some definite speed. If the body continue at rest, the forces that act upon it must be so related as to their intensity and direction, that they neutralize each other's effects. They are then said to be in equilibrium, and the science that treats of the relations that must exist between two or more forces in order that they may be in equilibrium is called Statics; while that which treats of the effects of forces not in equilibrium—that is, of the motion of bodies—is called Dynamics.

In statics, the magnitude or intensity of a force is measured by the weight which it would be able to support. A force that would support a weight of 1 lb. is called a force of 1 lb.; that which would support a weight of 2 lbs. is called a force of 2 lbs.; or, speaking of the two with reference to each other, the former may be called a force 1, and the latter a force 2.

Since the only things necessary to describe a force are its magnitude and its direction (that is, the direction in which it would tend to move any body to which it is applied), it is plain we can represent forces by lines, simply by drawing the lines in the directions in which the forces act, and of lengths proportional to their magnitudes. Thus if we want to represent, by means of lines, two forces of 3 lbs. and 5 lbs. respectively, acting on a body, O, at right

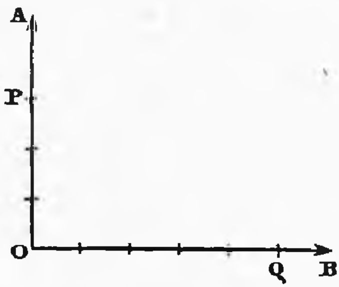

FIG. 1.

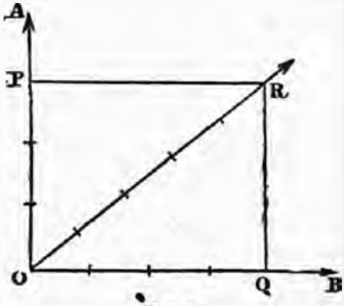

FIG. 2.

angles with each other, we draw from the point O two lines, O A and O B, at right angles to each other, as in Fig. 1. From O A we measure off O P=3 in., and from O B we measure off O Q=5 in.; then O P and O Q represent the said forces. Of course we might have taken three half-inches and five half-inches, making a line of ½ in. represent a force of 1 lb., or any other convenient lengths, taking care always to make the lines O P and O Q, which represent the forces, in the proportion of three to five.

Here is a body at O, Fig. 2. If it be acted on by a force which tends to move it in the direction O A, and at the same time be acted on by another force which tends to move it in the direction O B, it will obey neither, but will move off in a direction between them. From this it is evident that a single force might be found that would have the same effect in moving the body as the other two forces combined. That single force is called the *resultant* of the other two, and how to find it we shall now show. Let the force tending to send the body O in the direction O A be 3 lbs., and the force tending to send it in the direction O B be 4 lbs.; from O A measure off O P=3 in., and from O B measure off O Q=4 in. Now the lines O P and O Q represent the said forces. Complete the parallelogram, as in the figure, and draw the diagonal O R: O R represents the resultant. Let us measure it on the same scale as we measured O P and O Q on; we find it contains 5 in., and therefore represents a force of 5 lbs. Thus a single force of 5 lbs. acting in the direction O R would have the same effect in moving the body, O, as the other two forces combined have. The reader may, perhaps, now ask, What is the use of finding the resultant of two forces? Well, it is this: it enables us to tell both the magnitude and direction of a single force that would balance two given forces; and of the great and practical advantage of this no one will doubt. For instance, in the example that we have just taken, if a force of 5 lbs. be applied to the body at O, and be made to act in the *opposite* direction to O R, it will balance the other two forces, namely, the force of 3 lbs. acting in the direction O A, and the force of 4 lbs. acting in the direction O B. Two forces are called, in relation to their resultant, *components;* and the method of finding the resultant is called the *composition of forces.*

Having done this example, we shall now give in words the general rule for finding the resultant of any two forces acting on a body at the same point, but in different directions. Represent the forces by lines; complete the parallelogram of which these lines will be the adjacent sides, and draw the diagonal from the point at which the forces act. This diagonal represents the resultant. This rule is founded on the principle called the parallelogram of forces, which is in these words: if the two forces acting on a body be represented by the sides of a parallelogram, then the diagonal of this parallelogram, drawn in the direction of the forces, will represent the resultant.

We shall show by an experiment that this principle is true. Knot three strings together, and hang two of them over fixed pulleys, M and N; let the third hang from the point O; attach weights, P, Q, and R—R being less than the sum of P and Q: the whole, when left to itself, will balance in some definite position, as in the figure. The tension at every point of the string O M

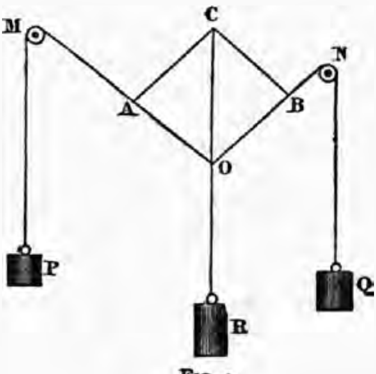

FIG. 3.

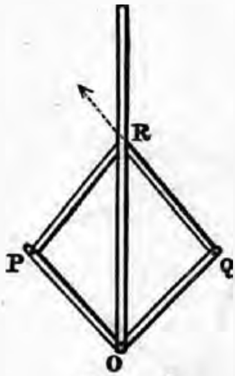

FIG. 4.

is the weight P, and at every point of O N the tension is the weight Q. Now, since R, acting vertically downwards through O, balances P and Q, acting in the directions O M and O N respectively, the resultant of P, acting in the direction O M, and Q, acting in the direction O N, must be a force equal to R, and acting vertically upwards through O.

Let us now find the resultant of P and Q, according to the method of the parallelogram of forces, and it will be found to agree with that which we have just obtained by experiment. To do it, from O M measure off O A, containing as many inches as there are ounces in P, and from O N measure off O B, containing as many inches as there are ounces in Q; complete the parallelogram as in the figure, and draw the diagonal O C. O C will be found on trial to contain as many inches as R does ounces, and to be drawn vertically upwards through O; it therefore represents the resultant found by experiment. This proves the truth of the principle; for, however the position of the pulleys may be varied, the resultant found by the *parallelogram of forces* will be found always to agree with that found by experiment.

If we take five rods jointed together, and form four of them into a parallelogram, making the fifth rod, which should be longer than the others, a diagonal, as shown in Fig. 4, and let the rods, O P and O Q, represent two forces acting on a body at O, then the rod O R will represent the resultant. By pushing in the corners at P and Q, so as to lessen the angle P O Q, we increase O R: this teaches us that the smaller the angle at which two forces act, the greater is the resultant. If the angle be diminished until it becomes nothing, then the forces act in the same direction, and the resultant is their sum: this is the greatest value the resultant of two forces can have. Again, if we pull out the corners P and Q, so as to increase the angle P O Q, we diminish O R: this teaches us that the greater the angle at which two forces act, the less is the resultant. If the angle be increased until the forces come to act in precisely opposite directions, then the resultant is their difference: this is the smallest value the resultant can have. If the two forces were equal to each other, in this case their resultant would be 0, and they would therefore be in equilibrium.

The resultant of any number of forces acting at a point may be found by a repetition of the same process: simply find the resultant of two of them by the above method, then find the resultant of this resultant and a third force, and so on; the last resultant found will be the resultant of all the forces. Thus, let three forces, O A, O B, O C, act on a particle, O, as in Fig. 5. To find the resultant of these three forces, find O R^1, the resultant of O A and O B; then find O R^2, the resultant of O R, and O C; O R^2 will be the resultant of the three given forces O A, O B, O C.

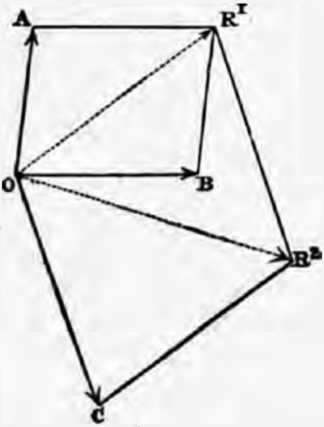

FIG. 5.

The reader will have no difficulty in finding illustrations of the composition of velocities acting as we have described. Thus, when a man rows a boat across a river so that in still water it would go straight across in the direction O A; if the river be running in the direction O B the boat will obey neither the oars nor the stream directly, but will go exactly in the direction O C, determined by the *parallelogram of velocities.*

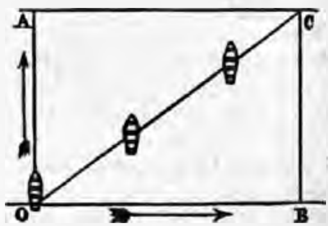

FIG. 6.

We now come to consider what is the resultant of two parallel forces acting on a rigid body at different points. To do this let us perform the following experiment: balance an inflexible rod by hanging a weight from its middle point over a fixed pulley, as in Fig. 7. Suppose the rod A B to be 10 in. in length; to the end A attach a weight, P, of 3 oz.; to the end B attach a weight, Q, of 12 oz. Now, it will be found that, in order to balance P and Q, we must suspend 15 oz. from a point, C, which is 2 in. from B and 8 in. from A. Now, since a weight of 15 oz. acting vertically *upwards* through C balances P and Q, the resultant of P and Q must be 15 oz. acting vertically *downwards* through C. This experiment teaches us that the resultant of two parallel forces acting on a body at different points is equal to their sum acting at a point between them, so that A C may bear the same proportion to B C as Q does to P; and we see that when that point is supported the bar on which the forces act remains at rest in all positions. This experiment must be borne in mind when we come to speak of the centre of gravity of a body. Similar experiments and considerations enable us to find the resultant of any number of parallel forces acting downwards.

No doubt the reader would be able now to determine the resultant of any number of forces acting at a point, and, therefore, able to tell what single force would balance any number of given forces; for he will remember that a force equal to the resultant, but acting in the opposite direction, would do so.

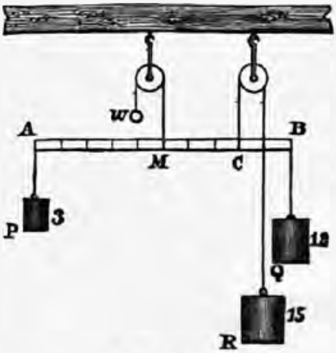

FIG. 7.

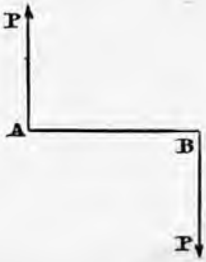

FIG. 8.

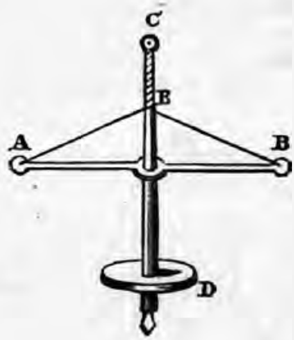

FIG. 9.

There is one interesting case, however, in which no resultant can be found of two parallel forces, and therefore no single force could be applied that would keep them at rest; this happens when the parallel forces are equal and opposite, and act at different points of the body, as shown in Fig. 8. Such forces constitute what is called a *couple*, and the tendency of a couple is to produce circular motion.

We have a good example of a couple in the centrifugal drill, represented in Fig. 9. When the handle, A B, is forced down, the actions of the string on the opposite sides of the spindle constitute a couple, which makes the spindle revolve rapidly, so that a hole is bored in whatever its lower end rests on.

Another beautiful illustration of a couple is seen in the philosophical toy, Fig. 10. Here a ball is kept in constant rotatory motion by a jet of water playing against it. The weight of the ball, acting downwards at its centre, is one of the forces of the couple, and the water, acting upwards against its side, is the other.

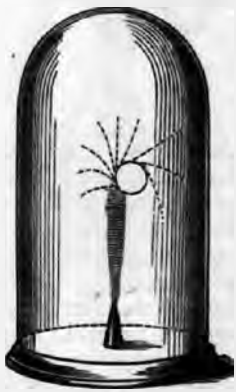

FIG. 10.

CENTRE OF GRAVITY.

We observe that when a body is not supported it falls to the ground; if we raise it again and once more leave it unsupported, down it falls in the same direction as before. The reason of this is, that every particle of the body is drawn towards the centre of the earth by a force that gets the name of *gravity*. The action of gravity on a body may be well represented by lines drawn from the places of the particles, as in Fig. 11: these lines will all point to the centre of the earth, and would therefore meet there; but as that point is nearly 4,000 miles distant, they may be considered parallel. The action of gravity, then, on a body is a number of parallel forces drawing its particles downwards; but we have just learnt that these parallel forces acting downwards are equivalent to a single force acting at a certain point between them, and that when that point is supported the body remains at rest in all positions. In this case, that point is the centre of gravity of the body, and the single force, which is the resultant of all the others, is the weight of the body. The centre of gravity of a body, then, is that point through which passes the resultant of all the forces which, on account of gravity, act on the body; and therefore, when it is supported, the body remains at rest in all positions.

This enables us to find the centre of gravity of many bodies by experiment;

FIG. 11.

FIG. 12.

FIG. 13.

thus, if we balance a rod on the finger, as in the figure, the point C, which is vertically above the point supported by the finger, is the centre of gravity of the rod; and if a piece of wire be put through the rod at this point and supported, the rod will remain at rest in whatever position it is put. The reader must be careful not to imagine that the centre of gravity of the rod is at its surface. In regular bodies of the same density throughout, we can fix upon the centre of gravity from general considerations; thus in a line it is its middle point, in a sphere it is the centre, in a cylinder it is the middle of the axis, and so on.

When a body is suspended freely from a point by a string passing through a hole in it, as in Fig. 13, and allowed to come to a state of rest, its centre of gravity will lie in the vertical line, A G, drawn from the point of suspension by means of a plummet, otherwise the centre of gravity would not be supported.

This principle enables us to find the centre of gravity of irregular bodies experimentally; for if we suspend the body in Fig. 13 from another point, B, and draw the vertical line B D from that point, the line B D will also contain the centre of gravity: the point, G, in which the two lines intersect, is the point required.

As long as the vertical line drawn through the centre of gravity of a body falls within the base, the body remains at rest; but the nearer this line falls to the extremity of the base, the more easily is the body overturned; and when this line falls outside the base, the body falls of its own accord. Thus, of the bodies represented in the margin, Fig. 14 is less easily overturned than Fig. 15; the slightest touch would overturn Fig. 16, and Fig. 17 would fall of its

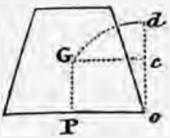

FIG. 14.

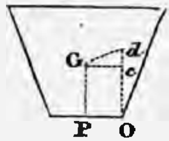

FIG. 15.

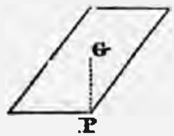

FIG. 16.

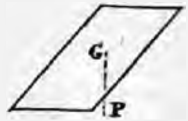

FIG. 17.

own accord. The art of balancing a stick on the finger consists in continually shifting the point of support, so as to keep it vertically under the centre of gravity, as shown in Fig. 18.

When a man stands upright, his centre of gravity is supported by his feet; but when he carries a load on his back, he has to lean forward in order to bring the centre of gravity of his body and of the load vertically above the base formed by his feet; for if he now stood upright, the load would have a

FIG. 18.

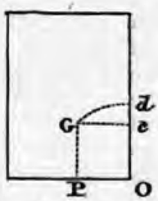

FIG. 19, A.

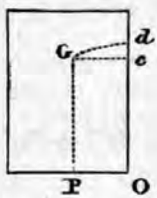

FIG. 19, B.

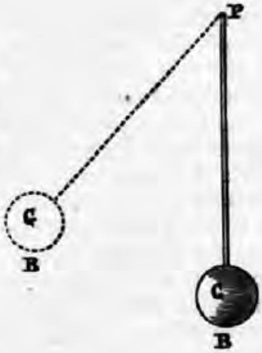

FIG. 20.

FIG. 21.

tendency to make him fall backwards. More than once has a porter been precipitated downstairs from attempting to carry a heavy box in front of him, instead of on his shoulders.

The vertical line drawn through the centre of gravity of a body is called the *line of direction*. Raising the centre of gravity in the same line of direction causes a body to be more easily overturned, as is shown in Figs. 19 A and 19 B. A and B are two bodies of the same weight and shape, but the upper part of B is made of heavier material than the under part, so that its centre of gravity is higher than that of A. The body B is more easily overturned than

A; for in order to overturn either, the centre of gravity, G, has to describe the arc G d, and is raised through the vertical distance $c\ d$; but this distance is less in B than in A, therefore B is the more easily overturned. This explains the danger of putting a great deal of luggage on the top of a coach, and the accidents that occur from persons suddenly standing up in a boat through fear. When a body is free to move about a point, its centre of gravity always assumes the lowest position it can attain; this we can see from holding a pen or pencil gently between the finger and thumb, so that it is free to move about the point by which it is held. This tendency causes a body which is suspended or supported from a point above its centre of gravity to vibrate for a few times like the pendulum of a clock, and finally to settle with its centre of gravity vertically under the point of support, as shown in Fig. 20, for this is the lowest position it can attain.

Fig. 21 represents an experiment which depends on the principle just mentioned. Two forks, A and B, stuck in a cork, C, are balanced on the point of a needle, which passes through the cork C and rests on a pin-head D. Here the point of support, D, is above the centre of gravity of the forks, and therefore, when they are put in motion, they will vibrate for a few times, and come to rest in the manner we described above.

Fig. 22 shows a simpler form of the same experiment, for in it the centre of gravity is visible.

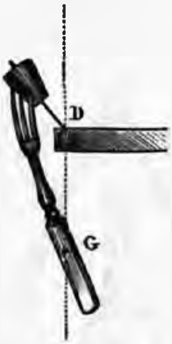

FIG. 22.

A cylinder may be made to roll for a short distance up an inclined plane, A B, by having one of its sides loaded with a piece of metal, M. The centre of gravity is thus changed from the centre of the cylinder to the point G; the cylinder will roll up the inclined plane till the vertical line from G passes through the point on which the plane supports the cylinder.

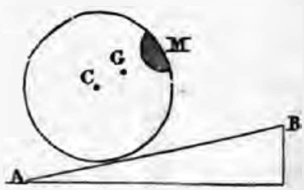

FIG. 23.

If a body is so situated that when it is slightly moved it returns to its former position, it is said to be in stable equilibrium; if it does not return to its previous position, but moves farther, it is said to be in unstable equilibrium; but if, when the body is slightly moved, it neither returns to its former position nor moves farther, it is said to be in neutral equilibrium: this is the case when a globe rests on a smooth horizontal plane.

Mechanical Powers.

Machines are instruments used for raising or supporting weights, or for communicating motion from one body to another. In a machine we have two forces in action—the resistance to be overcome, which we call the weight, and the force to overcome it, which we call the power. If a machine enables a power to overcome a weight greater than itself, it is said to have a mechanical advantage. Thus by using a bar, as in Fig. 24, a power of 1 cwt. may be made to raise a weight of 10 cwt., and then the bar is said to have a mechanical advantage of 10. The mechanical advantage of any machine is expressed by the ratio of the weight to the power when the machine is in equilibrium.

But we must not suppose that the bar, or any other machine, creates or begets force: it merely economizes it, and what is gained in power is lost in speed; for in order that the power of 1 cwt. may raise the weight of 10 cwt. through 1 ft., the power must move through 10 ft. This is called the principle of *virtual velocities*, and we find it exemplified in every machine.

There are six simple machines, namely, the Lever, the Wheel and Axle, the Pulley, the Inclined Plane, the Wedge, and the Screw. They are called the Six Mechanical Powers. Every machine, however complicated, is merely formed of a combination of these; it is, therefore, important that they should be well understood.

FIG. 24.

FIG. 25.

It will be the business of the present section to find the relation between the power and the weight when they balance each other in each of the simple machines; friction and the weight of the machine not being taken into account. For the sake of convenience, the power will be denoted by P, and the weight by W. We shall commence with the Lever.

A LEVER is an inflexible rod, straight or bent, turning on a point called the *fulcrum*. It is much used in the form of an iron bar for moving stones, and other heavy bodies, through small distances. Fig. 25 shows a lever used for that purpose, in which F is the fulcrum, P is the power exerted by the hand, and W is the weight to be moved..

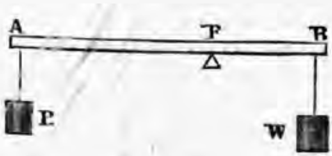

FIG. 26.

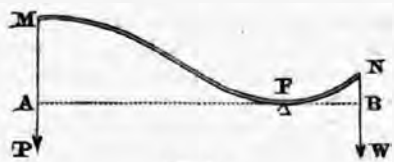

FIG. 27.

Take a straight inflexible bar, A B, and place it on a prop, F. On the end, B, hang a weight, W, and balance it with the power, P, hung on the end, A: F A is the power arm, and F B the weight arm. Now if F A is equal to F B, then W is equal to P; if F A be double the length of F B, then W is double of P; if F A be three times the length of the arm, F B, then W is three times P; and so on. The *weight* always bears the same proportion to the *power* as the *power arm* bears to the *weight arm*. The same thing is expressed by saying that the power multiplied by the length of the power arm is equal to the weight multiplied by the length of the weight arm.

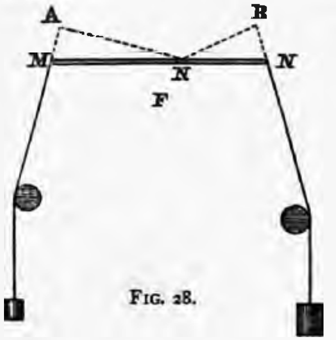

FIG. 28.

This rule holds for all levers; but if the lever be bent (as in Fig. 27), we must not take the bent arms of the lever, F M and F N, for the power and weight arms; but for the power arm we must take F A, the perpendicular drawn from the fulcrum to the direction in which the power acts, and for the weight arm we must take F B, the perpendicular drawn from the fulcrum to the direction in which the weight acts.

The same precaution must be observed if the power and weight do not act in directions parallel to each other, as shown in Fig. 28.

In the three Figs. 26, 27, 28, the power multiplied by the length of F A is called the *moment* of the power about the fulcrum, and expresses the tendency that the power has to produce motion about the fulcrum ; in the same figures the weight multiplied by the length of F B is called the moment of the weight about the fulcrum, and expresses the tendency that the weight has to produce motion about the fulcrum in the opposite direction. We see that when a lever is at rest, the moments of the power and weight about the fulcrum are equal.

Levers are generally divided into three kinds, according to the position of the power and weight with regard to the fulcrum. In levers of the first kind the power and weight act on different sides of the fulcrum, as shown in Fig. 29. It is evident that with levers of this kind we may either have a *mechanical advantage* or a *mechanical disadvantage*, according as the fulcrum is placed nearer the weight or the power. Examples of this kind of lever are numerous: the crowbar used as we have shown in Fig. 25; the poker used in stirring the fire; and the clawed hammer used in drawing a nail, furnish familiar examples. In these, as well as in the examples to be given of the other two kinds of levers, the reader should satisfy himself as to what constitutes the *fulcrum*, *power*, and *weight* in each case.

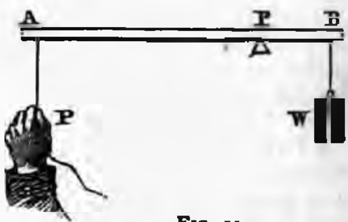

FIG. 29.

In levers of the second kind, the power and weight act on the same side of the fulcrum, the weight being nearer the fulcrum, as shown in Fig. 30. Here, it is evident, you have always a *mechanical advantage*, for the power arm must be always longer than the weight arm. Nutcrackers, a chipping-knife, an oar used in propelling a boat, and a door taken by the handle and opened on its hinges, are levers of the second kind.

In levers of the third kind, the power and weight also act upon the same side of the fulcrum, the power being nearer the fulcrum, as in Fig. 31. In this kind of lever there is always a *mechanical disadvantage*, for in it the power arm is always shorter than the weight arm, so that to support a weight with it, a greater power is required than if the power were applied directly without the intervention of a machine at all. This kind of lever is only used when velocity rather than power is wanted : the human arm (Fig. 32) is an example. The fulcrum is at the elbow, the weight is the body resting on the hand, and the contractile force of the muscle furnishes the power which acts at P. When the muscle contracts, the hand describes a much longer curve than P does, and this is convenient.

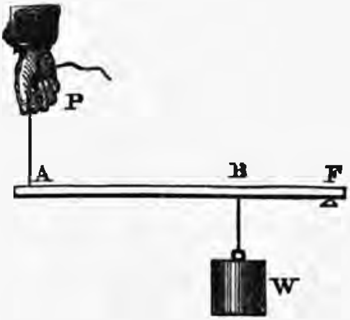

FIG. 30.

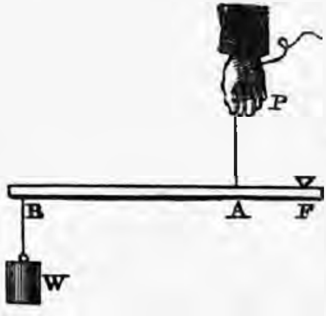

FIG. 31.

The WHEEL AND AXLE, as represented in Fig. 33, consists of two cylinders of different sizes, having a common axis to which they are rigidly attached: the larger cylinder is called the wheel, because a wheel having a groove in its circumference for carrying a rope is sometimes used instead of it; the smaller cylinder is called the axle; their common axis is supported on a frame. The

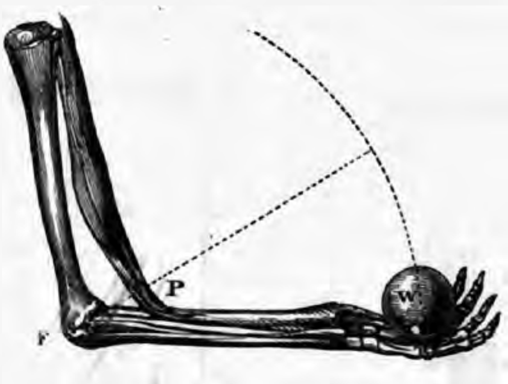

FIG. 32.

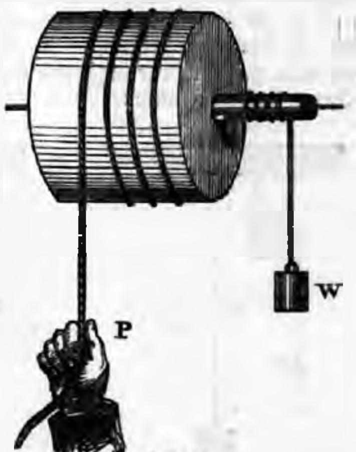

FIG. 33.

weight is attached to the end of a rope which is coiled round the axle, and the power acts at the end of another rope which is coiled round the wheel in an opposite direction, so that when the rope is pulled down the weight is raised.

Fig. 34 represents a vertical section of the wheel and axle, from which it is manifest that it is merely a modification of the lever, in which C, the centre of the axle, is the fulcrum. C A, the radius of the wheel, is the power arm, and C B, the radius of the axle, is the weight arm. It follows at once, from the law of the lever, that the wheel and axle is in equilibrium when the power multiplied that the power multiplied by the length of the power arm is equal to the weight multiplied by the length of the weight arm.

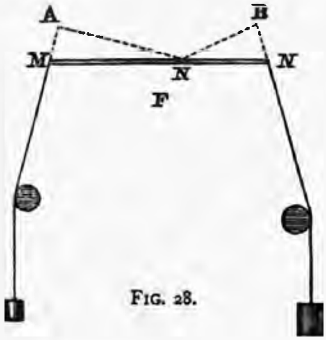

FIG. 28.

This rule holds for all levers; but if the lever be bent (as in Fig. 27), we must not take the bent arms of the lever, F M and F N, for the power and weight arms; but for the power arm we must take F A, the perpendicular drawn from the fulcrum to the direction in which the power acts, and for the weight arm we must take F B, the perpendicular drawn from the fulcrum to the direction in which the weight acts.

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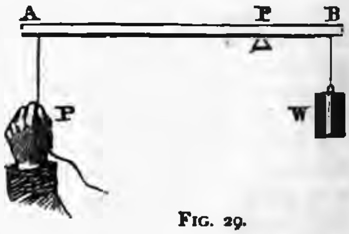

FIG. 29.

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In levers of the third kind, the power and weight also act upon the same side of the fulcrum, the power being nearer the fulcrum, as in Fig. 31. In this kind of lever there is always a *mechanical disadvantage*, for in it the power arm is always shorter than the weight arm, so that to support a weight with it, a greater power is required than if the power were applied directly without the intervention of a machine at all. This kind of lever is only used when velocity rather than power is wanted: the human arm (Fig. 32) is an example. The fulcrum is at the elbow, the weight is the body resting on the hand, and the contractile force of the muscle furnishes the power which acts at P. When the muscle contracts, the hand describes a much longer curve than P does, and this is convenient.

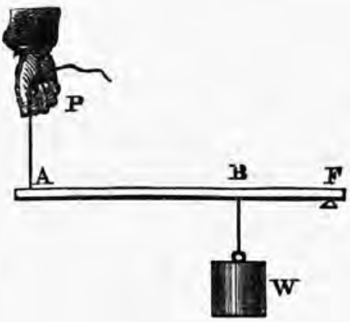

FIG. 30.

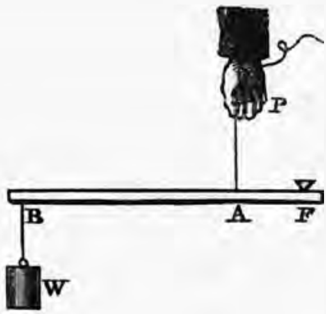

FIG. 31.

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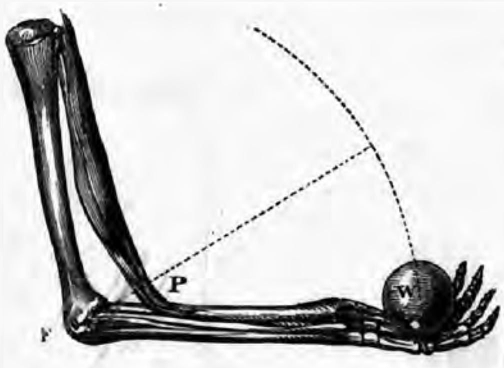

FIG. 32.

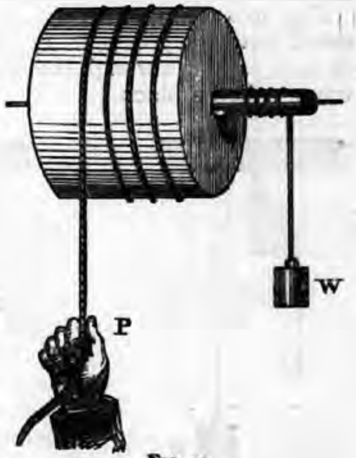

FIG. 33.

weight is attached to the end of a rope which is coiled round the axle, and the power acts at the end of another rope which is coiled round the wheel in an opposite direction, so that when the rope is pulled down the weight is raised.

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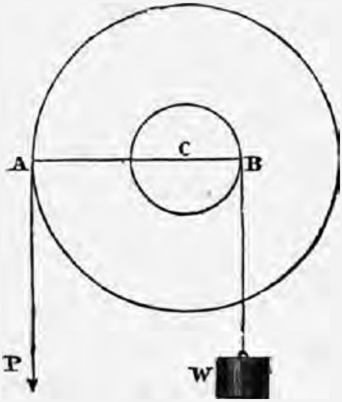

FIG. 34.

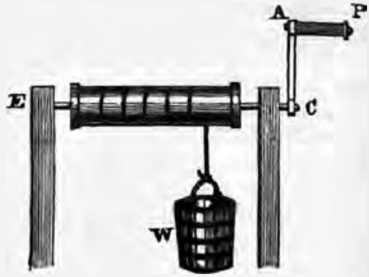

FIG. 35.

In the windlass, shown in Fig. 35, the arm, A C, is used instead of a wheel. Examples of the practical application of the wheel and axle are seen in the capstan, crane, water-wheel, and toothed wheels.

Fig. 36 shows a PULLEY in use. It is a small disc or wheel, of wood or metal, having a groove in its circumference for carrying a string, and turns on an axis passing through the centre of its faces, the axis being supported by a frame called a block.

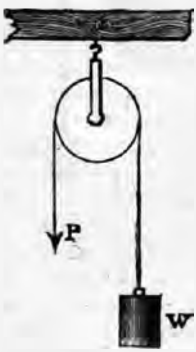

FIG. 36.

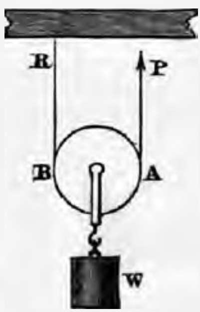

FIG. 37.

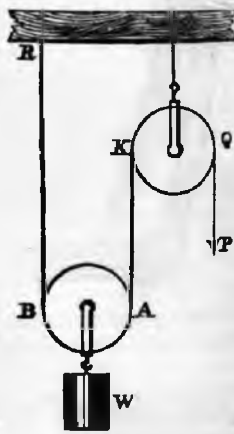

FIG. 38.

Pulleys are either fixed or movable: a pulley is called fixed when it does not ascend or descend according as the weight is raised or lowered. It is manifest from Fig. 36 that a fixed pulley has no mechanical advantage, for the power, P, must be equal to the weight, W, in order to support it. This machine is only used to change the direction in which a force acts. When force is transmitted through a string, as it is in the case of pulleys, it gets the name of tension, and a string possesses the property of transmitting a force without changing its amount; thus the tension at every point of the string in Fig. 36 is the weight, W.

Pulleys are called movable when they ascend or descend according as the weight is raised or lowered. We have a movable pulley in Fig. 37. When one movable pulley is used, the strings being parallel, the weight is equal to twice the power. For W (Fig. 37) is supported by the tension in B R and the tension in A P; and since the tension in each of these is the power, P, acting upwards, these two tensions would support a weight of 2 P, therefore W must be equal to 2 P.

Perhaps it will make it still clearer if you hold the end, R, also with the hand. Then it must be quite evident that the weight is supported by two forces acting upwards, each equal to the power, P, and that, therefore, the weight is equal to twice the power.

It is generally convenient to use a fixed pulley along with the movable to change the direction of the force, as in Fig. 38.

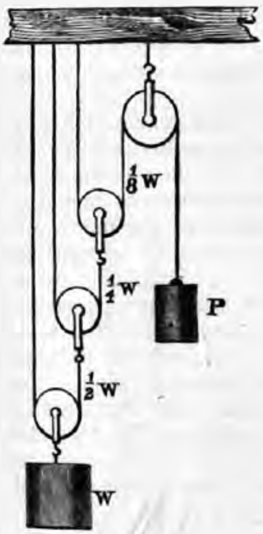

FIG. 39.

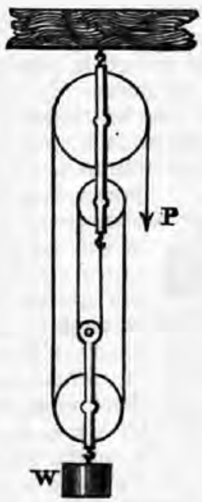

FIG. 40.

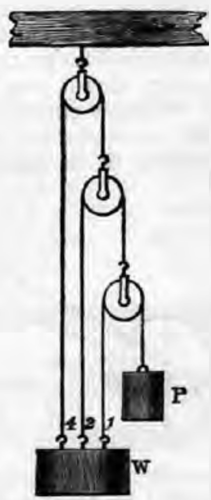

FIG. 41.

There are three systems of arranging pulleys, or reeving them, as it is called. In the first system, which is shown in Fig. 39, each pulley hangs by a separate string, and all the strings are parallel. When three movable pulleys are arranged thus, the weight is equal to eight times the power; for the tension in the string passing under the first movable pulley at the top is the power, P; the tension in the string passing under the second movable pulley is 2 P; the tension in the string passing under the third movable pulley is 4 P; and the tension in the string hanging from this pulley is 8 P; but this last tension supports the weight, W, therefore W=8 P. It will be observed that in this system each movable pulley that is added doubles the mechanical advantage.

In the second system the same string passes round all the pulleys, and the folds of this string are parallel, as represented in Fig. 40. Here the weight, W, is supported by the tensions in the folds of the string; and as there are four folds, each having the tension of the power, P, the weight must be four times the power. In this system the weight is always as many times the power as there are folds in the string, the folds being counted between the two blocks.

In the third system, Fig. 41, each pulley hangs by a separate string, and the end of each string is attached to the weight, the whole being suspended from a fixed support. The tension in the string passing over the first pulley at the bottom is the power P; the tension in the string passing over the next pulley is 2 P; the tension in the string passing over the third pulley from the bottom is 4 P; and so on. Thus when three pulleys are arranged in this manner, W is supported by P+2 P+4 P, that is, by 7 P, and therefore the weight is equal to seven times the power. The effect of any other number may be calculated similarly.

The first thing that strikes one on experimenting with the pulleys is the principle of virtual velocities. Let us make an experiment with the first system, shown in Fig. 39. Here we have three movable pulleys, and we find that a power of 1 oz. balances a weight of 8 oz.: true; but on putting the machine in action, we also find that when the weight is raised 1 ft., the power has to move through 8 ft., so that what is gained in power is lost in speed, and as we said before, this is true of every machine.

We now come to consider the INCLINED PLANE. Here is one in Fig. 42. We shall perform an experiment on it, and then draw a conclusion. Let the weight W, be drawn from the bottom to the top of the inclined plane by the power, P, which acts on the weight in a direction parallel to the length of the plane, A B; W will be thus raised through a vertical distance equal to B C, the height of the plane; but during this time P will have descended through a vertical distance equal to A B, the length of the plane. Now, from the principle of virtual velocities it follows at once that there is equilibrium here, when P multiplied by A B is equal to W multiplied by B C; that is, on the inclined plane, when the power acts parallel to the length of the plane, there is equilibrium when the power multiplied by the length is equal to the weight multiplied by the height.

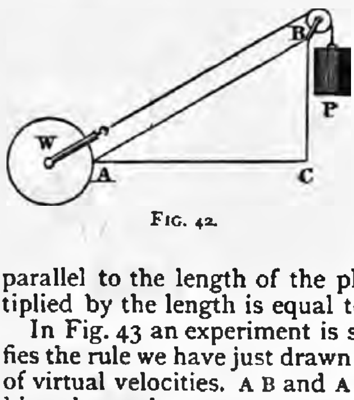

FIG. 42.

In Fig. 43 an experiment is shown which verifies the rule we have just drawn from the principle of virtual velocities. A B and A C are two boards, hinged together at A. A C rests on a table, and A B can be made to rise from it at any angle by inserting a wedge, as in the figure. From B hangs a bar graduated in inches, by which the height of the plane can be at once measured. The carriage, W, constitutes the weight, and the power, P, acts on it in a direction parallel to the length of the plane. Now make P balance W, and then measure the height and length of the plane; it will be found that P is to W as the height of the plane is to its length, that is, the power multiplied by the number of

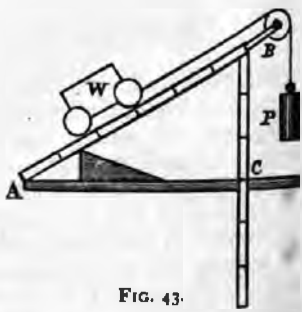

FIG. 43.

inches in the length will be equal to the weight multiplied by the number of inches in the height. By varying the experiment, so that the power might act in a direction parallel to the base, we would find that there would be equilibrium when the power multiplied by the base equals the weight multiplied by the height.

Two inclined planes placed base to base form a WEDGE. It is much used in splitting wood, as in Fig. 44; it is also used for raising great weights through small distances. In dockyards, ships are raised on the stocks by wedges driven under their keels. Theoretically considered, the mechanical advantage of the isosceles wedge is the side of the wedge divided by half the back; but this gives us no idea of the real advantage of the machine: this arises from its enormous friction, and also because the force which urges it is derived from the blow of a hammer or mallet, &c.; a force so very different in its nature from the resistance that it has to overcome, which is the pressure of some weight or the cohesion of the particles of a body, that they admit of no numerical comparison. One part of the theory is true—that the smaller the back the greater is the advantage of the wedge.

FIG. 44.

If a flexible inclined plane, A—one made of paper for example—be wrapped round a cylinder, B, as in Fig. 45, a screw is formed. By means of the apparatus in Fig. 46 we can determine the mechanical advantage of the screw. The resistance is the bar, W, to be moved forward; the power acts at the handle, A P. When the machine is put in action by turning the handle, the power moves through the circumference of the circle described by the handle, while the weight is only moved from a to b, the distance between two threads; so that in the screw the power is to the weight as the distance between two threads is to the circumference of the circle described by the power: thus, suppose A P sweeps a circle of 30 in., and that the distance between two threads is ½ in., then the mechanical advantage of the machine is 30 divided by ½, that is, 60; so that if a power of 50 lbs. be exerted on the handle, A P, the bar, W, is urged forward with a force of 60 times 50 lbs., that is, 3,000 lbs.

FIG. 45.

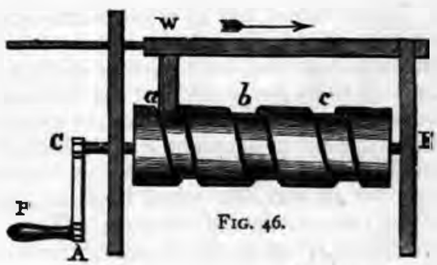

FIG. 46.

The screw is much used by bookbinders, &c., to exert a great pressure through small distances. Fig. 47 shows a common screw press. To apply the screw here, a hollow screw is cut in the nut N, into the grooves of which the threads of the solid screw fit exactly. The solid screw, S, is fixed to the press-board, B B, so that it cannot turn round, but can be made to move up and folds of this string are parallel, as represented in Fig. 40. Here the weight, W, is supported by the tensions in the folds of the string; and as there are four folds, each having the tension of the power, P, the weight must be four times the power. In this system the weight is always as many times the power as there are folds in the string, the folds being counted between the two blocks.

In the third system, Fig. 41, each pulley hangs by a separate string, and the end of each string is attached to the weight, the whole being suspended from a fixed support. The tension in the string passing over the first pulley at the bottom is the power P; the tension in the string passing over the next pulley is 2 P; the tension in the string passing over the third pulley from the bottom is 4 P; and so on. Thus when three pulleys are arranged in this manner, W is supported by P+2 P+4 P, that is, by 7 P, and therefore the weight is equal to seven times the power. The effect of any other number may be calculated similarly.

The first thing that strikes one on experimenting with the pulleys is the principle of virtual velocities. Let us make an experiment with the first system, shown in Fig. 39. Here we have three movable pulleys, and we find that a power of 1 oz. balances a weight of 8 oz.: true; but on putting the machine in action, we also find that when the weight is raised 1 ft., the power has to move through 8 ft., so that what is gained in power is lost in speed, and as we said before, this is true of every machine.

We now come to consider the INCLINED PLANE. Here is one in Fig. 42. We shall perform an experiment on it, and then draw a conclusion. Let the weight W, be drawn from the bottom to the top of the inclined plane by the power, P, which acts on the weight in a direction parallel to the length of the plane, A B; W will be thus raised through a vertical distance equal to B C, the height of the plane; but during this time P will have descended through a vertical distance equal to A B, the length of the plane. Now, from the principle of virtual velocities it follows at once that there is equilibrium here, when P multiplied by A B is equal to W multiplied by B C; that is, on the inclined plane, when the power acts parallel to the length of the plane, there is equilibrium when the power multiplied by the length is equal to the weight multiplied by the height.

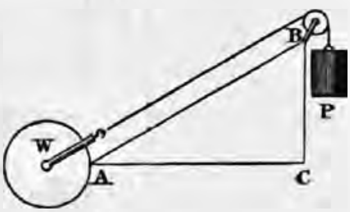

FIG. 42.

In Fig. 43 an experiment is shown which verifies the rule we have just drawn from the principle of virtual velocities. A B and A C are two boards, hinged together at A. A C rests on a table, and A B can be made to rise from it at any angle by inserting a wedge, as in the figure. From B hangs a bar graduated in inches, by which the height of the plane can be at once measured. The carriage, W, constitutes the weight, and the power, P, acts on it in a direction parallel to the length of the plane. Now make P balance W, and then measure the height and length of the plane; it will be found that P is to W as the height of the plane is to its length, that is, the power multiplied by the number of

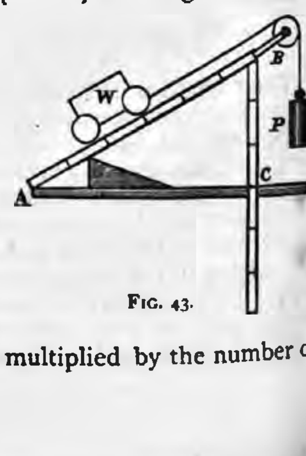

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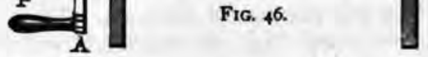
FIG. 45.



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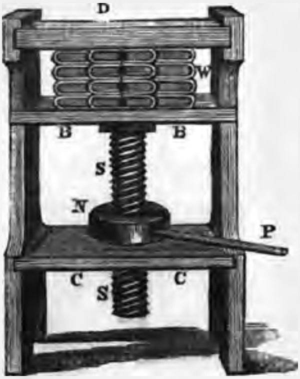

FIG. 47.

In the compound machines, the mechanical advantage is the product of the mechanical advantages of the simple machines which compose it. Thus, in Fig. 48 we have a compound machine consisting of three levers combined together; its mechanical advantage is 3 times 2 times 2, or 12; 3 being the mechanical advantage of the first lever, 2 that of the second, and 2 that of the third. A power of 1 lb. applied at A would balance a weight of 12 lbs. at D.

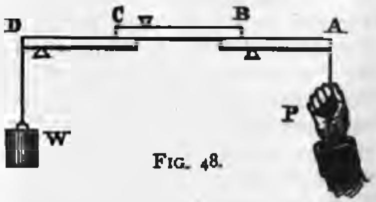

FIG. 48.

FALLING BODIES.

When forces not in equilibrium act on a body, motion ensues. The speed or rate at which a body moves is called its velocity. When the body in motion describes equal spaces in equal times, its velocity is said to be uniform, and is then measured by the number of feet described in one second: of course it might be measured by the number of miles described per hour, or in any other convenient way. We can write one second thus (1″). If a body move with a uniform velocity, it is evident that the distance described in any number of seconds would be found by multiplying the distance described in 1″ by the number of seconds. Thus, if a body move uniformly for 10″ with a velocity of 20 ft. per second, it will describe 200 ft. When a body does not pass through equal spaces in equal times, its velocity is said to be variable. When a horse gallops past you, you might say, "That horse was going at the rate of 12 miles an hour when it passed me:" you don't mean to say that the horse actually galloped uniformly for an hour, and went through 12 miles in that time; but what you do mean is this, that if the horse had galloped for an hour, and kept up during the whole of that time the speed that it had the moment it passed you, then it would have gone 12 miles. Thus, when the velocity of a body is variable, its velocity at any instant is measured by the space that would be described in a unit of time if the velocity were to continue during the whole of that unit the same as it is at the instant in question. We observe that when a body is unsupported it falls to the ground, and we said in a former section that what causes this motion is the large mass of the earth drawing the body towards its centre. In this section we have to find the *measure* of this force called gravity (that is, the velocity that gravity generates in a falling body in one second); the relation between the time that a body has been falling, and the space it has fallen through; the relation between the time that a body has been falling, and its velocity at the end of that time, &c.; or, in other words, we have to prepare ourselves to answer such questions as these: How far will a body fall in a given number of seconds? What velocity will it have at the end of this time? &c. These questions are of much importance, and we shall be very soon able to answer them.

It is found on experiment that a body falling freely passes through 16 ft. in the first second of time, and 64 ft. in the first two seconds; so that, in order to find the relations above mentioned, without in any way checking gravity, we would require a machine of impracticable size. It then became obviously necessary to invent a machine that would reduce the scale on which gravity acts, without in any way *relatively* altering its effects. Such an instrument we have in Atwood's machine.

Here is a drawing of a simple form of it in Fig. 49. It consists of two pillars, supporting a pulley at the top, which moves with little friction; a flexible cord passes over the pulley, and has equal weights, P and Q, attached to its ends. One pillar is graduated in inches, and on it slide a ring, A, and stage, B, which can be fixed at any part of it by means of screws; C is the pendulum of a clock beating seconds. Let us see how the machine works. Since P and Q are of equal weight, they have no tendency to move; but put an additional weight on P, such as a small bar, motion at once ensues, and the velocity increases as long as the bar remains on P; but the instant that P, by passing through the ring, A, loses the bar, the velocity at once ceases to increase, and continues the same as it was at A during the rest of the course. The heavier the bar, the more rapidly will the velocity increase while it remains on P, and the lighter the bar, the less rapidly will the velocity increase while it remains on P.

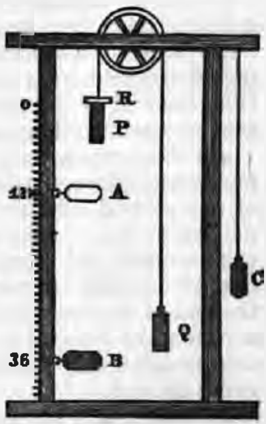

FIG. 49.

We shall now perform four experiments with the machine, which establish the laws that regulate the motion of falling bodies.

1st Experiment.—Let P and Q be $7\frac{1}{2}$ oz. each; bring the upper edge of P exactly opposite the 0 of the scale; fix the ring, A, at 12 in.; now lay upon P a bar (an ounce weight), and let go the string as the pendulum gives a beat. It will be found that the bar will be caught on the ring, A, at the next beat of the pendulum; that is, the bar will have fallen 1 ft. What does this teach? Why, there has been a mass of 16 oz. actually in motion, namely, $7\frac{1}{2}+7\frac{1}{2}+1$, and only 1 oz. has been causing that motion; therefore the bar will have fallen through only one-sixteenth of the distance it would have done had it been unimpeded during its descent; that is, a body falling freely would pass through 16 ft. in the first second.* This is what the first experiment teaches.

2nd Experiment.—In this experiment, put such a bar on P that in the first second it may fall through only 1 in.; then it will be found to fall in 2″ through

* More correctly $16\frac{1}{12}$ ft.

4 in.; in 3″ through 9 in.; in 4″ through 16 in; in 5″ through 25 in.; in 6″ through 36 in., and so on. This experiment shows that when a body falls under the influence of gravity, the space it describes increases as the square of the number of seconds it has been falling.

In the first experiment we found that a body falls through 16 ft. in the first second; and now the second experiment has shown that the space increases as the square of the number of seconds; therefore, to find the space described by a falling body in any time, *multiply* 16 *ft. by the square of the number of seconds it has been falling*. This answers the first question. As a practical application, suppose a stone takes 5″ to fall from the top of a tower to the ground: we know that the height of the tower is 16 ft. × 25, that is, 400 ft.

3rd Experiment.—Bring P to the 0 of the scale again; fix the ring, A, at 12 in., and fix the stage, B, 2 ft. and the length of the weight, P, below it. Now put on the bar (1 oz. weight), and let go the string at a beat of the pendulum. At the end of the first second, P will lose the bar at A, and then, moving uniformly during the next second, will strike the stage, B, just at the end of this second. This informs us that the velocity of the bar at the end of the first second was 2 ft.; but as there was a mass of 16 oz. in motion, and only 1 oz. causing that motion, the velocity of the bar is only one-sixteenth of what it would have been had it been allowed to fall freely; that is, a body falling freely acquires a velocity of 32 ft. at the end of the first second. This means that if the velocity were to continue during the second second the same as it is at the end of the first, then 32 ft. would be the space described during the second second. This is the teaching of the third experiment.

4th Experiment.—Let us use such a bar with P in this experiment that it may move through 1 in. in the first second. By taking off the bar at the end of any second, and noting the space described during the next second, we determine the velocity at the end of the second in question. Let us do so for each second, and we shall find that the velocity of the bar at the end of the first second will be 2 in.; at the end of the second second it will be 4 in.; at the end of the third second it will be 6 in.; at the end of the 4th, 5th, 6th, &c. seconds, the velocity of the bar will be 8, 10, 12, &c. inches respectively. From this we learn that the increments of velocity in a falling body are the same for every second.

Experiment 3 showed that gravity generates a velocity of 32 ft. in the first second, and from the last experiment we found that the increase of velocity is the same for every second; therefore, the velocity at the end of any number of seconds is found by multiplying 32 ft. by the number of seconds. This answers our second question: thus, if a body falls freely for 5″, its velocity at the end of the fifth second is 32 ft. multiplied by 5, that is, 160 ft. Other questions on falling bodies can be easily worked from the principles here established.

Since gravity destroys velocity in a body projected upwards just as rapidly as it generates it in a falling body, it follows that if a ball be projected vertically upwards from B, with the velocity it would acquire in falling from A to B, it should rise to the height A; and so it would, were it not for the resistance of the air.

HYDRAULICS.

Hydraulics (from two Greek words, *hudor*, water, and *aulos*, a pipe) properly treats of the flow of water through pipes; but it is usual in hydraulics to treat of the motion of liquids generally—of the flow of water in rivers and canals, of its waves, and of the resistance experienced by bodies in moving through it. Other liquids obey the same laws as water

If a vessel be filled with water, and holes made in it at different distances from the surface of the liquid, as shown in Fig. 1, the water will gush out of these holes with different velocities; the velocity of the escaping liquid at B is greater than at A, and at C greater than at B. The following law holds: when water escapes from an orifice its velocity is the same as that which a body would acquire in falling through a space equal to the height of the surface of the water above the centre of the orifice. Thus the velocity of the water escaping at A is the same as that of a body having fallen from D to A; its velocity from B is the same as that of a body having fallen from D to B, and so on.

FIG. 1.

We can show the truth of this law by an experiment. Fill a vessel with water to the height A (Fig. 2), having an orifice, B, opening upwards. If the principle hold, the jet should rise to A, the height of the surface of the water in the vessel; for we know from what we learnt on falling bodies, that if the particles of water be projected from B with a velocity equal to that which a body would acquire in falling from A to B, they will rise to A. Well, on making the experiment, the reader will find that the jet falls a little short of A, but nothing more than can be accounted for by the friction of the water against the sides of the tube, the obstruction of bends, and the resistance of the air: but for these the jet would rise to A, and thus completely verify the principle. By a proper arrangement a jet of 9 in. may be got from a column of water 10 in. high. On this principle artificial fountains are constructed.

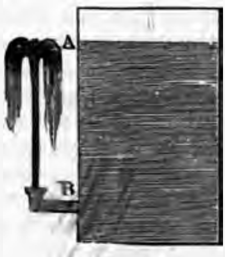

FIG. 2

We learnt from an experiment on Atwood's machine that a body in falling freely from a state of rest through a space of 16 ft. acquires a velocity of 32 ft. per second; therefore if A B be 16 ft., the velocity of the water escaping from B will be 32 ft. per second; if A B be 4 ft., the velocity will be 16 ft. per second; and if A B be 1 ft., the velocity will be 8 ft. per second. From this it is seen that the velocity varies as the square root of the height of the surface of the water above the orifice. The rule for finding the velocity in any case is to take the square root of the height of the surface above the centre of the orifice, and multiply the result by 8.

If you fill a vessel, A (Fig. 3), with water, and allow it to discharge itself from an orifice in the bottom, the velocity of the escaping liquid will continually diminish as the depth of water in the vessel becomes less. If the vessel were kept full by pouring in water at the top, then, of course, the velocity would continue the same. The following is an instructive experiment on this point.

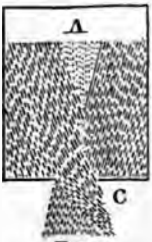

FIG. 3.

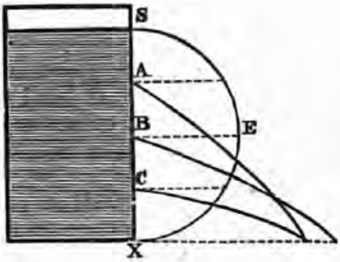

FIG. 4.

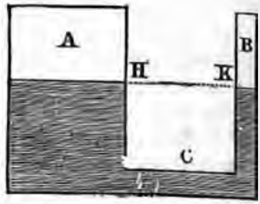

FIG. 5.

Fill the vessel, A, with water, and allow it to quite empty itself from an orifice in the bottom; say it takes five minutes to do so. Fill the vessel again and allow it to run for five minutes, but this time keep it constantly full by pouring in water at the top: it will be found to discharge twice the full of the vessel during these five minutes.

This experiment exactly agrees with what we learnt on falling bodies: that when a body falls under the influence of gravity, the space that it describes in any time is only half as much as it would have been had the velocity all through the descent been the same as it is at the end of the time.

In performing the last experiment we must have noticed that the section of the escaping liquid becomes less after leaving the orifice. This arises from the particles of water crossing and interfering with one another on rushing in from all directions towards the orifice. This narrow part, C, shown in the figure, is called the *vena contracta*, or "contracted vein;" the narrowest part is at a distance from the orifice equal to about half its diameter, the diameter of that part being about two-thirds that of the orifice.

Since we can find the velocity with which water escapes from an aperture in a vessel, it would occur to our readers that we should be able to tell the quantity of water that would be discharged by an orifice in a given time. And so we can. Suppose the orifice to be 1 square inch, and that the water escapes with a velocity of 12 ft. per second, that is, 144 in. per second, then will 144 cubic inches of water flow out every second, that is, 8,640 cubic inches, or rather more than 31 gallons, per minute. But it is found in practice, or on making the experiment, that the actual flow from an orifice is only about two-thirds of the quantity thus calculated. The diminution arises from the same cause as the contracted vein.

If, instead of allowing the water to flow from a mere hole in a thin bottom, a short pipe is used of a length equal to twice the diameter of the orifice, the discharge is increased: such a pipe increases the flow from being two-thirds of the calculated amount to be four-fifths of that amount, and if the pipe be made funnel-shaped at both ends, the discharge will still be increased. The reason why a short pipe increases the flow seems to be that the sides of the pipe attract the particles of water, thus widening the column, and causing a partial vacuum, which acts as a suckage on the water in the vessel. When water spouts from an orifice in the side of a vessel, it follows the same law as a projectile, and describes what is called a parabola; for it is acted on by two forces—the forces of projection and gravity. To find the horizontal range, we describe a semicircle (S E X) on the depth, as in Fig. 4; from the centre of any orifice we draw a horizontal line to meet the circumference: twice the length of this line is the horizontal range from that orifice. Since B E, drawn from the middle point of the depth, is the longest of these lines that can be drawn, it follows that the water will spout farthest from that point; from orifices A and C, equally distant from the middle point, the horizontal range will be the same as is seen in the figure.

The surface of water at rest is always horizontal, meaning by this that every part of its surface is equally distant from the earth's centre. This is usually expressed by saying that water always tends to find its own level. Thus, if two vessels, A and B, be connected at the bottom, as in Fig. 5, when water is poured into one it will rise to the same height in both, however different the vessels be in size or shape.

Fig. 6.

This property of liquids often enables a town to be supplied with water from a hill at a distance, though a valley and uneven grounds lie between; for water, when confined in a pipe, will rise to the same height as its source. Fig. 6 shows water conducted by a pipe from a lake (S) on a hill, through a valley, to a house situate on a rising ground. This property of liquids was not unknown to the ancients, for Pliny distinctly says that "water ascends in a pipe to the height of its source."* However, they did not avail themselves of the property, probably from want of the material and means of constructing the necessary apparatus. Their mode of conducting water from one place to another was by open channels called aqueducts, either cut in the level ground, or supported on arches when necessary: such structures cost great labour and expense.

When water is thus conveyed through pipes of any considerable length, the friction against the sides is so great, that in practice it is found necessary to allow them one-third or one-fourth more diameter than would be necessary to convey the same quantity of water if there were no friction. A pipe 30 ft. long and $1\frac{1}{3}$ in. in bore, only delivers half the quantity of water that it ought to do, theoretically considered. A great gain in the flow is secured by increasing the capacity of the tube; thus a tube 2 in. in diameter would deliver five times as

* "Aqua in plumbo subit altitudinem extortûs sui."—*Plin.*, *Nat. Hist.*, 31, vi 31.

much water as a tube 1 in. in diameter, although its section is only four times as great.

The quicker the flow of water through a pipe the less it presses against the sides; this explains why water-pipes often burst when choked or stopped in any way. If water in flowing through a pipe met with no retardation, but had the velocity due to the height of its source, then it would exert no lateral pressure, so that if a hole were made in the pipe, no water would spout out; and if the pipe be short, so that the velocity of the water is greater than if no pipe were used, there is then not only no outward pressure against the sides of the pipe, but the opposite, namely, a pressure exerted in an inward direction.

This is readily illustrated by the following experiment. In an orifice near the bottom of a vessel (Fig. 7) insert a cylindrical pipe of a length equal to three or four times the diameter of the orifice; in the upper side of this pipe insert a small bent tube, which dips into a vessel underneath filled with water, as shown in the figure. Now, when the water is allowed to flow from the pipe, A, liquid will rise in the tube, C B; and if this be not too long, the vessel, D, will be exhausted of its water, which will rise in the tube, C B, and flow out at A. The experiment is made clearer by colouring the water in the vessel, D.

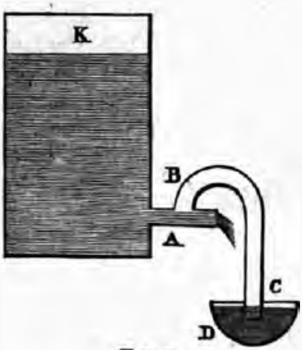

FIG. 7.

Venturi, availing himself of this principle, employed the lateral draught of a mill-race near Modena to drain a marsh situated at a lower level. It is also employed in the circulating system of animals: a current of blood passing along one vessel may assist in emptying a lateral branch, or two currents entering a large trunk at the same part may drain a small one lying between them.

In rivers, the friction of water against solids is readily observed. The velocity of the water is least at the bottom of the current, where the friction is greatest; for the same reason the velocity at the sides is less than in the middle of the stream. The water in rapid motion in the middle draws the water at the sides after it, and this causes the river to be somewhat raised in the centre. The velocity of a stream may be practically determined by throwing into it pieces of turnip or other body of the same specific weight as water, and noting the mean time required to pass through a known distance.

When the velocity of the stream is known, the number of cubic feet of water that it discharges per minute is at once found by multiplying the sectional area of the stream expressed in square feet by its velocity in feet per minute.

When a pebble is dropped into a still piece of water, a series of small waves is transmitted from the point of disturbance in widening circles; the size of these continually diminishes, and the motion is finally overcome from the imperfect mobility and friction of the fluid. It is merely *motion* that is transmitted from one part of the liquid to another, and not water that is carried onwards. We may satisfy ourselves of the truth of this by dropping a cork on the surface of water through which waves are passing; the cork will be seen merely to move up and down, and not to advance with the waves. These undulations can be well observed by dropping a glass bead into a basin of mercury.

Water offers considerable resistance to bodies moving through it, but the amount depends much on the shape of the body. The surfaces ought to be oblique to the direction of the motion; thus, when a cylinder is moved through water end foremost, if the end be terminated in a hemisphere the resistance is only one-half of what it would be if the end were a plane perpendicular to the axis; and if the termination be an equilateral cone, the resistance is reduced to one-fourth. When the speed of a body moving through water is doubled, the resistance is made four times as great, for the body has to displace twice the number of particles, and also to displace them with twice the velocity; if the speed be made three times as great, then the resistance becomes nine times as great, and so on. A good deal of resistance is due to a vacuum being formed in the water behind the moving body, thus causing it to be subjected to a hydrostatic force in front pressing backwards. The sooner and more easily this is filled up, the more is the force in front counteracted; hence, the bow and the stern of a ship being unchanged, the longer the body is, within certain limits, the less is the resistance.

FIG. 8.

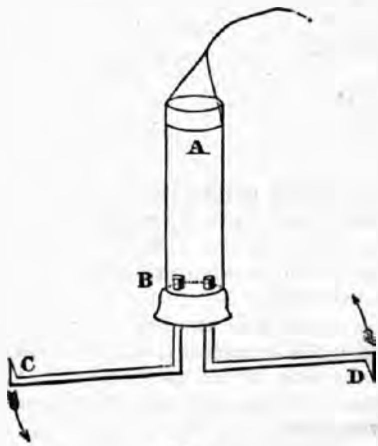

FIG. 9.

We now come to speak of water as a motive power. Here is a tube (Fig. 8) filled with water and suspended by a string. Let us fix our attention on any two points, C and D, on opposite sides of the tube. The pressure of the column of water, A B, is transmitted equally to C and D; thus these points experience equal pressures, but opposite in direction. Now make a hole at C, so that the water may be free to gush out: the tube at once moves in the opposite direction! Why? Simply pecause the pressure has been removed from the point C and continues at D, hence the motion.

On this principle is founded Barker's Mill. The following experiment beautifully illustrates its mode of action: into the end of a large tube, A B, a cork is inserted; to this is fitted two small tubes, C and D, bent as in the figure. When the whole is suspended from the ceiling and water poured into the large tube, a rapid rotatory motion commences. For, as was shown above, the current escaping from C gives the tube a tendency to move in the opposite direction; the same is the case with the current from D; thus both currents tend to prodnce motion in the direction of the arrows. (Fig. 9.)

But WATER-WHEELS afford a better means of employing currents of water as a power to drive machinery. Vertical water-wheels are of three kinds: *overshot*, *breast*, and *undershot*. Fig. 10 shows an overshot wheel. It is used when a fall can be obtained at least equal to the height of the wheel; on it the water acts by its weight, and the buckets are made of such a shape as to retain the water as long as it is of any effect in turning the wheel.

FIG. 10.

FIG. 11.

FIG. 12.

When such a fall cannot be commanded, we use a *breast wheel* (Fig. 11). The water acts on it both by its momentum and weight, momentum meaning the force that a quantity of matter possessing some velocity can exert on another body; the momentum of a body is measured by the product of its weight and velocity.

The *undershot wheel* is used when there is scarcely any fall. It is sometimes turned by tidal streams, and then works in both directions; in this case the water acts only by its momentum. When an undershot wheel is driven by a current which runs always in the same direction there is a decided advantage in having the *float-boards* a little inclined to the advancing stream, for then the water rolls up the floats and acts by its weight as well as by its momentum. An undershot wheel might be used where a fall could be obtained that would be sufficient for an overshot; but it appears from the experiments of Smeaton that the dimensions, quantity of water, and height of the fall being the same, an overshot will produce double the effect of an undershot wheel. (Fig. 12.)

Various contrivances have been employed in the course of time for raising water. An early and ingenious method was by the screw of Archimedes, invented by that celebrated philosopher about 200 years before Christ. Constructed as in Fig. 13, it consists of a flexible tube, wound round a cylinder in the form of a screw; the lower end of the screw dips into the water to be raised. As each part of the screw changes from a lower to a higher position during a revolution, the water within it falls backwards, and at the same time is raised by the lower surface of the interior; thus, it gradually ascends from A, and is finally ejected at B.

We had occasion to mention before that when the flow of water in a pipe is suddenly stopped, a great lateral pressure is exerted: this is the principle of the HYDRAULIC RAM (Fig. 14), an instrument invented by Montgolfier, in 1796, by which water can be raised to a height much above its natural level. Through the inclined pipe, C, leading from a reservoir, the water flows; but, on reaching the orifice at D, it has acquired a force sufficient to raise the valve, and thus close the orifice; the flow being thus suddenly stopped, a lateral pressure is exerted so great as to lift the valve E; the water then flows into the chamber B; this condenses the air in B, which, from its elastic force, soon

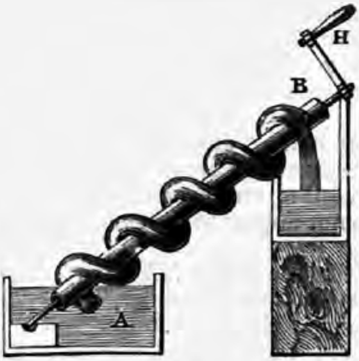

FIG. 13.

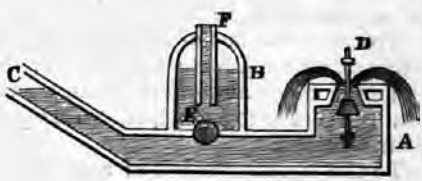

FIG. 14.

closes the valve E again and forces the water up the pipe F. The liquid in A is now quiescent, but in that state is unable to support the heavy valve D, which therefore falls, and allows the water to escape from the orifice; soon such a force is acquired by the water as is sufficient to again close the valve D. The above process is repeated, and thus the action is continued. This engine can only be employed with advantage when there is an abundant supply of water, for more flows out of the orifice at D and is lost than is actually raised through the pipe F.

All other methods for raising water are inferior to the simple and beautiful contrivance of the common pump and force-pump, but the principle of their action belongs to pneumatics.

ELECTRICITY.

The study of electricity has been usually divided into two parts: *static*, or frictional electricity, and *dynamic*, or current electricity.

The great advance that has been made in the science has been within, comparatively speaking, very few years: in its early stages the distance between discoveries was very great. Of the earliest known date of the observation of electrical phenomena, we find the first to be B.C. 600, when Thales of Miletus, tion; the same is the case with the current from D; thus both currents tend to prodnce motion in the direction of the arrows. (Fig. 9.)

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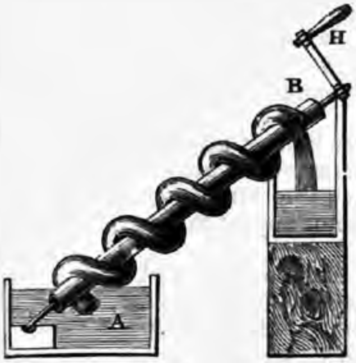
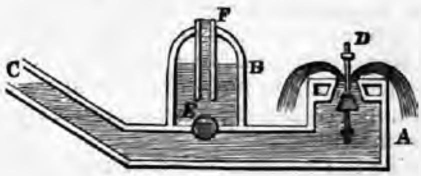


FIG. 13.



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The next electrical phenomenon was observed by Theophrastus, about B.C. 321, who observed a similar property in a hard stone called "*lyncurium*," now supposed to be tourmaline, which not only possessed the power of attracting, similar to amber, light pieces of straw, but even small pieces of metal.

Amongst other ancient philosophers who have made mention of these facts in their writings, I will only refer to Pliny, A.D. 70, who, in speaking of amber, says, "*attritu digitorum accepta vi caloris attrahunt in se paleas et folia arida ut magnes lapis ferrum.*"

The observations of the above facts have been handed down to us by writers, a few of whom I have mentioned; but the observations are simply recorded as facts: cause and effect are in no way entered into, and conjecture and reasoning relative to such extraordinary effects do not appear to have entered into their writings.

To the peculiar effect of amber excited by friction do we fall back for the name given to the science. Electricity is derived from "amber," in Greek ἤλεκτρον *(electron)*, and in Latin *electrum*, hence "electricity."

If you will take a piece of amber and rub it with some dry woollen stuff, you will find the peculiar attractive properties noticed above: it will readily attract small pieces of paper, &c. Amber so excited is called "electrified."

From the period mentioned above but little observations appear to have been taken until Dr. Gilbert, in the sixteenth century, instituted a series of experiments upon electrical attraction. He found that amber was not the only substance possessing that peculiarity, but that it belonged to many bodies, among which were glass, sulphur, sealing-wax, and resin. It was subsequently observed that the attractive power was increased upon warming the substance.

The principal discovery that added to the advancement of the science was that of Otto Guericke, of Magdeburg, who was the first to invent an electrical machine. A globe of sulphur was mounted on an axis, and on being turned round friction was applied. By this means a greater quantity of electricity was obtained, and its principal features experimented upon and recorded.

Sir Isaac Newton contributed several important discoveries, and in 1710 a globe of glass was substituted by Hawkesbee (some say Newton) for the globe of sulphur; this he mounted in a wooden frame, and it is, indeed, very similar to those in use at the present time.

The following experiments will enable you to observe some of the peculiar effects of electrified bodies; but first provide yourself with these articles: a tube of stout glass about 1½ ft. long, an ebonite ruler or paper-cutter, a stick of sealing-wax, and two pairs of pith balls attached to some silk thread.

1st Experiment.—Warm the glass tube, and with a dry silk handkerchief excite it by rubbing it several times; then it will become electrified and capable exercising its attractive powers. On a small stand or convenient support hang one of the pith balls (a stand somewhat similar to Fig. 1 * is most convenient); present the glass towards it: the pith ball will immediately fly towards

* A glass rod bent to the required form and attached by sealing-wax to a small wood base.

the glass and cling to it for a short space of time; it will then drop away and remain at some distance from it. If you follow it with the glass, you will see it try to avoid the glass. In the former case the glass exhibits electrical *attraction*, and in the latter, electrical *repulsion.*

Next excite the sealing-wax or ebonite with some warm flannel; similar results will be observed, the two bodies showing attraction and repulsion.

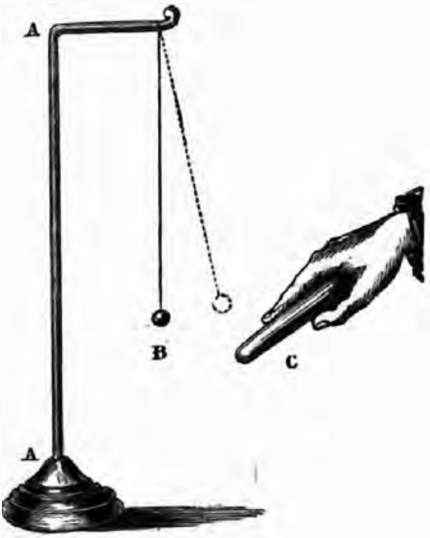

FIG. 1.

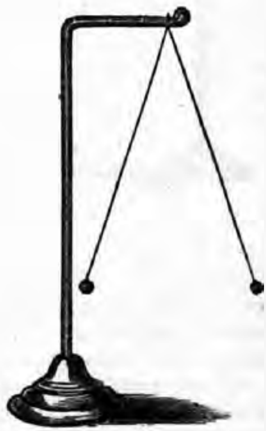

FIG. 2.

2nd Experiment.—Excite the glass and then the sealing-wax, and present the glass to the pith ball; it will, as before, be immediately attracted and then repelled. Now present the sealing-wax: it will immediately *attract* the pith ball. Reverse the experiment, and first present the sealing-wax: the ball will be, as before, attracted and repelled; but immediately on the presentation of the excited glass it will be *attracted.*

From this it appears that these bodies, which both attract light substances, exhibit a different kind of force; they are consequently called, those exercising the same attractive property as glass, *vitreous* electricity; and those similar to the wax, *resinous* electricity.

The fundamental rule is that bodies charged with the same kind of electricity repel each other; charged with opposite kinds of electricity they attract each other.

Suspend the two pith balls from the same support, Fig. 2; charge them with the glass—the pith balls will repel each other; touch them in order to discharge them, as, until bodies which have been charged have touched the earth or some substance in connection with it, they will remain charged and cause repulsion. Next charge them with the excited wax or ebonite; they will again repel one another, showing that they are charged with the same electricity exercising mutual repulsion.

Suspend the two balls from two points near each other; charge one with the glass, and the other with the wax; on bringing the balls near they will be found to be violently attracted to eac other.

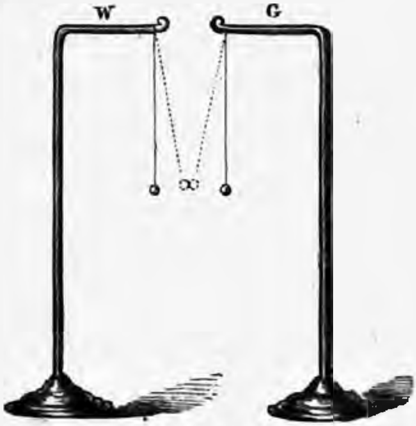

FIG. 3.

That the terms *vitreous* and *resinous* are not without some objections, the following experiments will prove:

Excite the sealing-wax with the woollen cloth; present it to the pith ball: it will first attract and then repel the pith ball. Now present the woollen cloth — the pith ball is immediately attracted, showing that the cloth is *vitreously* or excited with electricity of an opposite nature.

Perform a similar experiment with the glass tube: it will be found that the woollen cloth will attract the ball that the glass repelled; this would show that the cloth was *resinously* excited.

Next, if the glass be rubbed first with a woollen cloth and then with the fur of a cat, it will be found to be excited in the first place with *vitreous*, and in the second with *resinous* electricity. Both glass and woollen cloth exhibit, therefore, both kinds of electricity.

These terms have, therefore, been considered objectionable, and *positive* and *negative* are now generally substituted for them; thus glass excited with a woollen or silk cloth is said to exhibit *positive* electricity; sealing-wax exhibits *negative* electricity when similarly excited.

Excite the sealing-wax or ebonite as before; but, instead of having pith balls suspended on silk threads, let them be hung on thin wire or cotton thread; present the ebonite—the pith ball will be found to be permanently attracted, and will remain so as long as there is any electric excitement in the ebonite. Under these circumstances, it shows that it cannot retain a permanent charge, and that the electricity communicated to it is *conducted* away by the cotton. A body, therefore, will not retain a charge unless *insulated.*

Various bodies conduct or insulate differently: the two terms as usually applied mean the opposite condition. Faraday says that conduction and insulation are only extreme degrees of one common condition. A body that insulates well must of necessity be a bad conductor; on the other hand, a body that conducts well must be a bad insulator.

Of conductors, the various metals are the best, then bodies in a fluid state; of insulators, gums—such as India-rubber, gutta-percha—bodies like glass, amber, wax, jet, &c., are the best; but between these extremes, the one condition gradually merges into the other.

In any experiments that may be made with frictional electricity, it is necessary that everything should be kept dry, as insulators, when moist or damp, become, practically speaking, conductors.

Amongst the instruments used for detecting electricity are some by which the electricity can be measured: these are called ELECTROMETERS; those for simply indicating its presence are denominated ELECTROSCOPES—the pith-ball arrangement is about the simplest of the latter. Another simple electroscope can be made by attaching to a stick of sealing-wax (as an insulating handle) a narrow strip of gold-leaf: a very little moisture from the lips will be sufficient to attach it. This form of electroscope for delicate experiments is usually enclosed in a glass bottle, as gold-leaf is very susceptible to the slightest motion. In this case it is necessary to attach the gold-leaf to a brass rod, or some conductor projecting beyond the mouth of the bottle.

Amongst the most interesting electrical phenomena we must place that of *induction*, for it is everywhere, and no experiment can be carried on without it. In the experiments previously shown, induction played its part; but in order to show it more effectually, let us try the following experiment:

On an insulated stand of glass let us support a small metal cylinder (brass is the best, but wood covered with tinfoil will answer the purpose); upon the end of it place our electroscope (a pith-ball arrangement, similar to what we used before); excite the glass tube or ebonite, and present it towards the end opposite to the pith balls. Immediately the tube comes near enough, the cylinder becomes charged *inductively*, causing the pith balls to diverge; remove the glass tube—the balls converge, and show the absence of electricity. This may be repeated, and the same results will follow so long as any charge remains in the glass tube. If the cylinder be tested whilst under the action of induction, it will be found that the end nearest to the glass tube is oppositely (negative) electrified, whilst the other end is similarly electrified, showing that a disturbance has taken place of the natural electricity of the conductor under induction—the opposite electricity to the end near the excited body. Similar electricity to the opposite end (following the before-mentioned fundamental law of opposite electricities) are attracted, and similar are repelled.

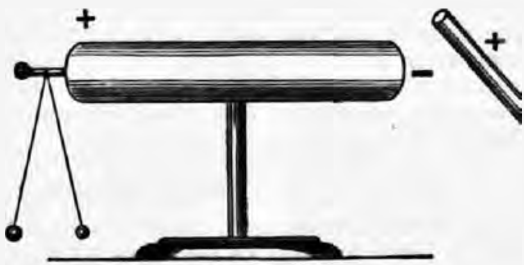

FIG. 4.

Whilst the cylinder (Fig. 4) is under induction, let it be touched with the finger: the pith balls will immediately collapse; remove the finger and suddenly withdraw the tube: the pith balls will diverge, and remain so for a length of time. If they be examined, the electricity will be found to be *negative* or opposite to what it was before.

For any experiments relative to induction with statical electricity, the ELECTROPHORUS is about as good an instrument as can be used. The following is a description of this useful instrument:

B is a metal sole upon which A, a resinous plate of equal parts of resin, shellac, and Venice turpentine, is placed;* C is a metallic cover with an insulated handle. The plate A is to be excited by striking it briskly with dry silk: place the cover on. This cover, being insulated, does not take away the electricity from the plate, but is simply electrified by induction; the upper surface is

* A polished plate of ebonite will be easier to prepare, and equally efficacious.

charged similarly to the plate; the under, being next to the plate, is charged oppositely. Now, if the top of the plate be touched with the finger or other conductor, the negative induced electricity will escape, but the positive on the lower surface will remain. Remove the cover: the electricity will spread over

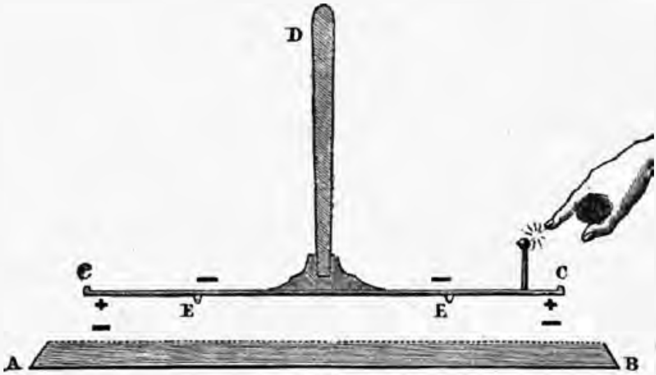

Fig. 5.

the surface, and the cover be found to be charged positively. The plate remains in the same state, not having lost any of its electricity, as the cover was electrified by *induction* only. It will thus be seen how useful this instrument may become; in fact, it has been termed *a perpetual electrical machine.* The discovery is due to Professor Volta.

Electrical Machines.

An electrical machine is simply the glass tube and rubber on a large scale, and is "an apparatus by means of which electricity can be developed and accumulated in a convenient manner for experiment;" in fact, any instrument for the excitement of electricity is a machine. The following illustration will explain the form now usually adopted: it is generally termed a *cylinder machine.* The old machines were usually excited by hand, but in the modern the great improvement of rubbers has been introduced.

The hollow cylinder of glass, having open ends fitted with caps of wood, is fixed on two upright supports. At one end of the cylinder is fixed a crank-handle. In front is placed the rubber on an insulated stand; this rubber consists of a cushion of soft leather, stuffed with horse-hair. When in action it is necessary to smear the surface with a metallic amalgam,* the object being to increase the excitement. On the opposite side to the rubber, and also on an insulated stand (this is frequently made separate from the machine), is placed the conductor, or *prime conductor*, as it is called: this is a cylinder of brass or wood covered with tinfoil, provided next the machine with a number of metal points, and with a metal ball on the opposite side. The addition of

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* *Amalgam.*—The following is given as the method of making it: "Melt together five parts of zinc and three parts of tin: pour gradually on the melted mixture nine parts of metallic mercury previously warmed; the whole is shaken briskly till cold in an iron or thick wooden box: it is then reduced to a fine powder in a mortar, sifted through muslin, and mixed with lard in sufficient quantity to reduce it to the consistency of paste."—*Noad.*

It can be procured of any philosophical and electrical instrument maker.

a flap of oiled silk (oiled on one side only) from the rubber, covering the glass cylinder, completes the machine. The advantage of this silk is the prevention of the electricity escaping from the excited cylinder into the atmosphere.

It is very essential that the glass cylinder should be kept free from dirt and moisture; before being used it should be well warmed: placing a well-heated flat iron under it is a very good plan. These machines can be constructed very cheaply, and with but little trouble, the only great expense being the purchase of the cylinder; the remaining portion can be easily put together. A small machine of this kind is very useful, for with it all the experiments connected with frictional or static electricity can be performed.

Fig. 6.

It is generally necessary that the machine should be connected with the earth; for this purpose a chain or wire to the table or floor should be in connection with the rubber. Attach this to the rubber, and turn the machine; the electricity of the rubber (according to Noad) is decomposed by the friction, the positive is carried off on the glass round to the conductor, whose induction comes into play. The negative electricity of the conductor is thus brought towards the points where the negative of the conductor and the positive of the cylinder unite; this is the cause of the bright sparks constantly passing between the two. The result is, that the conductor is left powerfully positive, and the rubber proportionately negative. On applying the hand, or anything metallic in connection with the earth, to the ball on the conductor, vivid sparks, accompanied by loud cracking noise, will constantly pass from one to the other; this is termed the *positive* spark. On the application of the knuckles to the conductor, the spark will be accompanied by a slight shock. Take away the earth connection from the rubber, the effect will be that but a small quantity of electricity will be given off: the supply of the rubber and glass being small, it is necessary to recruit them from the earth. By connecting the conductor with the earth, a constant supply of negative electricity can be obtained.

Besides the cylinder, there is also a powerful machine made of glass, called the *plate machine*, from the disc being of plate glass. The glass plate is fixed between two uprights; attached to it is a handle for rotation. At top and bottom it passes between two pieces of wood, with amalgamated rubbers and silk flaps, as in the cylinder machine. Its conductor is formed of hollow brass, fixed on to one of the uprights, and brought round at each end close to the machine, where, at the place the flaps leave off, it is fitted with points. The action is similar to the cylinder. Mr. Hearder estimates that cylinder machines of equal surface are four times superior to plate machines. These latter have also been made of ebonite, but in that case it is necessary that the amalgam should be softer.

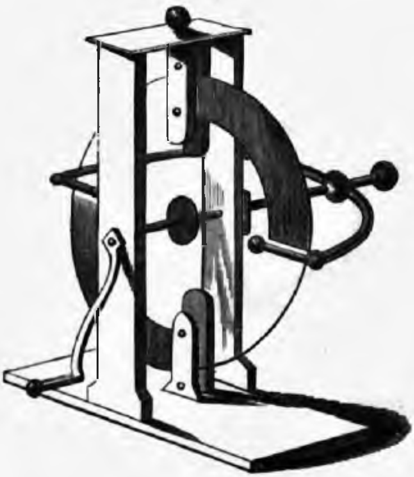

FIG. 7.

FIG. 8.

Many and very beautiful experiments may be made with a cylinder machine. Relative to the variety of the sparks, Professor Faraday says:

"In *air* they have, when obtained with brass balls, a well-known intense light and bluish colour, with frequently faint or dark parts in their course, when the quantity of electricity is not great.

"In *nitrogen* they are very beautiful, having the same general appearance as in air, but more colour of a purple or bluish character.

"In *oxygen* they are brighter, but not so brilliant as in common air.

"In *hydrogen* they are of a fine crimson colour, but have very little sound, in consequence of the physical character of the gas.

"In *carbonic acid gas* they have the same general appearance as in air, but are remarkably irregular. Sparks can be obtained under similar circumstances much longer than in air, the gas showing a singular readiness to pass the discharge.

"In *muriatic acid gas*, when dry, they are nearly white, and almost always bright throughout.

"In *coal gas* they are sometimes green, sometimes red; occasionally one part is green and another red. Black parts always occur very suddenly in the line of the spark; *i.e.*, they are not connected by any dull part with bright portions, but the two seem to join directly the one with the other."

For observing the peculiarity of the spark under the above varying circumstances, the following apparatus, consisting of a glass globe about four inches in diameter, provided at each end with a brass cap. Through the upper of these projects a brass rod, terminating at each end with a brass ball; at the lower cap is arranged a stop-cock, to which is attached a short brass rod and ball, slightly projecting into the globe; the upper rod should be so arranged that by a well-fitting collar it may be lengthened or shortened, in order to increase or decrease the distance between the two balls. (Fig. 8.)

To put this in action, it is necessary to exhaust the air from the globe by an air-pump or condensing syringe; and for observing the discharge in rarefied air only, connect one ball with the positive, the other with the negative conductor. Immediately the machine is turned, "a current of beautiful light passes from the positive to the negative ball, on which it breaks, and divides into a luminous atmosphere entirely surrounding the ball and stem."

For experimenting with the spark in different gases, first well exhaust the globe, and then charge it with the required gas. Connect the wires, and on turning the machine the sparks will be observed of the colours mentioned above.

Very many beautiful experiments can be performed with the machine by bringing the sparks into play. A pretty experiment may be tried by pasting on a sheet of glass pieces of tinfoil cut out into various patterns, separated from each other by a slight distance: letters may be so cut out and arranged. On connecting the one end with the conductor, and the other with the earth, the whole is immediately lighted up, and the design becomes apparent.

In the experiments that I have mentioned, the power of the electricity obtained has been, comparatively speaking, slight; but in order to obtain electricity of greater power, we make use of what is termed a *Leyden jar*, an instrument that plays a very important part in static experiments. Its discovery was made under peculiar circumstances in about the years 1745 and 1746. Some Dutch philosophers at Leyden turned their attention to try and find some method of enabling an insulated conductor to retain an electric charge, as they found the conductors rapidly discharge themselves. In their experiments a small glass phial was filled with water, establishing electric connection with the water by a nail through the cork; this was attached to the prime conductor. One of the experimenters, in trying to take away the phial, received a shock across his arms and breast that shook his whole frame.

A similar result was obtained about the same time by Von Kleist. In a letter, found in the register of an academy at Berlin, he communicates his discoveries.

"When a nail or a piece of brass wire is put into a small apothecary's phial and electrified, remarkable effects follow; but the phial must be very dry and warm. I commonly rub it over beforehand with a finger, on which I put some pounded chalk. If a little mercury, or a few drops of spirits of wine, be put into it, the experiment succeeds the better.

in my hand, to the nail, I receive a shock which stuns my arms and shoulders."

Great excitement was shown everywhere at this discovery, and experiments were carried on in London and elsewhere, which ended in the Leyden jar, as at present used, being perfected. The coating the jar externally as well as internally was due to Sir W. Watson.

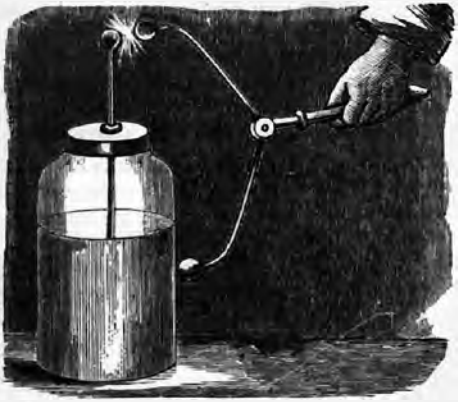

FIG. 9. FIG. 10.

The construction of a simple Leyden jar is shown in the drawing. The shaded lines show the extent of the tinfoil coating. At the mouth of the jar is fixed a cover of wood or otherwise, through the centre of which passes a brass rod terminating in a round ball at the upper end, and in a chain at the lower, which rests upon the bottom of the jar, completing the electrical connection between the brass ball and the inner coating.

In connection with the jar is an instrument that plays a conspicuous part, and saves the experimenter from many a rude shock: it is called a *discharger*. Fig. 10 represents the ordinary form—two bent brass rods, terminating in brass balls, and fixed to a glass handle. They are so jointed at the handle that they can open or close like compasses. To charge the jar, it is only necessary to place the ball of the conductor in connection with the conductor of the machine, and the exterior coating with the ground; it will be found to be rapidly charged. If, instead of making connection between the two, the ball is placed near the ball of the conductor, as soon as the machine is set in motion, the sparks fly across the intervening space, the jar rapidly accumulates electricity, and the sparks get fainter until the jar is completely charged, when no more sparks pass. Remove the jar; touch the outside with the discharger, and bring the other end near the ball of the jar. While yet some distance off, the discharge will take place, causing a brilliant spark to pass between the two balls, accompanied by a loud report. The jar may be again charged, and the experiment repeated; but between the discharger and the ball of the jar place a card: the discharge will take place through the card, causing a disruptive action, and making a very small hole. If wood is used in a similar way, the disruptive effect is so great that it sometimes splits it up. The disruptive action is shown in imperfect or inadequate conductors by tearing, splitting, and heating, and by combustion—thin wires are melted, gunpowder inflamed, &c.

The following pretty experiment may be shown with an ordinary Leyden jar: place in a straight line, and just touching each other, three or four eggs; pass a charge from a Leyden jar through them: they will immediately become luminous.

Noad gives the following substances, rendered phosphorescent for a time by transmitting a charge through them, acquiring various colours, viz.: chalk,

"If, while it is electrifying, I put my finger, or a piece of gold which I hold orange; rock crystal, first red, then white; sulphate of barium, bright green; calcined oyster-shells, the prismatic colours; loaf sugar, green.

But the magic effects of disruptive action require the accumulation of more than one jar. A combination of Leyden jars is termed a *Leyden battery.* Placed in a box, the bottom of which is lined with tinfoil, so as to connect *all* the outside coatings, are as many jars as may be required. The brass rods of all are connected together. They are charged in a similar way to that adopted for a single jar. The accumulated power of this battery is in exact proportion to the number of cells. A shock from twelve jars is stated to be sufficient to kill a man.

The object of the tinfoil coating is merely to conduct the electricity to the surface of the glass, and to afford it a free passage from point to point.

On presenting the jar for charging to the prime conductor, the following takes place: the inside acquires a positive charge, and induces a negative one on the near surface of the outer coating fronting it, that is, on its inside surface. The outside surface of the outer coating would then be positive; but, it being in connection with the ground, the positive electricity passes away, and leaves the outer coating entirely free for a negative charge, which it thus possesses, and thereby fixes the positive charge in the inside.

That the glass itself retains the charge may be proved by testing both inside and outside coatings with the electrometer: its presence cannot be detected; but connect the two by the discharger, and immediately the discharge takes place with a brilliant spark.

The following facts are mentioned in the early use of Leyden jars: "At Paris, M. Nollet transmitted a shock through a hundred and eighty soldiers; he also formed a chain measuring 5,400 ft. by means of iron wires extending between every two persons: the whole company received the shock at the same time."

Dr. Watson stretched a wire across the Thames over Westminster Bridge. One end of the wire was attached to the interior of a Leyden jar; the exterior of the jar was in connection with one hand of a person, whose other hand held an iron rod. On the opposite side of the river was stationed a second person, holding the other end of the wire in one hand and in the other hand an iron rod dipped in the water. Immediately the person near the jar dipped his rod in the river, a simultaneous shock was felt by both. Great astonishment was expressed at the time. This was the first time in experiments of conduction that the circuit was completed with wire and the earth.

Dr. Watson subsequently made other experiments. In 1747 experiments were made at Shooter's Hill for a distance of *two* miles, and it was proved from that time that electricity could be conducted from one point to another at a distance from it. To that year we must look back as the period from which the electric telegraph may date.

Amongst the disruptive effects of the Leyden jar may be mentioned the deflagration of metals. Between two pieces of paper place a slip of tinfoil or gold-leaf, ends projecting; press the whole firmly together. On passing a strong charge through it, the metals will be burnt. The paper will be coloured of a purplish blue if the gold-leaf be employed.

For deflagrating metal wires a Leyden battery should be used. Great care must be exercised with the single jar, and still more so with the battery, as the shocks will be very severe. Professor Noad gives the following: "The wires are stretched above sheets of white paper, and powerful discharges sent through them. The results are exceedingly beautiful—the wires disappear with a brilliant flash, leaving different coloured impressions on the paper. Diameter of the wire used should be $\frac{1}{180}$ of an inch."

Gold . .	Purple and brown.	Tin . .	Yellow and grey.
Silver . .	Grey, brown, and green.	Zinc . .	Dark brown.
Platinum .	Grey and light brown.	Lead . .	Brown and blue-grey.
Copper .	Green, yellow, and brown.	Brass .	Purple and brown.
Iron . .	Light brown.		

With the above experiments we will take leave of static electricity, and now enter into some description and account of experiments with Dynamic Electricity.

DYNAMIC OR CURRENT ELECTRICITY.

Dynamic or Current Electricity may be divided into Galvanism or Voltaic Electricity, Electro-Magnetism, Magneto-Electricity, Thermo-Electricity, and lastly, Animal Electricity.

At present we can only enter into the phenomena of some of the former.

As the first observations of static electricity and many of its discoveries were accidental, so was also in a great measure the circumstance that gave rise to the discovery of Galvanism or Voltaic Electricity. Indeed, it has become a matter almost of history: as you may not have heard the anecdote, I will tell the generally-accepted version.

Arago writes: "It may be proved that the immortal discovery of the galvanic pile arose in the most immediate and direct manner from a slight cold with which a Bolognese lady was attacked in 1790, and for which her physician prescribed the use of frog-broth." The "Encyclopædia Britannica" states: "When one of Galvani's (Professor of Anatomy in the University of Bologna) pupils was using an electrical machine, a number of frogs were lying skinned on an adjoining table, for the purpose of cookery. The machine being in action, the young man happened to touch with a scalpel the nerve of a leg of one of the frogs, when, to his great surprise, the leg was thrown into violent convulsions." Dr. Lardner, after giving this usually-received account of Galvani's discovery, writes: "This was the first, but not the only or chief, part played by *chance* in this great discovery. Galvani was not familiar with electricity; luckily for the progress of science, he was more an anatomist than an electrician, and beheld with sentiments of unmixed wonder the manifestation of what he believed to be a new principle in the animal economy; and, fired with the notion of bringing to light the proximate cause of vitality, engaged with ardent enthusiasm in a course of experiments on the effects of electricity on the animal system. It is rarely that an example is found of the progress of science being favoured by the ignorance of its professors. *Chance* now again came upon the stage. In the course of his researches he had occasion to separate the legs, thighs, and lower part of the body of the frog from the remainder, so as to lay bare the lumbar nerves. Having the members of several frogs thus dissected, he passed copper hooks through part of the dorsal column, which remained above the junction of the thighs, for the convenience of hanging them up till they might be required for the purpose of experiment. In this manner he happened to suspend several upon the iron balcony in front of his laboratory, when to hisinexpressible astonishment the limbs were thrown into strong convulsions. No electrical machine was now present to exert any influence."

From how little causes do great effects spring! The accidental circumstance of hanging a frog by a *copper* hook on an *iron* railing is the cause which has directly led to the ease and facility of telegraphic communication.

Galvani ascribed these effects to *animal* electricity. This hypothesis was for some years opposed by Volta, who for a long time occupied the chair of Natural Philosophy in the University of Pavia. He contended that the muscular action shown in the frogs was due to the contact of two dissimilar metals producing electricity. After conducting many experiments, in 1796 he made his name immortal by the discovery of the "Voltaic Pile."

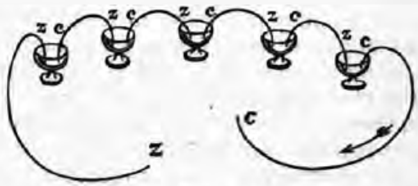

FIG. 12.

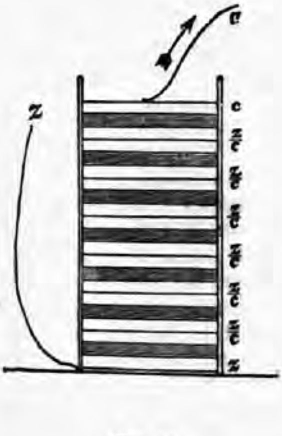

FIG. 11.

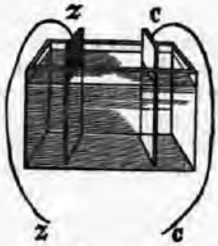

FIG. 13.

FIG. 14.

This pile consisted (Fig. 11) of alternate layers of silver or copper and zinc plates in pairs, of the same size, arranged one above another in regular order, each pair separated from the next by flannel moistened with salt and water. Applying an electroscope (gold-leaf) to the ends of a large arrangement of these plates, the zinc plate end would show negative electricity, and the silver end positive. By touching the two ends a small shock might be received.

Volta, in carrying out experiments for the improvement of his pile, in order that he might obtain a greater amount of power, invented the apparatus known as "*La Couronne de Tasses*" (ring of cups), which is indeed the father of all the batteries used at the present time. (Fig. 12.)

In the above arrangement you will see that a series of cups were placed, containing a solution of some acid. A rod of zinc and one of copper were soldered together and bent, and one end placed in one cup, the other in the next. A second pair was treated similarly, and the whole so arranged that each cup contained one zinc rod and one copper rod, the two ends being represented by one zinc and one copper. Immediately the two ends were brought together electrical effects were obtained.

Since that time, many and various have been the improvements made in batteries; but before giving you any account of them, I would wish you to understand the action of a battery.

In the arrangement of "*La Couronne de Tasses*," one cup represents a *cell*, the combined series a *battery*. In a glass vessel (Fig. 13) partly filled with a weak solution of sulphuric acid, Z and C represent the two elements of a single cell—the zinc and copper elements. So long as these two elements remain unconnected, and in the position shown, practically no effects are observed. Connect their upper ends together by a short wire, and electric effects due to chemical action are observed: the water becomes decomposed; the oxygen, having a great affinity for zinc, attacks it, and forms on its surface an oxide of zinc; the hydrogen becomes liberated at the copper plate and escapes; but oxide of zinc is not soluble in water, here the acid comes into play. In addition to its making the water a better conductor, the oxide of zinc is dissolved by the sulphuric acid, forming a "sulphate of zinc," which is held in solution, and leaving a fresh surface of zinc to be operated on. This operation continues (the plates being joined together) so long as there remains any zinc. The zinc is, therefore, being continually eaten away or corroded, the solution becomes impregnated with sulphate of zinc, and the hydrogen is set free.

By observing this arrangement, you will see a constant series of bubbles given off at the copper plate. The action is peculiar: the hydrogen is originally set free at the zinc plate; it passes through the various particles of water, combining and decomposing until it is set free at the copper plate, where, for the first time, it becomes visible. This action is going on over the whole surface of the plates. Now, when the cell is left to itself, the acid attacks the zinc and reduces it. In order to avoid this extra expense, the zinc is amalgamated with mercury, the acid then having but little action upon the zinc.

On referring to Fig. 14, you will see the arrows point to the direction the current takes; the electricity evolved by the chemical action originating at the zinc plate is conducted through the acidulated water to the copper plate, from whence it is directed by the wire conductor to wherever required, and back to the zinc plate. This evolution of electricity is dependent on the amount of decomposition of zinc, and continues so long as there is any zinc left.

A single pair of plates forms a single cell; a series of cells forms a battery. The zinc plate, or that from which the electricity is produced, is called the *positive* element; the copper, or plate to which it is conducted, is called the *negative* element. The upper ends of these elements or plates, to which the conducting wires—called *battery-wires*—are attached, are called *poles:* the copper pole from which the electricity proceeds is called the *positive* pole; the zinc to which it returns is called the *negative* pole.

These terms are conflicting, Professor Faraday has therefore introduced the terms *anode* and *cathode*—the former representing the positive pole, the latter the negative—(the words mean, "the way up" and "the way down")—but you will generally find that positive and negative poles are most used (Fig. 22).

The electric action of a battery is set up when the two plates are dissimilar in their affinity for oxygen: the more the affinity one metal has for oxygen, and the less the other has, then the more powerful the current a combination of these two will form. Now, of different metals, platinum has the least affinity for oxygen, and zinc about the greatest. A combination of these two forms a most powerful battery, and constitutes the principle of several batteries.

The following embraces a general description of the most important varieties of the battery:

Daniel's Battery (generally called *the constant battery*, on account of its remaining in action for a great length of time) consists in dividing the ordinary cell into two by inserting a porous pot or other porous diaphragm. Fig. 15 shows a section of an ordinary Daniel cell.

In the glass cell is placed a cylinder of copper in a solution of sulphate of copper (blue vitriol); in the porous cell—in a solution of sulphate of zinc—is placed a solid rod of zinc; the zinc of one cell is connected to the copper of the next.

The action of this battery, by the use of the porous cell, prevents the injurious effect of the evolution of hydrogen in the single-liquid arrangement; the effect of the hydrogen was to deposit oxide of zinc on the copper plate, neutralizing in a great measure the effectiveness of the battery.

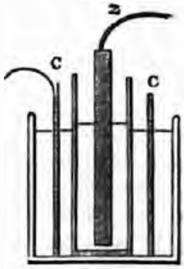

FIG. 15.

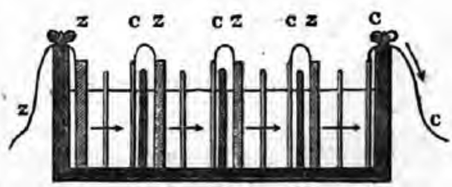

FIG. 15 *a*.

A very convenient arrangement of Daniel's battery is shown in Fig. 15 *a*, in great use amongst the principal telegraph companies.

A trough of wood, coated internally with some insulating and waterproof substance, is divided into ten or twelve cells; these are further subdivided by inserting between each two divisions a porous plate. A plate of zinc and one of copper are soldered together, and placed one on each side of the wooden division; the separate spaces are filled with solutions of sulphates of copper and zinc. The last plate in each trough is fixed down by a screw, to which a wire may be attached.

In fact, there are many arrangements of Daniel's battery, but the principle remains the same.

Groves's Nitric Acid Battery.—In this arrangement (Fig. 16) a zinc cylinder is placed in the outer cell. Inside the cylinder is a porous pot, with a platinum plate for the negative element. The exciting liquids are common nitric acid with the platinum, and a solution of sulphuric acid with the zinc. The action of the battery is very powerful, but it does not remain in order for any length of time. This battery is unpleasant for using in a room, as the fumes from the nitric acid are disagreeably strong.

Smee's Battery is one of those that require only one exciting liquid. On a wooden bar is attached a platinized silver plate, P, with a binding-screw on its upper surface. On each side of the bar are placed two large plates of zinc, kept together by a metal clamp. When required for action, the jar, or gutta-percha cell, is charged with common sulphuric acid (1 part to 7 of water); the plates are then dipped in. This arrangement is one very frequently used, and very much so for electrotyping. (Fig. 17.)

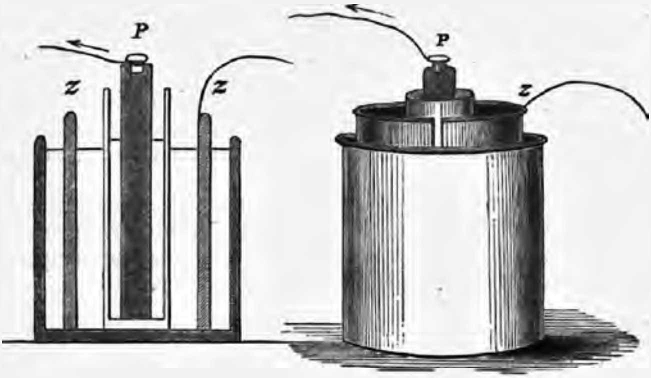

FIG. 16.

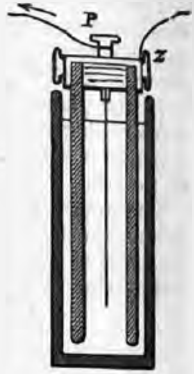

FIG. 17.

Bunsen's Carbon Battery.—This is an arrangement very similar to that of Groves, only carbon is used instead of platinum, the exciting liquids being the same. Although much used, it has the same unpleasant disadvantage as the Bunsen; however, the following alteration of exciting liquids does away with that disadvantage, and gives us a battery which lasts for some days in pretty constant action, and has the great recommendation of being *cheap*.

In the carbon cell, put two parts of a saturated solution of bichromate of potash, and one part of common sulphuric acid: with the zinc, put a saturated solution of common salt. A saturated solution is when the water contains so much in solution that no more crystals can be dissolved.

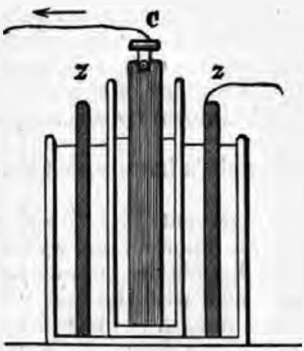

FIG. 18.

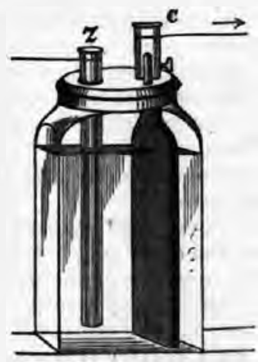

FIG. 19.

For the bichromate of potash, dissolve in hot water the crystals (it will be found that about 2 oz. go to a pint), to this add ½ pint of common sulphuric acid. Care must be taken in mixing sulphuric acid. It should be done gradually and quietly, for the great heat evolved by it might break the jug or jar. When cool, charge the cells. (Fig. 18.)

This arrangement is excessively useful for all experiments, especially for those in connection with induction coils, for which I have used it myself, and find it a great comfort. I certainly recommend it, for various reasons, in preference to all others.

The small battery I have just used consists of a large jam-pot; a piece of zinc formed into a cylinder, with a wire attached; a porous pot, and a piece of carbon. It is in action at once, and the arrangement simple.

Sulphate of Mercury.—This is again a single-liquid battery, and is very simple. In a glass bottle (Fig. 19) are two elements, consisting of a rod of zinc and a plate of carbon, passing through a porcelain cover, and terminating outside in binding-screws. The bottle is charged with about 3 oz. of bisulphate of mercury; water is then poured in up to nearly the shoulder; the elements are then inserted. This battery is the most useful of the kind for ringing household bells, &c., and for purposes where you only require occasional action, and for no great length of time. Under such circumstances I have known one of these batteries last over twelve months without being touched; it then only required some more bisulphate of mercury.

Bichromate of Potash Battery.—This is a battery that, for experiments, is in great request; it is strong in action, but does not last so long as could be wished. It consists of carbon for the negative, and zinc for the positive elements, excited by one part of a saturated (see before) solution of bichromate of potash, to about ten parts of sulphuric acid. A convenient form of this battery is shown in Fig. 20, where the centre rod is of zinc, and can be drawn up out of the liquid when the battery is not wanted, in order to prevent waste.

FIG. 20.

In the various batteries I have described there are again variations, and further description would become tedious.

In connecting up a few cells into a battery, the arrangement is called one of *intensity* when the zinc of one cell is connected on to the copper of the next, and so on throughout the series; but when the zincs are all connected together, and the coppers together, the arrangement is called one for *quantity*.

In the first arrangement, the *quantity* of electricity evolved in the battery is the same as that evolved by *one* pair; but the intensity increases in direct proportion to the number of cells used.

Intensity depends upon the number of cells, and not upon the size of the plates; quantity, on the contrary, depends upon the size of the plates.

If you increase the size of the plates six times, you increase in the same proportion the quantity of electricity evolved.

On joining up the cells (Fig. 21) for *quantity*, you practically increase the

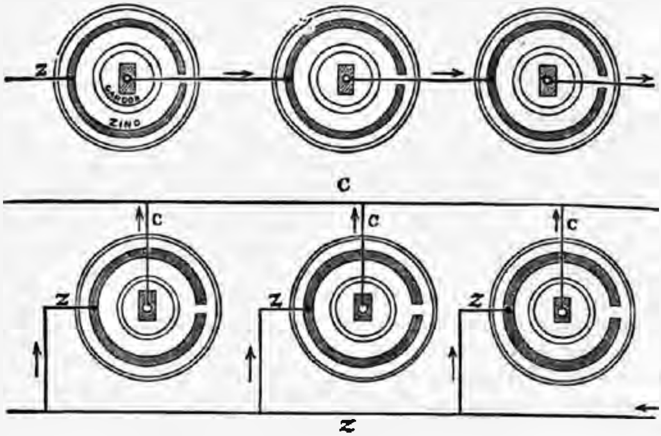

FIG. 21.

size of the plates, and consequently obtain proportionately increased quantity; but in this case the intensity is the same as with the one cell.

The accompanying sketch (Fig. 22), showing an elevation of a Bunsen carbon battery, will place the nomenclature of the various parts of a battery beyond doubt. Make yourself perfectly familiar with these terms, and you will save yourself a great deal of trouble, and be enabled at once to comprehend the manner of carrying out experiments which otherwise you might find a difficulty in grasping.

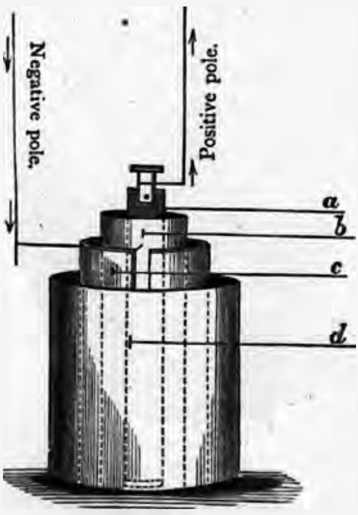

FIG. 22.

a, negative element; *b*, porous cell; *c*, positive element; d, outer cell.

When you join the two ends of the wires from the battery together, allowing a current of electricity to circulate through, you establish what is termed a "circuit."

One of the great results due from the pile was the discovery of Œrsted in 1819. He found that a magnetic needle suspended near a body, placed in the same meridian, through which an electric current was passing, tended to place itself at right angles to that body. He also observed that the deviation of the needle depended upon the quantity of the current, and its direction upon the direction of the current.

Some few years after this discovery, it was remarked that increased effects were observed in the needle by increasing the turns the wire took round the needle; for, at first, a wire was passed above or below the needle, and then completely round. Instruments were made with many turns of wire round the needle; this rendered the needle more sensitive to the presence of electricity.

These instruments were and are still called *Galvanometers:* the addition of a scale of degrees to mark the deviation of the needle to the one side or the other was a still further improvement. Instruments so constructed are in daily use; they are now made of various shapes, with vertical or horizontal needles, with various quantities of wire according to the required sensitiveness.

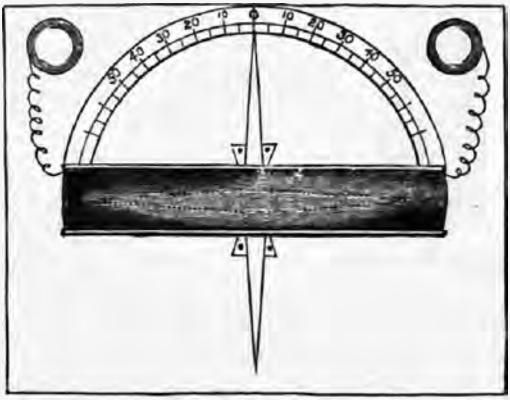

FIG. 23.

The next discoveries were due to Ampére and Arago, who found that wires when under the influence of electric currents were magnetic, and attracted iron filings, &c. Arago further noticed that iron became temporarily magnetic whilst under the influence of electric currents passed near or around it; steel, under similar circumstances, becoming permanently magnetic.

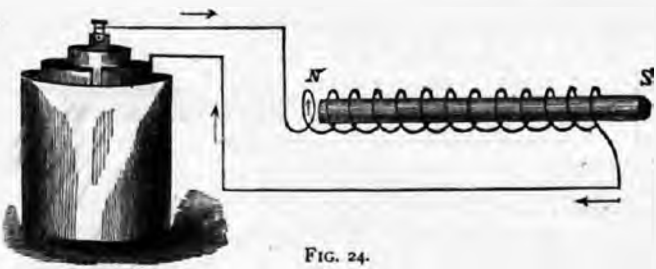

FIG. 24.

This was the origin of the grand invention ot *Electro-magnets*, the use of which is now so great, and the principle of which may be found in almost all the important telegraph instruments of the present time. In fact, in telegraphy we depend entirely upon the discoveries of Œrsted and Arago for enabling us to produce instruments for detecting electric currents or receiving messages.

That a bar of soft iron becomes magnetic may be easily tried by experiment. Round a bar of soft iron wind some wire in the form of a helix (Fig. 24); attach

If you increase the size of the plates six times, you increase in the same proportion the quantity of electricity evolved.

On joining up the cells (Fig. 21) for *quantity*, you practically increase the

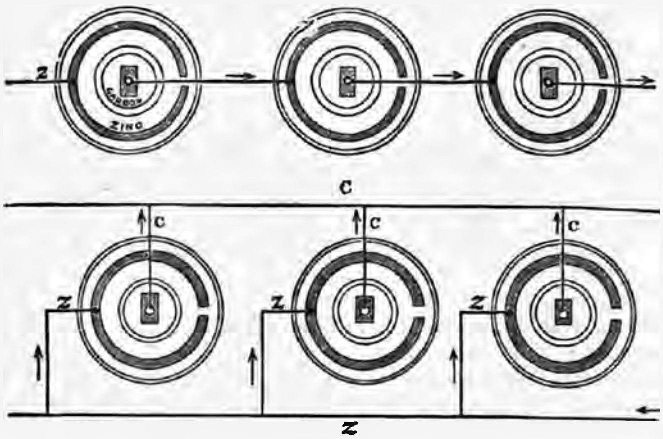

FIG. 21.

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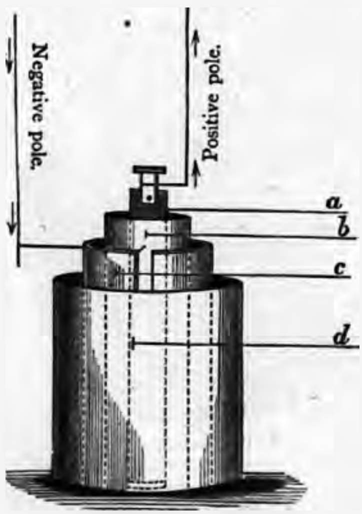

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Some few years after this discovery, it was remarked that increased effects were observed in the needle by increasing the turns the wire took round the needle; for, at first, a wire was passed above or below the needle, and then completely round. Instruments were made with many turns of wire round the needle; this rendered the needle more sensitive to the presence of electricity.

These instruments were and are still called *Galvanometers:* the addition of a scale of degrees to mark the deviation of the needle to the one side or the other was a still further improvement. Instruments so constructed are in daily use; they are now made of various shapes, with vertical or horizontal needles, with various quantities of wire according to the required sensitiveness.

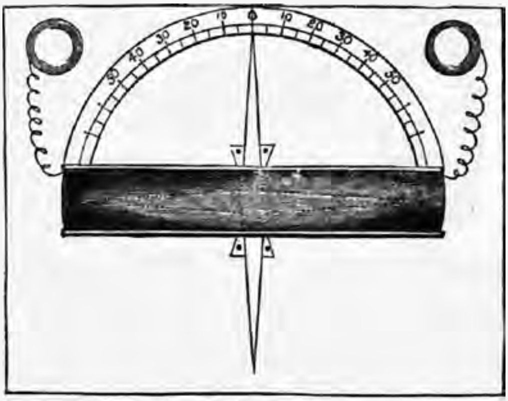


FIG. 23.

The next discoveries were due to Ampére and Arago, who found that wires when under the influence of electric currents were magnetic, and attracted iron filings, &c. Arago further noticed that iron became temporarily magnetic whilst under the influence of electric currents passed near or around it; steel, under similar circumstances, becoming permanently magnetic.

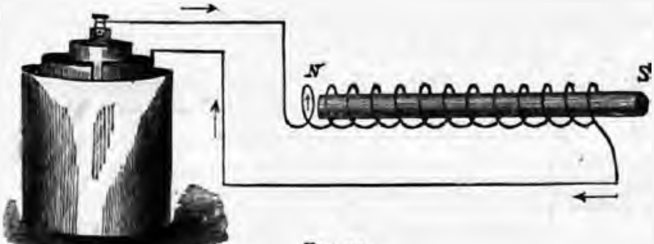


FIG. 24.

This was the origin of the grand invention ot *Electro-magnets*, the use of which is now so great, and the principle of which may be found in almost all the important telegraph instruments of the present time. In fact, in telegraphy we depend entirely upon the discoveries of Œrsted and Arago for enabling us to produce instruments for detecting electric currents or receiving messages.

That a bar of soft iron becomes magnetic may be easily tried by experiment. Round a bar of soft iron wind some wire in the form of a helix (Fig. 24); attach the ends of the wire to the battery. If you apply iron filings or nails to either end of the bar, they will be immediately attracted; disconnect one of the wires from the battery, the filings will drop off, and the iron will have lost it attractive power; connect the battery wire, attraction will again follow. From this you will perceive that if a bar of soft iron be surrounded with wire, it becomes magnetic so long as an electric current passes through the wire. The polarity of this electro-magnet is dependent on the direction the wire is wound round it.

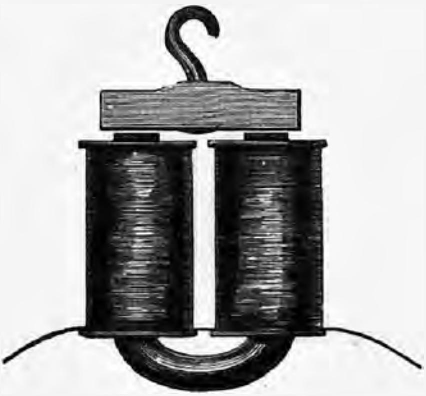


FIG. 25.

Instead of inserting in the helix a bar of soft iron, insert a bar of steel: the steel, on passing a current through the wire, becomes also magnetic; remove the steel, and it will be found that, unlike the soft iron, it retains its magnetism.

The bar shows an electro-magnet of small power; they can, however, be made of great power, and able to support greater weights than natural or artificial magnets. The common form of electro-magnets is that of a horseshoe, with a large quantity of insulated wire wound in the same direction round each pole.*

Induction by Voltaic Currents.—If you complete a battery circuit, as in Fig. 14, and place near it a second wire, forming also a complete circuit but unconnected with the battery, it will be found that a current of *electricity* is induced in the second wire, but with this peculiarity, that the current is induced *momentarily:* when the battery circuit is closed, it almost immediately ceases; but on breaking the battery circuit, another current is perceived in the second wire, but in the *opposite* direction to the first. By increasing the quantity and proximity of the two wires, an induced current may be obtained of sufficient strength to produce sparks.

Induction by Magnetism.—A similar result to the above may be obtained

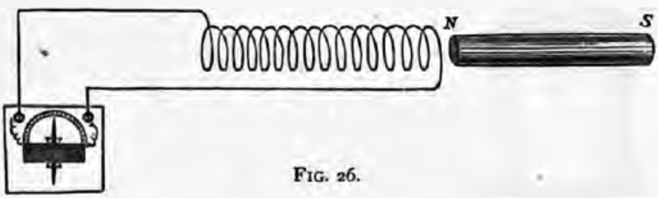


FIG. 26.

(without the use of a voltaic current) by a steel magnet. If a helix of wire (Fig. 26) be prepared and connected with a galvanometer, a deflection will be observed immediately a strong bar magnet is inserted within it—this current is of short duration; withdraw the magnet, and a current in the opposite direction will be observed.

Another method, and that now usually adopted for producing "magneto-

* At page 667 will be found a description of the mode of construction of an electro-magnet.

electricity" (as this kind of electricity is called), is by making a small horse-shoe electro-magnet. On bringing it near the poles of a powerful permanent magnet, a strong current is induced in the wire of the electro-magnet. By fixing this electro-magnet on a pivot near the poles of the permanent magnet, and giving it a rapid rotation, intense currrents are induced.

INDUCTION COILS.

An explanation of the above facts is rendered necessary before you could comprehend the construction of, or results obtained from, a Ruhmkorff's induction coil; for in this coil, to which I have been gradually leading you, you will find that induction by voltaic currents and by magnetism plays the most important part.

Now, we have seen that one wire induces a current in a contiguous wire; if a helix of a second wire of much smaller diameter than that just used be placed around the helix with the soft iron in it, it will be found that the currents induced in this wire on making and breaking battery circuit are greater in strength than when the bar is removed, the presence of the bar most materially increasing the induction. This rough arrangement is the foundation of an induction coil: the helix round the soft iron is the *primary coil*, the outside wire is the *secondary coil.* By increasing the size of the magnet and the lengths of the primary and secondary wires, instead of a faint spark, we obtain a flame of light many inches in length; but the principle of the coil remains the same.

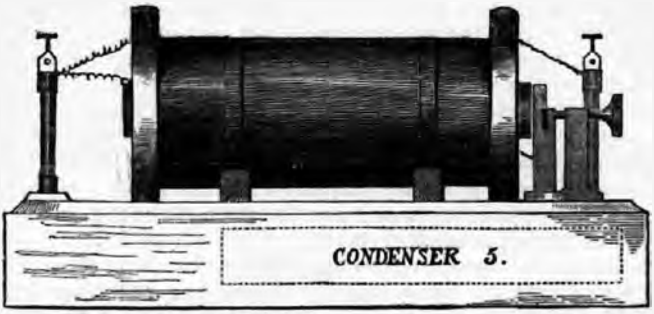


FIG. 27.

To M. Ruhmkorff is due the credit of perfecting the induction coil which now bears his name. The coil consists of the following parts:

1. The core of soft iron, or electro-magnet.
2. Primary coil.
3. Secondary coil.
4. Contact-breaker.
5. Condenser.

In experimenting upon electricity there are no more beautiful experiments than those performed with Ruhmkorff's intensity coil. I therefore give my readers a description of a very useful coil, capable of carrying out a great variety of experiments. For this description I am indebted in a great measure to a small but very interesting volume on "Intensity Coils," by Dyer, recently published.

The core of soft iron consists of a bundle of small iron wires of No. 18

gauge; the wires should be straight and tied well together, the whole forming a bundle of $\frac{7}{8}$ in. diameter and $7\frac{1}{2}$ in. in length. The ends should be filed smooth and slightly varnished.

The *Primary Coil* is wound on a reel consisting of a cylinder of cartridge-paper (see section), having an ebonite disc at each end $3\frac{1}{2}$ in. in diameter and $1\frac{3}{8}$ in. thick; the tube should be 7 in. long and 1 in. in diameter. Upon this is wound the primary wire; but before winding, to prevent damage to the reel, it should be filled up inside with a wooden roll. Two holes should be made in one of the discs to receive the ends of the primary wire, which should consist of about 1 lb. of cotton-covered wire, No. 15, measuring about 20 yards. One end of this wire should be passed through one of the holes in the disc and wound carefully on the reel to the opposite disc, and then back again, so as to form two layers; the end should then be passed through the remaining hole in the disc. The layer should then be well and carefully varnished with several coats of shellac dissolved in spirits of wine; a second coat must not be put on until the first be dry. When dry, the primary wire must then be tightly covered with cartridge-paper passed several times round and gummed down. When dry, it must be varnished.

Secondary Coil.—In this, the opposite disc, one above and the other below, should be two holes for the ends of the secondary wire, which consists of about 800 yds. ($\frac{1}{2}$ lb.) of No. 32 *silk*-covered copper wire. This wire requires great care in the handling, and the operation of putting it on is one of great delicacy. Pass the lower end through the lower of the holes, and then wind on carefully until the first layer is complete, and then having varnished it, and covered it with four or five layers of very fine gutta-percha sheet, a second layer may be wound on: the sheeting must not be put on until the varnish be dry. And so on, layer after layer, varnish and sheeting between, until the wire is finished and the coil complete; the end should then be passed through the other hole in the disc. As each layer is put on, an observation should be taken with your galvanometer and battery, to see whether the wire is perfect and not broken. When the wire is entirely wound on, it should be protected by a series of coatings of gutta-percha, and with an outside wrapper of leather or other material. Very often, to increase the strength of the coil and decrease the danger of the small secondary wire breaking where it comes through the disc, it is soldered on to a larger copper wire, which is wound round the secondary, and forms its outer layer. Where the secondary wires come through the disc, they are usually made into a helix.

The *Contact-breaker*, or Interrupting Apparatus, performs a very valuable part in the performance of the coil; in fact, it is the arrangement whereby we are enabled to utilize the wonderful effects of induction. In our previous experiments we have seen that the effects of induction only took place on making or breaking battery connection: in order to effect this, we introduce the ingenious arrangement known as a "contact-breaker." There are various forms of it, but the principal remains the same—the invention of Dancer. In Fig. 28, fixed on a brass pillar, C, in connection with one end of the primary wire, is a spring with a small armature at the end of it, facing the bundle of wires, and at a small distance from them. Between the armature and the pillar holding the spring is a small pillar with a screw through the upper part, the end of which, projecting through, touches the spring, and regulates its distance from the iron bundle. The end of the screw, and the part of the spring it touches, should be faced with platinum. The pillar holding the screw is in connection with the terminial P, N being in connection with the other end of the primary wire. Now bring the two ends of a battery into connection with P N; a circuit will be at once established through the coil, the spring and the screw which rests against the spring. But we have seen that a current of electricity passing round soft iron makes it magnetic, so our bundle of iron wire becomes magnetic, and attracts to it the armature at the end of the spring. This action immediately results in severing the connection between the spring and the screw; the battery at once ceases to act; the iron wires are no longer magnetic; the spring armature immediately resumes its original position, but as soon as it does so the battery connection is again

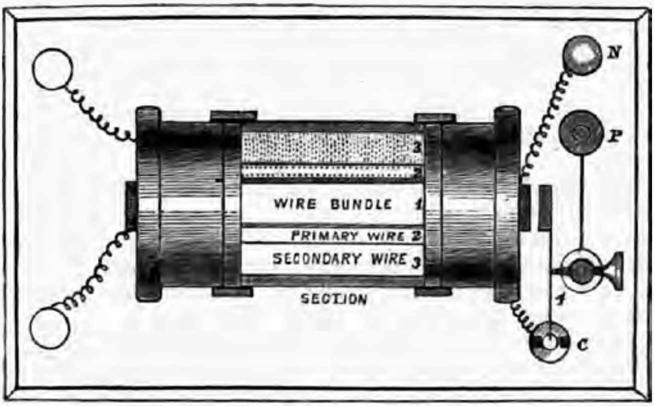


FIG. 28.

established, the armature attracted, the result being that the armature is kept oscillating between the two points so rapidly as to produce a loud humming sound and vivid sparks at the point of contact. We therefore obtain the result we wished, and our battery circuit being so rapidly made and broken, we are thereby enabled to provide a self-acting arrangement, in order that we might profit by the induction which takes place in the secondary wire, which experiment has shown to us *only* takes place on the making and breaking of battery contact. The more rapid the action, the greater frequency of the induced current.

The Condenser.—This is an invention of Fizeau, and was first applied by Ruhmkorff to his coil with great effect. It is, in fact, a peculiar arrangement of a Leyden jar, and consists of sheets of tinfoil insulated from each other by silk, paper, or paraffin. The original appeared to have been made of two large sheets of tinfoil, separated by an insulating coating, and then placed between *two* insulating coatings; they were rolled up into the desired size, and connected with the contact-breaker. For a coil of the dimensions I have described, Dyer gives the following as the capacity of the condenser:

"Fifty sheets of tinfoil, 5×5; sixty pieces of varnished paper, 7×5; and two mahogany boards, varnished on each side, but rather smaller. Upon the lowest board place five pieces of the varnished paper; upon that one piece of tinfoil, overlapping at one side about 1 in.; then paper; then a second piece of tinfoil, but overlapping at the other side; then paper, tinfoil, and so on to the end; care being taken that the *alternate* pieces of tinfoil overlap on the *same* side, that is, the odd numbers to the left or one side, the even numbers to the right or other side. When the last tinfoil is put on, place above it the remaining pieces of paper and the other mahogany board. It is then ready to be placed in a box under the base of the coil."

The various parts being constructed, it is necessary to fix the completed coil and the condenser upon a proper frame. A wooden base, large enough to hold the parts, should be constructed, fitted at one end with the contact-breaker (Fig. 28); at the other end, for receiving the wires of the secondary coil, should be two insulated supports, having at their upper ends two double binding-screws, the one for the coil wire, the other for the experimental wire. The condenser should be fixed under the base in a hollow, and tightly screwed in; but before doing so a connection should be made between the one set of plates and the pillar, C, holding the spring armature, and between the other set of plates and the pillar holding the adjusting-screw. These pillars, to facilitate their connection, should project through the wooden base. Connect the primary wires to C N, Fig. 28, and the secondary wires to the terminals at the other end.

This coil must not be worked with more than six cells, as it may be hopelessly damaged.

If you obtain a coil, or make one, similar to the above, or at any rate if you wish to try any experiments with the induction coil, I would recommend you to be careful, as the shocks are too strong to be taken with comfort, and use well-insulated wires to connect to the secondary terminals.

When you have finished any experiment, disconnect one of the battery-wires from the coil (you can arrive at this result by unscrewing the contact-breaker), and do not connect it on again until you have the secondary wires ready connected for another experiment.

Never keep the battery-wires connected unless you are performing some experiment, otherwise you allow the battery to run to waste.

Fig. 29 shows an instrument called a *discharger*, which is a very necessary addition to the induction coil.

On a small stand are fixed two insulated supports, having at their upper end a small tube; beneath it a binding-screw for attaching the coil wire. Through this tube passes a small brass rod with an insulated handle; at the opposite end is a screw for attaching wires, or whatever may be required to be experimented with. In the centre of the stand is placed a small table of insulating material. By making the top of the supports movable, an improvement may be effected.

FIG. 29.

The following are a number of experiments that can be performed with an induction coil.

1st Experiment.—Connect the battery: an intensely vivid spark will be seen at the contact-breaker. This is called the *primary spark*, and appears continuous, though not so in reality: it is due to the making and breaking battery contact.

2nd Experiment.—Join two wires to the terminals of the secondary coil; bring them close together (hold only *one* in your hand): a magnificent spark will, immediately you connect the battery, pass from one to the other; and, bringing them nearer, the spark or flame will appear to be continuous. It is called the *secondary spark*, and is the result of the induced current.

3rd Experiment.—Attach the wires from the secondary terminals to the discharger, to the ends of which two fine wires ought to be attached. Connect the battery. By varying the distance between the ends of the discharge, you can see the extreme distance of air the spark will pass through: the length of spark will depend upon the amount of battery used. Vary the distance, and observe the different appearance of the spark, and its varying intensity. When the two ends are brought near each other, the spark becomes less blue; approach it still nearer, it becomes red, and is called a *calorific spark*, as, under that condition, it is more suitable for deflagrating experiments.

4th Experiment.—Arrange the discharger so that sparks of a good length pass between; bring the flame of a taper near: the spark will diverge towards the flame. Let the sparks pass through the flame: under this circumstance the distance may be increased. If the sparks pass through the upper part of the flame, they will appear as a white ball; if they pass through the lower part, a thin line will be the appearance.

5th Experiment.—Place some fine copper and steel filings on a card; pass the spark through them: the filings will be found separated.

6th Experiment.—Arrange very fine copper filings alone on some paper: it will be found that one wire will attract the copper filings, whilst the other remains apparently inactive.

7th Experiment.—Substitute for the copper filings powdered plumbago on glass: a decided repulsion will ensue.

8th Experiment.—Place a plate of glass over some hot water so that it might be covered with vapour: on placing the wires from the secondary coil at some distance from each other, a long zigzag spark will pass from one wire to the other along the glass.

9th Experiment.—Place a piece of paper between the ends of the secondary wires: the paper will be punctured immediately the battery is connected. Instead of paper use gold-leaf: it will be immediately deflagrated.

10th Experiment.—Attach to the discharger two fine platinum wires or two iron wires: the wires will be ignited and deflagrated.

11th Experiment.—Try the deflagrating effects mentioned in page 652.

12th Experiment.—Place the two ends of the secondary wires one on each side of a piece of plate glass. Connect the battery: in a few minutes the glass will be fractured.

13th Experiment.—On the discharger table place a moistened piece of ebonite or gutta-percha: zigzag sparks, as in Experiment 8, will be seen.

14th Experiment.—Remove one wire from the discharger, and fix in its place a brass ball: the sparks will now assume a brush-like appearance.

15th Experiment.—Decompose water by inserting the two ends of the secondary coil in water: the gases may be collected by using proper apparatus.

16th Experiment.—Arrange the two wires of the discharger, and allow a stream of sparks to pass; bring in the stream a piece of gun-cotton, held by a pair of forceps: it will ignite.

17th Experiment.—Drop a little sulphuric ether upon a piece of cotton: it will ignite by bringing it in the stream.

18th Experiment.—Sprinkle gunpowder on cotton-wool, and bring it within the stream: the gunpowder will explode.

19th Experiment.—Upon the table place a glass plate with a small piece of phosphorus on it: on passing the spark through it, the phosphorus will ignite.

There are many other experiments that can be performed by ignition—firing of fuses, and so on.

20th Experiment.—Disconnect the secondary wires; attach the battery. On applying the knuckle to one of the supports, you will receive faint sparks and slight shocks. This is known as a *static* effect: no result from the other support. It will be found that these effects are only visible from the outer end of the secondary wire. Instead of trying with your knuckles, attach one end of a Geissler tube, it will be found partially illuminated; by placing the finger round the glass near the end, the light will be increased; pass the fingers slowly down, it will appear as if they attracted the light. This forms a very pretty experiment, and may be varied.

21st Experiment.—Attach the wire from the ball of a Leyden jar to the support giving static sparks; from the other support lead a wire to the outside of the jar; connect the battery, and the jar may be charged. So long as the battery contact is kept up the jar continues to receive charges; but it must be borne in mind that the secondary wire forms a complete circuit, and consequently acts as a discharger. According to this arrangement, a jar is constantly being charged and discharged.

It is possible to permanently charge a jar by connecting as before the outside wire of the secondary (that from which you get static effects); attach the other wire to the discharger, and again the discharger to the outside of the jar. Keep the points of the discharger some distance apart; connect the battery, and you will soon find the jar charged.

There are a variety of beautiful and pleasing experiments to be performed with the coil in passing the sparks through partial vacuum and through various gases.

22nd Experiment.—Repeat the experiments given on page 648, with the apparatus (Fig. 8).

Relative to the spark in the air, Professor Noad observes: "If the spark be attentively watched in the dark, it is seen to be surrounded with a sort of yellow-green atmosphere. It is generally of an ovoid form, and seems to be collected principally round the negative pole. When a steady current of air is thrown upon the spark taken between two metallic wires, the luminous atmosphere becomes expanded into a large mass of irregular violet-coloured flame, surrounded by brindles of rays, the spark itself not appearing to undergo any variation."

23rd Experiment.—Mr. Groves has rendered his name very celebrated for his experiments of the discharges in rarefied media, especially the peculiar effect of *stratification* in the globe experimented with before (Fig. 22). Exhaust it well and introduce some vapour of naphtha; connect the secondary wires: the discharge will now be stratified, and not in a stream as before.

A variety of experiments may be made with glass tubes containing highly rarefied gases and vapours. These were formerly made at Bonn, by M. Geissler, and are known everywhere as "Geissler tubes." They vary in form and give most beautiful and varied results. They can now be obtained at a low price at almost any philosophical instrument maker's.

There are numerous experiments that can be performed with an induction coil. I have contented myself with giving some of the principal amongst them; but if you wish to carry out more, you will find a number mentioned, especially with Geissler tubes, in Dyer's "Intensity Coils," which I have already referred to.

In connecting up a Geissler tube you will find no difficulty, as the platinum wire is continued outside. Connect the secondary wires, and then the battery. Put out the lamp or gas, and the tube will be seen in perfection.

Arrangements can be made for giving a number of people a series of shocks by attaching by wires to the secondary terminals metal handles, one of which must be grasped by one person, who holds another, and so on, until the last person grasps the other handle. Immediately the battery is connected, a series of shocks will be felt.

To Construct a Galvanometer.

In carrying out any experiments with current electricity, a galvanometer is a most valuable instrument, as it enables you to detect and observe any currents that may be flowing through a wire. The following represents a very simple instrument. (See Fig. 23.)

Construct a reel or bobbin of the shape shown in the diagram, and wind a quantity (according to the delicacy required) of fine No. 35 silk-covered copper wire round it; make the ends into a helix. In the centre of the bobbin should be fastened a small pivot for the magnetic needle to rest on. The needle should be well magnetized and a little shorter than the coil, so as to revolve freely; but, as it is necessary that the needle should lie in the same direction as the wire, it remains hid. In order, therefore, that its deviation should be known, a needle of copper or some light material is fixed at right angles to it. The coil is fixed on a board, and the ends attached to the binding-screws. In front of the indicating needle is placed a scale of degrees (Fig. 23); the slight deviation of the magnetic needle inside will, therefore, be read off by the indicator.

The delicacy of the galvanometer can be greatly increased by suspending the needle with a piece of unspun silk from a small curved brass rod, instead of allowing it to rest on a pivot. In this case it would be necessary to leave an opening in the centre of the bobbin, in order that the needle and silk might move freely from the point of suspension.

To Construct an Electro-Magnet.

In page 660 I made allusion to electro-magnets. The following will be found very simple directions for making an electro-magnet of small size, but one that would support a weight of some pounds:

Get some stout iron wire or small rod about $\frac{3}{8}$ in. diameter, and $5\frac{1}{2}$ or 6 in. long, and bend it into a horse-shoe about 3 in. long, and $1\frac{1}{4}$ in. across (outside), keeping the same diameter all the way up. (Fig. 25.) Make two reels of wood,* with discs at each end of 1 in. diameter; let the centre of each be just large enough to admit the horse-shoe. Procure a small quantity of cotton-covered copper wire (about No. 22), and wind it on each reel; first pass the end through one disc and wind one reel full, then pass the other end through. Do the same with the second reel, but take particular care that you wind both wires the *same way round*, leaving the ends of the wires out at corresponding discs. When the reels are wound, pass the horse-shoe through them, and join together the two inner wires.

* For this empty crochet-cotton reels will do by increasing the size of the hole.

On completing the battery circuit with the outside ends, you will find your horse-shoe turned into a powerful magnet. Construct a small armature with a hook, so that you may attach weights.

An ordinary electro-magnet can be made by simply winding some cotton-covered wire round the naked ends of the iron horse-shoe—about two layers round each; varnish the whole with sealing-wax varnish, and you will have a capital magnet. These, I need hardly say, you can make of any size.

To Construct an Electric Bell.

An electric bell may be constructed, similar to the one in the diagram, very cheaply. (Fig. 30.)

Make an electro-magnet in the same manner as above described (Fig. 25); use a similar horse-shoe, but rather smaller reels, and upon them wind in the same manner until full a quantity of 24 cotton or silk-covered wire; upon a small piece of mahogany fix this coil by means of the clamp and screw, C;

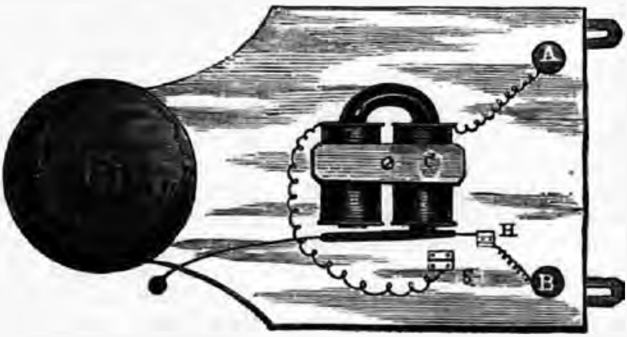


Fig. 30.

lead the ends of the wire to A terminal, and to the spring, S. At the place, H, is attached with a spring the armature, bent at its lower end and provided with a round knob for striking the bell, which should be fixed as drawn. The terminal, B, should be connected with the brasswork to which the hammer is fixed. The spring, S, you will see is resting against the armature, and serves the purpose of a contact-breaker similar to that described for the induction coil.

As soon as battery connection is made, the bell begins to ring, and continues a rapid noise so long as the battery is on. This bell is called a "trembling bell." Connect the two points, S and H, and it will become a single-stroke bell, that is, it will strike once for each time you make battery contact.

By lengthening the two wires, you can make the communication all over a house. Place the bell and the battery down below, and carry up two wires to any place: one from the battery, the other from the bell—the other battery-wire being connected to the bell. Now, if at any place you join these two wires together, the bell will ring.

Fig. 31 shows an upright single-stroke bell. The electro-magnet is made the same as in Fig. 30, but the bell-dome is fixed on an upright in the centre of the magnet; the hammer is kept up by a spring. The dotted lines show the position of the hammer when the armature is attracted.

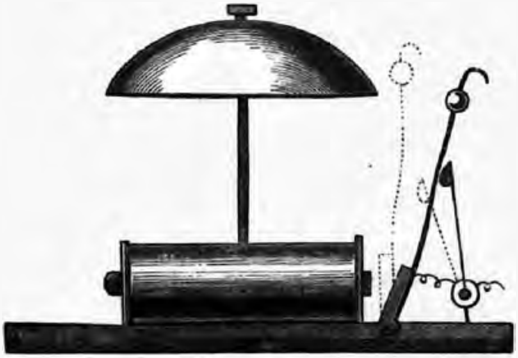


FIG. 31.

For bringing the two wires (wires making connection) the following diagrams shows very simple forms:

The first is what is termed a "button;" the second a "key." In the button, *b* and *c* represent the two wires. On pressing A, connection is at once made.

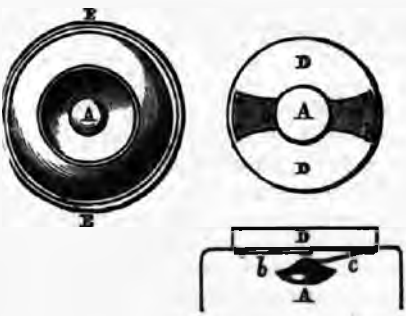


FIG. 32.

FIG. 33.

In Fig. 33 the two wires are represented by the brass key, A, kept up by a spring against a small bridge, and the stud, B. Immediately A is depressed. the two wires are joined together, and the bell rings.

ASTRONOMY.

Astronomy is one of the most ancient of sciences, dating back to the earliest times. It was largely studied in India, China, Chaldea, and Egypt, and has ever been considered the first of sciences.

The results of ancient and modern astronomy have shown that our earth is a sphere, or ball, about 7,926 miles in diameter; that it is one member of a group termed the "solar system," and that the other members appear to be very similarly constituted.

The Sun is the centre of the solar system. Next to the sun is the planet Mercury, then the planet Venus, then the Earth. The following table shows the size, distance, and period of revolving round the sun of the planets belonging to the solar system.

	Diameter in miles.	Distance from Sun in millions of miles.	Length of year in days.
Sun	888,646		
Mercury	3,089	36	87·9
Venus	7,896	68	224·7
Earth	7,926	93	365·2
Mars	4,070	140	686·9
(Several small planets, termed "asteroids," revolve round the sun between Mars and Jupiter.)			
Jupiter	92,164	485	4,332·5
Saturn	75,070	880	10,759·2
Uranus	36,216	1,860	30,686·8
Neptune	33,610	2,870	60,126·7

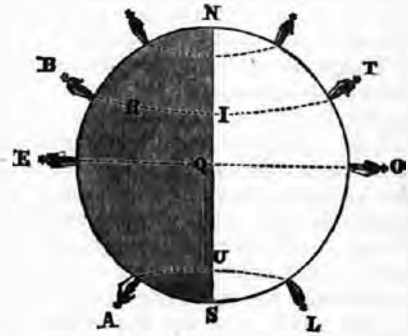
The earth is attended by one satellite or moon; Jupiter by four satellites; Saturn is surrounded by a ring and attended by eight satellites. Both Uranus and Neptune are also attended by satellites, the number of which is uncertain.

As all the planets in the solar system rotate on their axes and thus have a day and night, and revolve around the sun and thus have a year, we will describe fully these movements in reference to our earth, thus explaining how our change of season from summer to winter is produced, and how various other effects take place during our year, or during, in astronomical language, "our annual revolution round the sun."

The first movement of our planet of which we purpose to treat is the daily rotation, and it is one which produces most important results, which are perceptible to every observer. We cannot even direct a telescope towards a star and observe it during a few minutes before we become conscious of a change in the position of the star, which change is due to the slow turning round of the planet on which we stand. The daily rising and setting of the celestial bodies are due to the same movement, and hence night and day are merely effects of the turning round of the earth.

So deceptive are mere appearances that we should observe exactly the same daily occurrences connected with the sun and the other heavenly bodies if the world remained stationary, whilst they travelled round us. Hence in the earlier ages of astronomy it was believed that such a condition did prevail, and much controversy occurred, and many apparently sound and scientific arguments were brought forward to prove that the earth was a stationary body, whilst the sun, moon, planets, and stars were all in rapid motion around it.

Referring to our sketch, which represents the earth, we will suppose N and S to be the north and south poles thereof; thus the line N S, passing through the centre of the earth, represents the *axis* about which the sphere rotates, so that whilst N and S remain stationary during a rotation of the sphere, the point B is carried round to R I T and over on the other side until the point B is again reached, when one rotation would be completed. The point E would be carried round from E to Q and on to O, and again round on the opposite side until E is again reached. A in like manner would be carried round to U and L, and again to A.



It will be seen upon examining the diagram that half the sphere is dark, whilst the remaining half is light, and that the line between the light and dark portion coincides with the axis, N S. This relative position of night and day is that which prevails on the earth twice during the year, viz., in March and in September, and at about the 21st of each month.

If we trace on the earth the course over which each spot would be carried by the turning round of the sphere, we shall find that an exactly equal portion is traversed in darkness and in light, that is, the spot B moves from B to I in darkness, and from I to T in light. In like manner, E moves from E to Q in darkness, and from Q to O in light. In each case the distance travelled in darkness is equal to that passed over in light, or, in other words, the day is equal to the night. This equality will exist no matter on what part of the earth a spot may be; so that at these periods the day and night are equal, and hence they are spoken of as the *equinox*.

Every person who stands erect upon the earth's surface will occupy the position represented by the various figures on the sphere; that is, a line drawn from his head to his feet would, if produced, pass through the centre of the earth.

We are accustomed to speak of "up" as the direction over our heads; but upon examining the diagram we shall perceive that the "up" of each person on the earth's surface will be different at the same instant of time, and that, in consequence of the earth's rotation, our "up" will be altering each hour. Thus B and T, two positions of the same person in the same locality, would cause the "up" or point overhead to vary considerably. The effect of this variation in the "up" is that the various celestial objects, which may be quite stationary, appear to describe circles in the heavens, which circles are large or small according as the celestial body is near to or far away from that part of the heavens towards which the axis, N S, points.

Thus, there will always be two points in the heavens which will seem to be stationary, whilst all other points will appear to describe circles.

If a person were at O or E, the fixed points in the heavens would appear to him to be on his horizon, as will be seen by examining the diagram; whereas, if the person were at N or S, then one fixed point would appear exactly overhead. If a person were at T or B, then only one of the fixed points would be visible, viz., that one above N, the other above S being invisible, in consequence of a portion of the earth intercepting our view in that direction. Also the fixed point above N would be just as many degrees above the northern horizon as the place of observation was distant from the equator of the earth; so that if we can find how many degrees above the northern horizon this fixed point may be, we can at once obtain our *latitude* on earth, and this is one method of finding the position of a ship at sea, or of obtaining the latitude of places on the earth's surface.

To enable us to comprehend thoroughly the apparent motion of the stars produced by the earth's daily rotation, we may call to our aid a common umbrella.

First open the umbrella, then point the top of the stick to a spot rather more than midway between the northern horizon and the point overhead. If the umbrella have several holes in it, it will do very well, as these holes will represent stars; if not, then attach several small pieces of paper to the inside of the cover, to represent stars: let some of these be near to the top of the stick, others near the edge of the cover, and we have an excellent representation of the heavens, the stick serving for the axis, the ribs of the umbrella for meridians, and the paper for stars.

By turning round the stick whilst it still points to the same part of the heavens, we shall observe that the pieces of paper will describe circles, which will be large or small according as they are far from or near to the top of the stick.

The umbrella ought to be turned so as to cause the lowest part to move upwards to our right hand, and then the course of the stars is imitated.

If also we place the eye on a level with a table, and allow a portion of the umbrella to pass below the table, we shall perceive how it is that some stars never set, whilst others do so; for the table will represent the horizon, and we shall then see how some stars will follow a course which should cause them to be nearly over our heads at one time, and then down near the northern horizon at another. In fact, an umbrella will serve for a cheap but explanatory kind of orrery, and we can by its aid at once perceive the cause of the course followed each night by such stars as those composing the constellation known as the Great Bear.

If we were situated at the central or equatorial regions of the earth, the stick of the umbrella should be held horizontally whilst we pointed it at the north or south point on the horizon; then, by twisting it as before mentioned, we should perceive the apparent course pursued by the stars, which we should find took place half above and half below the horizon.

Thus by a very simple contrivance we can readily perceive how the stars are apparently moved by the daily rotation of the earth.

According as a person is near to the equator of the earth, or situated in higher latitudes, so will he be carried each day over a greater or less amount of space. All localities on the equator are carried round about 25,000 miles per diem, or rather over 1,000 miles each hour. Not more than half this distance is moved in consequence of this rotation by those people who reside in middle latitudes, such as those of England or the greater part of Europe; whilst people who reside in the high northern latitudes move over a far less amount of space.

To all individuals who are in the northern portion of the earth, or beyond $23\frac{1}{2}°$ of north latitude, the sun appears to move each day from the left hand round to the right, consequently this is a movement from left to right, and also from east to west. When, however, our locality is changed to a point in the southern hemisphere, we then perceive that the sun moves from right to left. This fact occurs in consequence of the east being on our right hand and the west on our left when we face the position of the noonday sun from the southern hemisphere, whereas in the northern hemisphere, under similar conditions, the east would be on our left.

These apparently simple terms of east and west are really much more puzzling than the mere superficial observer would imagine. A comet, for example, seen from the earth in June to pass from east to west towards the sun, would, had it been viewed in December, have been announced as passing from west to east. The satellites of a distant planet called Uranus appear, when seen from the earth, to be moving from east to west during forty years, but during the remaining forty they appear to move from west to east. They would seem, in fact, to move exactly as would the hands of a clock, if we viewed these hands first from the front and then from the rear of the clock's face: in the first instance they would appear to pass from the top of the clock's face *round to the right*, and then under to the left; in the second instance, viz., from the clock's rear, they would seem to pass from the top *round to the left*, and then under to the right. In one instance we should speak of the movement as a right hand, and in the other as a left hand, rotation. This planet Uranus taking eighty years to complete his revolution around the sun, his satellites appear to move during forty years with right hand, and during the remaining forty years with left hand, rotation. It was formerly supposed that these satellites moved in a manner different from other satellites in the system; the mistake arose in consequence of a confusion in the terms east and west, &c.

Those who consider east and west very simple terms may be asked where the east and where the west would be were they standing at the north pole of the earth?

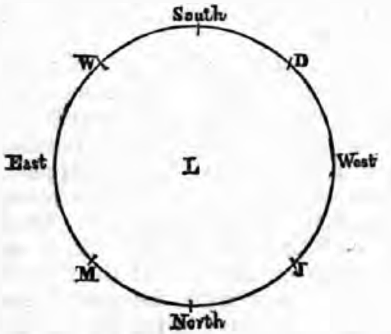
In the diagram of the earth which we have given, we have taken a sketch as though the north pole of the world were uppermost, and we obtained a side view of the earth. We will now represent a plan of the earth as it would appear were we to look down upon it from a point above London; we shall then perceive where the sun would rise and where set during summer and winter.

In consequence of the earth's movement around the sun (of which we shall treat at a future page), the earth is at one time of year considerably above the sun, whilst at another time it is below it—that is, when we speak of the north as the uppermost part of the earth.

This change in the relative position of the sun and the earth causes the daily rotation to produce a vast change in the length of the days, and consequently in the times of sun rising and sun setting.

Suppose L in the annexed sketch to represent the position of London, or any locality in the northern hemisphere the latitude of which is similar to that of London, and let us suppose that the horizon is clear, like that of the sea, and uninterrupted by hills, houses, &c. Then, as represented in the sketch, we should find the horizon divided into four equal parts, by the north, east, west, and south points.

On the 21st of December we should find the sun rising above the horizon from the point marked W. It would pass the south at noon, and would set at the point marked D. At this time of year the sun passes over a very small portion of its course above the horizon, and hence the days are short, for merely about 102° of the sun's daily course are travelled over above the horizon, consequently 258° below it; and as the sun occupies twenty-four hours in passing round the whole circle of 360°, we find by simple proportion that he will traverse the 102° in about seven and a half hours, which period is about the length of the days in winter.



On or about the 21st of March the sun will rise from that point on the horizon marked east, it will pass round to the south at noon, and will set in the west. At this time of year exactly 180° of the sun's course are passed above the horizon, or one-half, and hence the days and nights are equal. On the 21st of June the sun will rise from the point marked M, it will pass round by W and the "south," which it will again reach at noon, and will in the afternoon be found above D, and will set below the point J.

The distance from M round by the south to J is 258°, during which part of its daily course it is entirely above the horizon, that is, during seventeen hours out of the twenty-four; hence, in June the days are very much longer than in December. The cause of these changes will be explained when we refer to the "Revolution of the Earth."

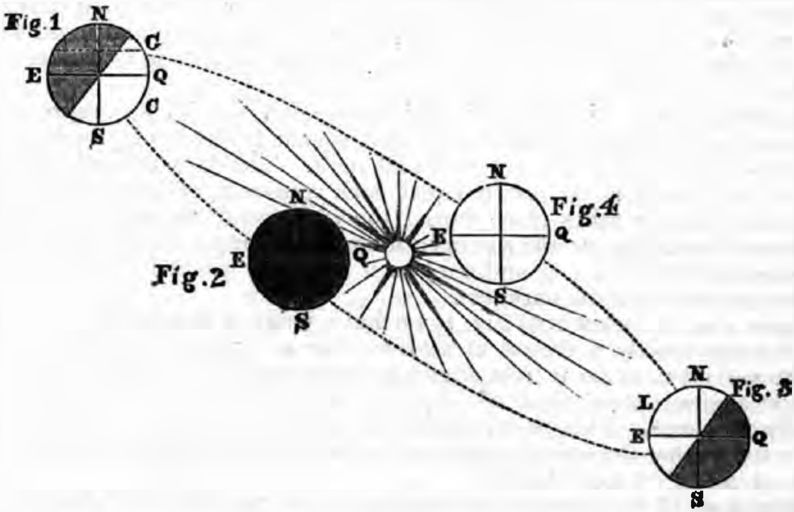
The rotation of the earth serves for a measure of portions of time; for this rotation may be compared to the movements of the hour hand of a clock, which passes over equal portions of the circle in equal times.

If we took up our position on the equator of the earth, and could select twelve stars equidistant from each other, the first being due west, the last due east, we could at once discover what portion of the twelve hours had elapsed, by observing which of these stars happened to be overhead or near that point; for the whole twelve stars would have disappeared during twelve hours, and in six hours the star due east when first observed would have reached the point overhead. Thus the rotating earth is really a sort of large clock, and in like manner the heavens, and the stellar hosts which appear to move round us, also serve as measurers of time.

It may be truly said that there are only two out of the many movements of our world with which the average observer is acquainted; these are the daily rotation, which causes the alternation of day and night, and the annual revolution, which produces the change in season and many other singular effects. In our own experience we have found many well-informed people who had yet failed to observe that the sun was higher in the heavens at midday in summer than it was in winter, or that any change occurred in its place of rising or setting at the two periods. Many other individuals, again, had observed the facts, but were sadly puzzled to account for the cause of them.

Far more than the average of well-educated people are, however, acquainted with the two principal movements of the earth, whilst a very few entirely comprehend the three additional motions, one of which has not yet, we believe, been made public, at least not in a popular and comprehensible manner.

The revolution of the earth round the sun is the cause of the change in midday altitude of the sun, and hence of the seasons. It is also the reason why some stars are visible to us only during the summer months, whilst others are seen merely during the winter season. Conjoined with the movements of its sister planets in the same system, the earth's revolution round the sun is the cause of some planets appearing occasionally as evening and then again as morning stars, whilst others gleam in full splendour upon us from the midnight sky for at least a few months, and then again approach each evening to the sun, until at last they disappear amidst his brilliant rays.



The alternation of day and night, produced by the earth's rotation, takes place during twenty-four hours. The revolution around the sun is completed in about 365¼ days. Other changes are produced by other movements, and these run through their cycle many thousand years, whilst others, again, require yet longer to pass through their phases. Hence, as might be expected, the two most obvious movements are those about which the most interest is displayed, although it may be that the others are not less important in their effects, although these occur at longer intervals; the only difference being that the latter may affect the condition of the whole human race, whilst the former is merely felt by those who now live upon earth.

Referring to the accompanying diagram, we find four circles, which represent the relative positions of the earth and the sun during four periods of the year. Fig. 1 represents the earth in December; Fig. 2 the earth in March; Fig. 3 the earth in June; and Fig. 4 the earth in September.

In these diagrams the north pole of the earth is represented as uppermost; and as, for the present, we may consider that the earth's axis, during its entire revolution round the sun, remains parallel to its first position, we will speak of the direction of the north as "up," and the south "down;" therefore the equator, E Q, we must also assume as horizontal.

During each year the earth moves round the dotted line, which is called the ecliptic, and is represented on the diagram.

About the 21st of December the earth would be at the position indicated by Fig. 1. It would then be considerably above the sun, so much so, that the sun could not be seen from any locality in the neighbourhood of the north pole, which, even as the earth rotated and brought other portions of the surface into sunlight, would still remain in darkness; hence, at this time of year, there would be perpetual night in those regions immediately around the north pole.

Lower down on the same figure, at G, a line will be seen drawn round the earth. Upon tracing this line across the sphere, we shall perceive that a very small portion of it lies in sunlight, whilst the greater length is in darkness. This portion of light and darkness is the proportion of day and night which prevail upon the earth in all places situated in such a latitude as G during the middle of December.

Upon examining lower down the sphere, we find the line E Q, representing the equator of the earth. This line, we find, is exactly divided by the light and darkness, half of it being light and half dark. The days and nights at the equator will therefore be exactly equal, each consisting of twelve hours, and this equal division takes place during the whole year, no matter where the earth may be as regards the sun, as a momentary glance at Fig. 3 will show, if we examine the line E Q, and see how it is exactly divided by the line separating the light from the darkness.

Again, passing below E Q, Fig. 1, we find a point, C, from which we should see the sun exactly overhead at midday; for as a person standing on the earth's surface must be at right angles to that surface, so a line drawn from C at right angles to the surface would pass to the sun, which would therefore be exactly overhead. This point, C, is found by observation to be nearly $23\frac{1}{2}°$ below E Q, so that the sun at midday in December will be vertical at all places situated in $23\frac{1}{2}°$ of south latitude.

Passing on to the point S (the south pole), we perceive the whole of that portion of the earth to be illuminated by the sun, which consequently would be visible both by night and by day; in fact no night, properly so called, would take place. The distance from the pole at which this effect would be produced is also nearly $23\frac{1}{2}°$, and it is dependent upon the distance of those places from the equator at which the sun is vertical each day; so that if the sun were vertical at a locality 23° south from the equator, it would not set at any place within 23° of the south pole; also the sun, under the same conditions, could not be seen within 23° of the north pole.

A slight examination of the diagram, Fig. 1, will show how the above-mentioned facts really occur in consequence of the earth being, as it were, *above* the sun.

During the month of December and the earlier part of January, the earth at Fig. 1 moves nearly horizontally as regards the sun, the daily altitude of which, therefore, does not vary much; in fact, from the 1st of December to the 21st the sun merely decreases in midday altitude about three times its own diameter, also from the 21st of December on towards January a like gradual increase takes place during twenty-one days.

The earth will then be approaching the position marked Fig. 2; and if we remember that the dotted line is nearly a circle, only seen by us obliquely in the diagram, we shall perceive that the nearer the earth approaches the position of Fig. 2 the more rapidly will it move *downwards* as regards the sun, consequently the more rapidly will the increase in the sun's daily height take place.

The earth reaches the point Fig. 2 about the 21st of March, and still referring to the north as "up," the earth will be exactly level with the sun at this period; the result will be that each pole (N and S) of the earth would be just illuminated by the sun, which would at midday be vertical at all localities situated on the equator only, whilst the days and nights all over the earth would be exactly equal, and would consist of twelve hours each. The diagram on page 675 will show the relative sunlight and darkness on the earth at this period.

The sun at this date varies his midday altitude very considerably, and also remains a longer time above the horizon, in fact, during twenty-one days in March he varies his altitude more than sixteen times his diameter, or more than five times as much as he does during December.

From the 21st of March to the 21st of June the earth moves still downwards until the point indicated by Fig. 3 is reached. This is the lowest point in its orbit, and the sun consequently shines down on the northern portion of the world.

The vicinity of N (the north pole) is now shone upon without interruption, and consequently enjoys a perpetual day.

The sun would now be found vertical at midday at all places situated in $23\frac{1}{2}°$ north latitude; thus at a point such as L, the sun would be vertical at midday. If we trace a line on the sphere Fig. 3, and parallel to E Q from the point L, we shall find that the greater part of this line will be in sunlight; whereas a line similarly traced on Fig. 1 would show the greater portion in darkness. This is the reason why the days in June are so much longer than in December in localities such as England. We can also perceive why the sun should rise in June far to the north of east, and set far to the north of west, because the line joining N and S would represent the east or west, and to a person at L the sun would rise just as much north of east as the line of darkness is on the right hand side of the line N S when referred to a horizontal line drawn through L.

In December likewise (see Fig. 1) the sun, we can see, must rise to a locality like G from a point far to the south of east, and thus we may understand the cause of the sun's rising and setting from different parts of the horizon, a fact pointed out by aid of the diagram on page 674.

Passing down the sphere, Fig. 3, we find, as before, the line E Q half in light, half in darkness, showing us equal days and nights at the equator.

The localities round S (the south pole) are now in total darkness, no day or night alternating to them; also the nearer we approach the south polar regions from the equator, the shorter will become the days, until we cease to see the sun.

Thus the earth being low down below the sun causes the bright orb of day to shine down upon the northern half of the world, and thus to give it a summer; whereas, when at Fig. 1, the earth is elevated, so that the sun only shines obliquely on the north, and thus produces winter.

If we were to take fifty yards of ground for the sake of illustration, and were to suppose that the heat from the sun came in lines, or fell like snowflakes on the earth, then thirteen only of these would fall during winter in

England to forty-four in summer. Thus also if the sun poured out degrees of heat on a certain space in England, thirteen would be poured out in winter to forty-four in summer. This is one reason for the great variation in temperature between the two periods.

Before leaving the sphere at Fig. 3 on the diagram, we should look at it with the sketch upside down; we shall then see that it looks exactly similar to Fig. 1 previous to the latter's inversion. All the conditions are the same for each hemisphere, except that they occur at exactly opposite periods of the year, so that in December (Fig. 1) it is winter in the northern and summer in the southern half of the world; whilst at Fig. 3 it is winter to the southern, summer to the northern half. Thus, in the present day, when steam is so much used, it would be a very simple matter for a person to travel from one hemisphere to the other, so as to enjoy perpetual summer.

From December to June, then, the sun is vertical at some localities each day from $23\frac{1}{2}°$ north and south of the equator. Thus in December it would be summer at C, Fig. 1, but winter in June at the same locality; at Q, Fig. 1, however, it would be summer when the sun was vertical at the equator, and this would take place, as before remarked, when the earth had reached the point indicated by Fig. 2. But the sun would also be vertical at Q when the earth had reached Fig. 4, for the same reasons as when it was at Fig. 2. Hence at the equator there would be two summers during six months, and, in fact, two summers during a like period in all localities within the limits of $23\frac{1}{2}°$ on each side of the equator.

Whilst moving round that portion of its orbit near Fig. 3, the daily rate in the variation of the sun's altitude would be very slight, just as it was at Fig. 1. After it had passed the lowest point it would then begin to ascend, very slowly at first, but more rapidly the nearer it approached the position of Fig. 4.

When the earth reached Fig. 4, the September position, it would be moving upwards just as quickly each day as it moved downwards during March; thus the sun would sink lower each day with great rapidity.

The days and nights each day about the 21st of September would again be equal all over the world, just as they were during March, and, in fact, the conditions are exactly similar, except that the earth is now rising, and consequently producing a falling each day in the apparent position of the sun; when whereas on the opposite side of its orbit it was sinking lower each day.

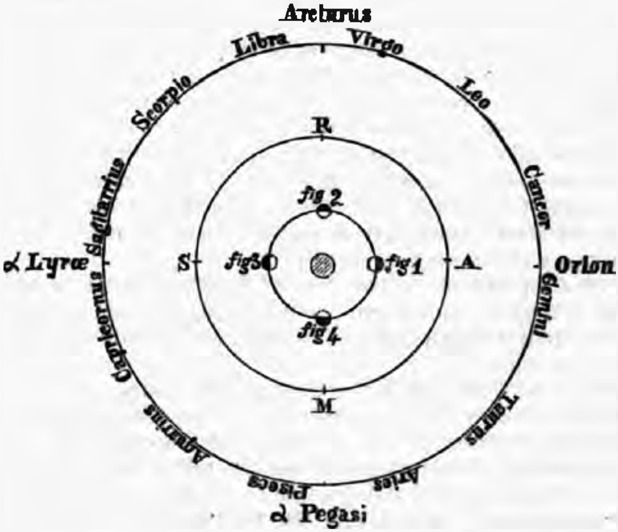
From Fig. 4 the earth moves on to Fig. 1, the rate of rising each day becoming less after leaving Fig. 4, until at Fig. 1 it moves nearly horizontally.

Upon again reaching the point Fig. 1, the earth has completed its annual journey round the sun. It has passed round the dotted circle, and in so doing has traversed rather more than 590,000,000 miles. If an express train were to start from Fig. 1, and move round the same course at a continuous speed of sixty miles an hour, the train would complete the circuit in something about 1,300 years.

The earth also moves downwards, or away from a star situated about the north pole, about 85,000,000 miles in its transit from Fig. 1 to Fig. 3, and the two extreme points 1 and 3 are about 190,000,000 miles apart. Let us conclude our explanation of this portion of the movement, known as the revolution, by stating that an imaginary line joining Figs. 1 and 3 is called the *line of solstices*, whilst one joining Figs. 2 and 4 is called the *line of equinoxes*.

In the preceding explanation of the earth's revolution we obtained a sort of side view of the earth's various positions. We will now examine the same movement from a position exactly above the earth's orbit. We shall then look down upon its positions at the various periods, and can observe the cause of those effects which must have been noticed by every observer of the midnight heavens.

Taking, as before, Figs. 1, 2, 3, 4 to represent the positions of the earth in December, March, June, and September, we at once perceive that as regards the distant heavens the sun must appear in different parts at different times. In order to give some definite boundary to various portions of the sky, the very earliest Eastern astronomers divided that portion of the heavens over which the sun appears annually to travel into twelve parts; these they called by various names, which will be seen written round the largest circle. Thus we have Aries, Taurus, Gemini, Pisces, &c., which are called *signs of the zodiac*, the zodiac being a belt of the heavens extending a few degrees above and below the exact path of the sun.



In consequence of the sun being comparatively very near when we consider the distance of the nearest fixed stars, the movement of the earth round the sun causes a considerable change to take place in the relative positions of the sun and stars during the year. For example, in December (Fig. 1) we find the sun and a star marked α Lyræ on the diagram in the same line; consequently when the sun was south or east of us, this star would also be south or east. But if we look at the position of the earth during June (Fig. 3), we find the sun in one direction, the star α Lyræ in the directly opposite position. Thus when the sun was now south, this star would be north of us; consequently the movement of the earth causes the sun to appear in different parts of the heavens during various periods of the year.

On or about the 21st of December the sun enters the sign Capricornus; that is, a line drawn from the earth and passing through the sun would, if produced, pass to that point in the heavens indicated by the commencement of the sign Capricornus; or, in other words, if we could see the distant heavens exactly behind the sun, we should perceive that he was at the commencement of Capricornus about the 21st of December.

As the earth moved from Fig. 1 down to Fig. 2, that is, from December to March, so would the sun appear to pass over the signs Capricornus, Aquarius, and Pisces, until, at or about the 21st of March, it would be found at the first point of Aries.

The first point of Aries is a very important point in astronomy, and merits, therefore, a particular description.

In the first place it is found as follows:

When the earth has moved downwards from Fig. 1 to Fig. 2, and to such an amount that the equator is exactly on a level with the sun, then will the sun be exactly vertical at the equator, and consequently exactly 90° from the pole of the heavens.

There will, of course, be only one instant of time when these conditions exist, in consequence of the rapid downward movement of the earth, combined with its onward movement; yet, by observation with instruments, and calculations based thereon, this moment of time can be accurately ascertained.

When, then, the sun is thus crossing the equator, a line drawn from the earth through the sun's centre, and produced on to the extreme boundary of the stars, fixes the position of the "first point of Aries."

The first point of Aries is the starting-point from which to count the two very similar terms *right ascension* and *longitude* for celestial objects. It is, in fact, a celestial Greenwich, and a line from this point to the pole of the heavens is a celestial Greenwich meridian. The further details connected with these terms will be given presently.

From the 21st of March to the 21st of June the earth would move from Fig. 2 to Fig. 3, and its movement would cause the sun to appear to travel first over Aries, then through Taurus, Gemini, and on the 21st of June Cancer would be entered upon.

From the 21st of June until the 21st of September the sun would pass through the signs Cancer, Leo, and Virgo; and between the 21st of September and the 21st of December, Libra, Scorpio, and Sagittarius are traversed.

By an examination of this diagram, we can tell in which sign the sun is at all times of the year; for by drawing a line from the position of the earth at the time of year mentioned, tracing this line through the sun, and producing it until it meets the circle on which are indicated the various signs, we see at once in which it must be.

We can, of course, find where the earth will be at any season besides those exactly indicated by the Figs. 1, 2, 3, 4, which refer to December, March, June, and September, for we can take proportional parts between these according to the date; thus, in the middle of November the earth would be at two-thirds of the distance between Figs. 4 and 1, the sun consequently in *Scorpio* and close to *Sagittarius*. In May, again, about the 1st, the earth would be nearly midway between Figs. 2 and 3, the sun consequently near the middle of *Taurus*.

In connection with the position of the sun in the various signs, a means is afforded us of telling the date at which many ancient events occurred. The process is very simple, and can be comprehended by any clear-minded individual without much mental exertion. Its explanation, however, belongs specially to the movement of the earth, technically called the "Precession of the Equinox."

We have seen how the sun passes through the various signs of the heavens during the year, and thus seems to pass in front of different stars at different periods; we will now examine in detail, from the same diagram, how various stars are seen in different positions at certain times of year.

We have selected four stars, which are situated at nearly four opposite points of the heavens, and are of sufficient size and note to be generally known, even to the average observer of the heavens.

We will suppose that we are seated at a window facing the south, and that the time of year is December. If we could see, night and day, the signs of the zodiac, we should find that these, in consequence of the earth's rotation, passed our south in the following order, commencing at midday: Capricornus, Aquarius, Pisces, Aries, Taurus, Gemini. At midnight Cancer would be to our south, after which Leo, Virgo, Libra, Scorpio, and Sagittarius would pass. By reference to this order we see in which direction the earth rotates as regards the sun and fixed stars.

At noon, in December, we should find the sun south of us, and in the same direction as the sun, but infinitely farther off, the stars of Orion would be situated. These stars, of course, would be invisible, because the brilliancy of the sun would prevent their being seen.

The regular turning round of the earth would cause us, at six o'clock in the evening, to face the direction of that portion of the heavens in which the star α Pegasi is marked; the sun, consequently, would now be on our right hand, and if we had been observing from a locality such as England, the sun would now have set, and we might, therefore, be able to perceive the various members of the stellar host.

Facing the star α Pegasi, which would now be to our south, we should have the sun situated on our right hand, whilst on our left the star Sirius and the constellation of Orion would be found, and they would be just rising above the horizon from the east.

As the earth continued slowly to turn round until we faced Orion, we should experience exactly the same effects as though the whole mass of the heavens revolved, whilst we remained stationary. The various stars would seem to travel from the east to our south, and to rise as they did so, until, having attained this position, they would begin to descend towards the western horizon.

At about midnight in December we should find Orion to our south, whilst α Pegasi was on our right hand, and sinking below the western horizon. On our left or east the bright star Arcturus might now be visible, just rising above the horizon; and as the morning advanced we should perceive this star to our south, for at six o'clock a.m. the rotation of the earth would have carried us round so as to face this star, whilst the same cause would have made Orion pass on to our right hand, and to be nearly setting in the west.

When the earth's rotation had brought us round to face Arcturus, we should, of course, have the sun on our left hand; whereas, when we faced Orion, it was behind us; therefore at midnight in December the sun would be north of us, as would also the star α Lyræ.

At this time (six a.m.) the sun would be approaching the eastern horizon, and at about eight a.m. would begin to be visible, until the continued rotation brought it again to our south at midday, at which time the star Arcturus, although invisible, would be setting on our right hand. Thus, referring to these four stars, we find α Lyræ to our south at noon, α Pegasi about six p.m., Orion at midnight, Arcturus about six a.m.

We will next examine the difference produced by the earth's change in position to Fig. 2, viz., to March.

At midday the sun would, as usual, be south of us, and at the same time the star α Pegasi would also be south, consequently invisible. Now, during December we found this same star to our south at six o'clock p.m. Since that period, then, the star has gradually approached the sun; hence it would by degrees have passed the south at seven o'clock a.m., then at eight, nine, ten, and eleven, until in March it passed our south at the same time as the sun.

The direction of the rotation being the same as before, we should find, at six p.m., Orion to our south (Fig. 2), whilst the sun would be on our right hand, and nearly setting. This constellation would also have gained six hours on the sun, for it passed the south at midnight during December, that is, twelve hours after the sun, whereas now it passes merely six hours after.

Arcturus also we should find to our south about midnight, that is, twelve hours after the sun, whilst Orion would set about this time, instead of at six a.m., as it did in December, whilst the star α Lyræ would at the same time (midnight in March) be just rising from the eastern horizon.

At six a.m. α Lyræ would be south of us, and the sun just rising in the east. Hence from December to March we find all the stars have gained six hours on the sun, for those which passed the south when he did at the former period, pass at the latter period six hours before him, and so on.

Referring to Fig. 3, the June position of the earth, we find Orion in line with the sun, therefore invisible from all parts of the earth. Remembering also that the sun is south at midday, we should at this period, upon facing the south, find Arcturus on our left or east, α Pegasi on our right or west, and α Lyræ behind us, consequently to our north.

Without further detailed explanation it will now be evident that Arcturus will be south at six p.m., α Lyræ at midnight, and α Pegasi at six a.m. This will show that since December each of these stars has gained twelve hours on the sun, for α Pegasi in December was south of us at six p.m., whereas in June he is south at six a.m.

In September (see Fig. 4) Arcturus would be nearly in line with the sun, consequently invisible, α Lyræ would be south at six p.m., α Pegasi at midnight, and Orion at six a.m. The various stars would now have gained eighteen hours on the sun by the revolution of our earth.

From Fig. 4 (September) we should find α Pegasi rising in the east at six p.m., and setting at six a.m. in the west, whilst Orion would be rising at midnight, and would be south at six a.m. Thus, taking the rising only of Orion, we should find in December that it occurred about six p.m., in March at noon, in June at six a.m., in September at midnight.

A quiet examination of the little diagram to which reference has been made will explain the cause of all these variations; but it will be easily seen how hopelessly intricate they would appear to a person who had merely observed the facts, but had never called to his aid four little circles, a centre, and a larger circle, or any similar contrivance to aid him to realize these really simple but interesting facts.

For the sake of avoiding confusion, we have merely referred to four principal stars or constellations; but any person must perceive that we might fill in the spaces intermediate between these with any number of stars situated as they are in the heavens, and he could then tell exactly where these would be found at the different periods of the year.

In consequence of the revolution of the earth round the sun, we have, as has been shown, two singular results: the first is the change in the seasons—the regular progress from winter to summer, which causes the face of the country to exhibit an utterly different appearance in all parts of the world, except immediately in the vicinity of the equator; and we have a less perceptible one to the average person of a change in the apparent position of the stars, or of a different group of stars, being visible at various times of year.

Both the above changes, viz., that of the stars and the sun, occur in connection with fixed objects, for at present we may consider that both the sun and the stars are fixed. When we have to deal with moving bodies like the other planets of the system, we have a joint movement to consider, which will produce quite different results from those which have already been described. We will, therefore, now offer a few remarks upon the effects resulting to the planets from the earth's revolution round the sun.

The various fixed stars are invariably seen in the same part of the heavens and at the same time of year. Orion, for example, will always be to our south at midnight about December, whilst α Lyræ will occupy the same position during midnight in June. They will all be arranged in the same form or groups likewise, and to the eye unaided by instruments they appear to occupy exactly the same position in the heavens. The planets, however, do not thus appear with regularity in the same places, but they move round over nearly a similar course to that pursued by the sun, and they may consequently be seen in any of the signs. Thus we might perceive Mars, for example, in Aries, Libra, or Capricornus, or in any other sign of the zodiac. The reason of this is that Mars moves independently and round an elliptical orbit, just as does the earth; so that, if we examine the preceding diagram, and notice the letters M, A, R, S, we should observe four positions of Mars.

Now let us suppose that Mars is at M in his course when the earth is at Fig. 4; Mars would then appear to be at the commencement of the sign Aries.

In about six months afterwards Mars would have reached to the point A, whilst our earth had journeyed on to Fig. 2; Mars at this date would appear in the sign Gemini.

In six months more the earth would again be found at Fig. 4, whilst Mars would be near R in its orbit, consequently invisible, because behind the sun.

Again, in six months more the earth would have travelled round to Fig. 2, whilst Mars would have reached S, and would in that position seem to be in the sign Capricornus. Of course, in consequence of thus appearing in different parts of the heavens, Mars would rise, pass the south, and set at entirely different hours at various times of the year. And this is the case with every planet, the greatest variations in a short period occurring in connection with the planets nearest to the earth, because they travel the most rapidly.

These are a few of the results which take place in consequence of the earth's revolution round the sun, and of the planets also moving in the same manner, but at a greater or less speed. Astronomy, however, is so vast a subject, and is so uninteresting if only learnt in a parrot-like manner, that we have ventured in the preceding pages to give fully only two principal movements of our earth, trusting that the reader, having found these intelligible, will not be content to stop here, but will search in the many books now published for additional information in reference to the movements, appearance, &c., of the different celestial objects seen each night in the heavens.

THE WEATHER.

There are few subjects which become of more practical every-day use than a knowledge of the weather which is likely to take place during the next twenty-four hours. At the present time our knowledge of the causes producing a change of weather is in its infancy. We have, it is true, various kinds of barometers, and these, in some instances, serve as indicators; but still we have not yet arrived at sufficient proficiency to foretell with certainty the conditions of weather during the next forty-eight hours.

In some parts of our world the seasons are so divided that there is a rainy and a dry season—rain rarely coming at any period except during the rainy season; but in the British Islands there is no such arrangement. We may have a downpour of rain immediately after a bright clear sunny day, and when we least expect it a thunder-shower bursts upon us. These sudden changes, however, are foretold in the generality of instances, and by careful observation we may be able to make preparations for them.

The conditions which indicate certain changes of weather often differ in different localities, that which means wind in one place indicating rain in another. The first step towards becoming weather-wise is, therefore, to study the changes at certain localities, and not to be too ready to generalize results.

In judging of coming weather, we will first refer to appearances in the sky.

During the night, when the stars are distinctly seen and twinkle more than usual, we may anticipate wet on the following day. When the dew begins to fall early, and there is much dew in the morning, a fine day may be anticipated. When the sky at sunset is red and rosy tinted, a fine day may be anticipated, even though many clouds prevail; but when it is so in the morning, rain or wind is probable. A greenish or pale yellow sky at sunset indicates rain, also when the sun sets in a heavy bank of clouds. When, during early morning, the sun rises amidst a haze or fog, above which a blue tint is visible in the sky, a warm bright day may be anticipated. When, early in the day, masses of pale clouds of a woolly appearance are piled one above another, heavy rain may be expected; but huge mountainous-looking clouds of a yellowish tint may indicate fine weather or brief showers. Near the coast, inky-looking fleecy clouds indicate rain; as also light scud, but the latter often foretells wind only. When we find that overhead there are dark masses of cloud, but no rain falls, it is very likely that most suspicious-looking clouds to windward may also pass over us without rain. When small clouds are seen to disperse, fine weather may be anticipated; but when clouds seem to increase in size, rain is probable.

Animals are peculiarly sensitive to coming changes of weather, and by a study of their habits we may judge of what is coming. During summer-time spiders usually make a fresh web every twenty-four hours. When the weather is wet these creatures will not work, but as soon as fine weather is coming they commence building new webs. When a number of new spiders' webs are observed, a fine day may be anticipated.

If we hear a lark ascending in the air and singing when the morning is dull and showery, a fine day is probable. When swallows fly very low and stay near home, and when rooks are wild in their flight, rain and wind may be expected. When swallows and swifts glide about at great heights, fine weather will probably continue.

Cats, being highly electrical creatures, are readily influenced by coming changes, and usually rub themselves frequently, especially behind their ears, when bad weather is coming.

Many other creatures, such as crickets, frogs, bats, &c., may be watched with advantage as indicators of weather.

From very ancient dates down even to the present day, many persons are under the impression that the moon's changes are the cause of the changes in the weather, and immediately the latter is spoken of, they refer to the date of the former. Any influence which the moon produces ought to influence a whole district alike, and ought to produce the same effect on so small an area as England. Experience, however, shows that often when it is calm and fine say at Dover, it is wet and windy at Plymouth, showery at Liverpool, fine at Hull, and so on. Forgetting these facts, imperfect observers have often concluded that because it began to rain where they were immediately after full moon, therefore the full moon caused this, whereas a few hundred miles off directly opposite results occurred. Thus a full inquiry appears to have resulted in the conclusion that little, if any, effect can be attributed to the moon.

Many kinds of barometers are in use at the present time, and indicate with more or less accuracy the coming atmospheric changes: the best of these is the Aneroid Barometer, which is now made with considerable accuracy. The large Mountain Barometer, which has a long column of mercury, is also a very sensitive instrument.

A barometer should be placed in a convenient position, where it may be seen at any time of day and with little trouble. It should be set every morning and evening, and a memorandum made of its height.

The average height of the barometer in England, at the sea level, is about 29·95 inches; when we rise 100 feet the barometer falls about one-tenth of an inch, and *vice versâ*.

The barometer is in itself a study, and its changes require careful observation. To such as desire a knowledge of this instrument we recommend a study of "The Weather Book," by the late Admiral Fitzroy.

The heights of mountains can be obtained with fair accuracy by means of the barometer. Two readings are taken, one at the lower of two stations, the other at the upper; the difference in altitude can then be found by the following rule, where D represents the vertical difference in feet:

$$\mathrm{D} = 55{,}000\,\frac{\mathrm{L} - u}{\mathrm{L} + u};$$

where L represents the reading at the lower station, u the reading of the barometer at the upper station. Thus, if the reading were 29·800 at the lower, and 29·653 at the upper, we should have the following:

$$55{,}000 \times \frac{\cdot 147}{59\cdot 453},$$

which gives 136 feet for the difference of level between the two stations.

The weather in England is much affected by what we term an average, that is, there are about the same number of wet days every year, and about the same amount of heat each year. Thus, if during January, February, and March, for example, it is very wet and cold, much more so than usual, then we may expect in April or May warmer weather than usual; so that, by remembering past weather, we may predict that which is to come.

To the various kinds of clouds have been given names, such as Cirrus, Stratus, Nimbus, and Cumulus.

Cirrus is a light fleecy cloud, usually seen after fine clear weather. It is sometimes called "mares' tails," it being like hair or feathers.

Stratus is a smoke-like cloud, very common, with ill-defined edges. Rain does not fall from this, though it often conceals the stars or dims the sun.

Nimbus is the heavy-looking soft shapeless cloud, which may well be termed the "rain-cloud."

Cumulus is a hard-edged, well-defined cloud, the outline of which may be well traced.

It usually happens that these clouds are mixed, and may then be described as Cirro-Stratus, signifying a mixture of cirrus and stratus; Cirro-Cumulus, a mixture of cirrus and cumulus; Cumulo-Stratus, &c. Sometimes, for brevity's sake, only the first or first and second letters are used, and C or Ci stands for cirrus, Cu for cumulus, and so on.

For a few shillings a barometer and thermometer may now be procured, and observations may be made with these morning and evening, so that, by comparing these with the changes that follow, we may become very accurate foretellers of the weather, and may often save ourselves a wetting, or avoid starting on a journey in waterproof when, half an hour after leaving home, the sun shines brightly on us.

SUN-DIALS.

The very earliest form of clock or time-measurer was a sun-dial. We read of the sun-dial of Ahaz in Scripture, whilst among ancient nations, such as the Indians, Chinese, &c., sun-dials were common.

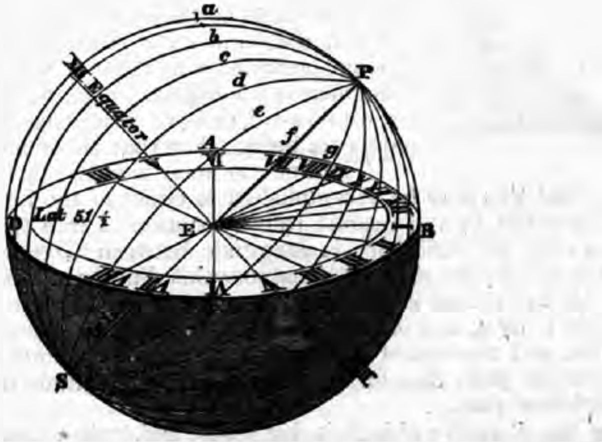
The principle of the construction of sun-dials depends upon the fact that during twenty-four hours the sun appears to move round a circle part of which is above and part below the horizon, and to return at the end of twenty-four hours to the same point from which it started.

If we resided at the North Pole of the earth, the construction of a sun-dial would be extremely simple. We should, when the sun was visible, find it moving round the horizon at a nearly uniform height, and we should then say that, as the sun moved round the horizon in twenty-four hours—that is, round 360°—it would move over 15° in one hour, and over 1° in four minutes of time. Thus, by dividing 360 by 24, we obtain this result. A common circle, therefore, with an upright in the centre, would be our sun-dial.

When, however, we are situated in any other part of the world, the lines which are equally distant from each other at the poles will be in some cases farther apart, and in other cases nearer together. The following diagram will aid in making this fact manifest.

Suppose P and S to be the north and south poles of the earth; *a*, *b*, *c*, *d*, *e*, *f*, and *g*, meridians or divisions 15° apart. These lines, as they cut the equator, will be equidistant from each other, but they will vary in distance when they cut the circle A B C D.

A B C D is the circle suitable for a latitude equal to the distance of *a* from the equator; and the distances apart of the various figures, I., II., III., &c., may be calculated by spherical trigonometry.

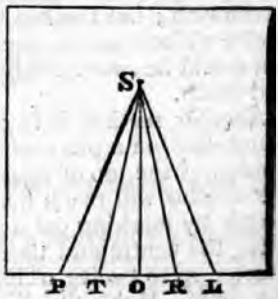


It being our object, however, to give the most simple means of making a sun-dial, we shall avoid all calculations which may require mathematical knowledge, and deal only with the subject in an easy, practical manner.

Thus we will suppose a sun-dial is required to be made for any part of Great Britain or Ireland, and we will proceed to make one.

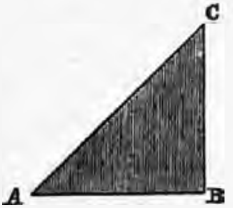
First examine a map of the county, and look down the side and find what is the latitude of the place on which your sun-dial is to be placed. Suppose this latitude to be $52\frac{1}{2}°$. Take a piece of cardboard like the annexed, and about the position S make a mark, and draw a line, S O, parallel to the sides of the card. The size of this card may be about eight inches or a foot square.

Next take a common protractor, or instrument for setting off angles, and from S on each side of S O set off angles of 12°, such as are represented by the lines S T and S R. Again, from the line S O set off angles of 24° 37′ in the same manner as the preceding, and draw these lines as shown by S P and S L. Again, set off 38° 25′, and 53° 57′, and 71° 20′ on each side of S O, and finally 90°.



Upon referring to the table at the end of this article, these angles will be found opposite $52\frac{1}{2}°$ of latitude. If, however, the latitude were different from $52\frac{1}{2}°$, we should set off the angles shown opposite this latitude, instead of those we have mentioned: thus for $51\frac{1}{2}°$ of latitude 11° 51′ would be the first angles set off, and 24° 19′ the next two.

Having marked off the card, we next cut a triangle in the annexed form, making the angle C A B equal to the latitude of the place for which the sun-dial is to be constructed. This triangle may be made of cardboard, brass, tin, &c., according as the dial is made of cardboard, tin, &c.



Fix the triangle on the dial so that the point A coincides with the point S on the dial, and the line A B coincides with the line S O, and take care that B C is exactly perpendicular to the dial.

The dial is now completed, and is ready to be fixed in its position, which, for a dial constructed in this manner, is a horizontal position. A horizontal stand, a window-sill, or a post firmly fixed in the ground would do, care being taken that this foundation is horizontal.

The line S O must now be placed exactly north and south, and this may be accomplished in either of the following ways:

Set a watch by the nearest railway station to true Greenwich time; find from a map the difference in longitude between Greenwich and where you want to place your sun-dial. Suppose this difference to be 1° 16′ west. Multiply 16′ by 4, and it becomes 64 seconds of time—that is, 1 m. 4 s.; also multiply 1° by 4, and it becomes 4 minutes of time, because degrees become minutes, and minutes of arc become seconds, according to the proportion of 24 hours for 360°: thus for 1° 16′ difference of longitude there will be 5 m. 4 s. difference of time.

The sun at twelve o'clock is due south, and it then casts a shadow from an upright object due north. To find when it is south, we allow for the difference of time due to longitude and for the clock being before or after the sun. In many almanacks (Hannay's and others) the allowance between sun time and clock time is given; and this, as well as the allowance due to longitude, being made, we obtain twelve o'clock by the sun at our position, and can then place the line S O so that the shadow of the triangle is over it.

Example.—On the 21st of November, 1867, I wanted to set a dial north and south by the sun at Liverpool. Having set the watch to Greenwich time by the railway, I found that there was 11 m. 30 s. difference of time due to the longitude, Liverpool being west of or after Greenwich.

There were 14 m. 2 s. difference of time between the sun and a clock on the 21st of November, as shown by an almanack, the sun being *before* the clock. Therefore at Greenwich the sun would be south 14 m. 2 s. before twelve. At Liverpool it would be twelve o'clock when it was 11 m. 30 s. after twelve by Greenwich; but the sun would be south at Liverpool 14 m. 2 s. before it was twelve o'clock there. Hence, at 2 m. 32 s. by the watch set to Greenwich the sun would be south at Liverpool, and the sun-dial might then be placed north and south.

Another method is to place a straight stick exactly upright by means of a plumb-line on a piece of level ground; at about nine a.m. mark where the shadow of the top of this dial comes to, and mark this spot: about three p.m. the shadow will reach the same length,—and we can tell when it is the same length by marking out a part of a circle, the point of the stick in the ground being the centre and the length of the shadow the radius. The shadow gets shorter up to twelve o'clock, and then longer again till it reaches the part of the circle. Halve the distance between the two shadows of equal length, and join the point thus found with the point of the stick, and this line will be north and south, and the sun-dial may be placed north and south by its aid.

When the sun-dial has been placed in position, it will then indicate *sun* time, and we must add or subtract the allowance due for the difference between sun time and clock time, in order to find the true local time.

The following table, for the 1st and 15th of each month, shows the allowance to be made to sun time in order to obtain true time.

			M.	S.
JANUARY	1st	add	3	43
"	15th	"	9	37
FEBRUARY	1st	"	13	50
"	15th	"	14	24
MARCH	1st	"	12	36
"	15th	"	9	11
APRIL	1st	"	4	2
"	15th	neither add nor subtrct.		
MAY	1st	subtr.	2	58
"	15th	"	3	51
JUNE	1st	"	2	30
"	15th	neither add nor subtrct.		
JULY	1st	add	3	26
"	15th	"	5	36
AUGUST	1st	"	6	4
"	15th	"	4	20
SEPTEMBER	1st	neither add nor subtrct.		
"	15th	subtr.	4	44
OCTOBER	1st	"	10	14
"	15th	"	14	6
NOVEMBER	1st	"	16	17
"	15th	"	15	18
DECEMBER	1st	"	10	52
"	15th	"	4	46
"	24th	neither add nor subtrct.		

According to different years, the allowance for seconds will vary slightly. The dates between those given will require a proportional allowance to be made.

Beyond the 90° or six hours on the dial, two additional angles may be set off for seven and eight hours p.m., these angles being equal respectively to those for five and four hours. When the sun-dial is completed and placed in position, as well as figured, it will be somewhat in the following form:

Various other sun-dials may be constructed, but that described is the most simple, and is generally useful.

Such a dial, fixed in the grounds or near the house in country localities, is a very good check on the clocks, and serves as a time-corrector. We have calculated the angles for several places in England, drawn the diagram on cardboard, and given it to a local ironmonger to cut in brass. The dial has been erected at an expense of a few shillings, and has not only been a useful instrument as regards time, but has been an interesting ornament in the grounds.

ANGLES FOR CONSTRUCTING A HORIZONTAL DIAL FOR LATITUDE FROM 50° TO 59½°.

Latitude	Morning 11 Afternoon 1		Morning 10 Afternoon 2		Morning 9 Afternoon 3		Morning 8 Afternoon 4		Morning 7 Afternoon 5		Morn. 6 Aft. 6
	deg.	min.	deg.	min.	deg.	min.	deg.	min.	deg.	min.	deg.
50 deg.	11	36	23	51	37	27	53	0	70	43	
50½ „	11	41	24	1	37	39	53	12	70	51	
51 „	11	46	24	10	37	51	53	23	70	59	
51½ „	11	51	24	19	38	3	53	35	71	6	
52 „	11	55	24	28	38	14	53	46	71	13	
52½ „	12	0	24	37	38	25	53	57	71	20	
53 „	12	5	24	45	38	37	54	8	71	27	
53½ „	12	9	24	54	38	48	54	19	71	34	
54 „	12	14	25	2	38	58	54	29	71	40	
54½ „	12	18	25	10	39	9	54	39	71	47	
55 „	12	23	25	19	39	19	54	49	71	53	90
55½ „	12	27	25	27	39	30	54	59	71	59	
56 „	12	31	25	35	39	40	54	9	72	5	
56½ „	12	36	25	43	39	50	54	18	72	11	
57 „	12	40	25	50	39	59	54	27	72	17	
57½ „	12	44	25	58	40	9	54	36	72	22	
58 „	12	48	26	5	40	18	54	45	72	28	
58½ „	12	52	26	13	40	27	54	54	72	33	
59 „	12	56	26	20	40	36	55	2	72	39	
59½ „	13	0	26	27	40	45	55	11	72	44	

THE MICROSCOPE.

Whether for amusement or instruction, there is no instrument so deservedly popular as the Microscope. Other amusements are soon exhausted, but the little world which the microscope reveals is inexhaustible: there is always something wonderful or something new to be seen, and the instruction it affords is unparalleled. Many beautiful objects may be observed by a single lens, which can be folded and carried in the waistcoat-pocket; but there is a limit to the use of such instruments, and the only satisfactory microscope is the compound microscope, which a good optician will supply at a cost of from three guineas upwards. It may be said that cheaper instruments can be had, which appear to do their work well. Perhaps so; but as we are about to recommend only what we know to be worthy of recommendation, we should not name a lower priced instrument than such a one as can be procured of Mr. C. Baker, of No. 244 High Holborn, for three guineas. It is not with any invidious spirit that this name is given. Other opticians may supply microscopes as good at the price, but this instrument will serve to illustrate all we have to say about the microscope, and we shall adopt it as the standard of all our observations.

The microscope we have named is packed in a neat polished mahogany box, with lock and key. The size of this box is 10 in. high, and 6 in. deep, by 7 in. wide. At the top is a brass handle by which it may be carried, and when fully replenished its weight is about 7 lbs. So much for the case and the microscope within it. But we must open the case and take out the instrument. On opening the door we observe at the bottom of the case a neat little mahogany drawer divided in two parts: one part is "racked" for holding glass slides and mounted objects, the other portion will contain small articles of apparatus, which we shall describe hereafter.

We draw out the stand of the microscope, which is clamped to a square of mahogany, so as to ensure greater steadiness, an object of importance in a microscope; from the left side of the case we take the brass tube or body, and screw this to the stand, so that it presents nearly the appearance indicated in our woodcut (Fig. 1). A little cylindrical brass box slides into a hole at the top right-hand corner of the case. This we take down, unscrew the top carefully, take out the combination of glasses set in a neat kind of brass nozzle, which piece of apparatus is usually called the *objective* or object-glass. There is a screw at one end of this objective and a lens at the other. Let us screw this nozzle or objective into its proper place at the end of the tube or body of the microscope, and then, behold! it is the complete original of which our woodcut is a copy. Having put it together, the next step must be a careful examination of all its parts, and an appreciation of how these parts are to be employed in the examination of objects.

Fig. 1.

It is not our purpose to enter into a dissertation on the science of optics, for which we have neither room nor inclination; what we most desire is to instruct our reader how to use the mysterious little piece of machinery which has just been unpacked. The "why and wherefore" will be sought by-and-bye, and there are plenty of means of acquiring the theory when it is wanted. Big boys would be more likely to try and use such an instrument at once than to sit down and ponder over "the reason why," and little boys are not a whit less curious or impatient than their elders.

Some one will perhaps read these pages before he has obtained his microscope, and would like to know how high it stands, so that he may imagine what its appearance would be under a glass shade. For the especial benefit of such a one we have measured the instrument, and declare its full elevation to be 13 inches.

Place the left hand firmly upon the mahogany slab which supports the instrument, then with the right hand hold the top of the tube or body; draw the tube backwards, and it will be found to move easily to any angle, so that a tall boy or a short one, a man standing or a man sitting, can either of them look comfortably down the tube without any danger of dislocating his neck, which might be the case if the tube were fixed bolt upright

As the body moves freely on the pivots the lower portion will be seen to carry with it a circular mirror, which is attached near the bottom; this mirror, by an admirable arrangement of joints, can be turned in any direction. The use of such facility of motion will be seen by-and-bye. Above the mirror is a square brass plate with a round hole in the centre; this is called the *stage*, and upon it the objects to be viewed by the microscope must be placed. A movable bar passes up and down on the upper surface of this plate, which is useful to retain the slide containing the object in position. Above this stage is the tube with the object-glass screwed in at the *lower* end, and the eye-piece at the *upper* end. At the side of the tube or body, near the bottom, is a screw with a milled head, which may be moved by the thumb and finger: this is called the *fine adjustment*. It will be time enough by-and-bye to speak of its uses. Below the tube are two other milled heads, one on each side. Turn one of them towards you with the thumb and finger: they move easily, freely, and smoothly, and with their motion, behold! the tube of the microscope, with the eye-piece at the top and its object-glass at the bottom, glides up and down just as the operator wishes! A firm, steady, gradual motion here is a necessity in all good instruments. These milled heads and the screws which they move we call the *coarse adjustment*. Now, having learnt the names of all the parts of the microscope which at present we desire to know, let us put it to work.

Take a slide containing a mounted object, which is transparent, and one may be purchased of an optician for a shilling, which will serve as a model for

FIG. 2.

imitation. (Fig. 2.) It consists of a strip of glass, 3 in. long and 1 in. wide. In the middle, a circular disc of very thin glass is fastened by means of Canada balsam, and in the middle of the disc, between the thin glass and the thick glass, lies the little object to be examined—perhaps it is the tongue of the house-fly. Place the slide upon the stage of the microscope, with the label and the thin glass upwards. If the object-glass is in the way, turn it up by means of the coarse adjustment, so that the slide containing the object may lie flat on the stage, with its bottom edge resting against the movable bar which crosses the stage. This bar, you now see, will prevent the slide falling off the stage, even when the body is bent down to a convenient angle for looking through the tube. Then with the coarse adjustment bring the end of the object-glass to within about half an inch of your object. The tube is now supposed to lean just at the angle you wish, so that you may look down it in an easy position without bending the neck uncomfortably. If it is daylight, your microscope will be standing on a steady table by the window; if it is too dark for daylight, the microscope will be on a table equally steady, with a lamp, the flame of which should be only 6 or 8 in. away from the mirror of your microscope. Take the object off the stage for a few moments. Replace it by a piece of writing-paper large enough to cover the hole in the stage. Now turn the mirror with your finger and thumb, in such a manner that the light which falls upon it from the lamp shall be reflected up, and form a bright spot on the piece of paper just in the centre of the hole of the stage. When the light is thus properly adjusted, take off the piece of paper, and place the glass slide containing the object upon the stage in its place, so that the light reflected from the mirror falls just in the centre of the object, which may be kept in place by sliding up the movable bar. Now look down the tube. You see nothing but a bright disc of light like a full moon, perhaps. That is fortunate, because it proves that your light is properly managed. Now for the object. By means of the coarse adjustment you move the "body" of the microscope, and consequently the object-glass, a little nearer to the object. Proceed slowly, cautiously, and by no means near enough for the object-glass to touch the slide. Gradually, as you look down the tube, you will see the shadow of the object, and at length the indistinct image of the object will appear upon the bright disc of light at the bottom of the tube. Quit your hold of the milled head of the coarse adjustment, and apply your thumb and finger to the milled head of the fine adjustment. Turn this also slowly and gradually till the object appears clear and distinct upon the bright field or disc of light at the bottom of the tube. Now, if you have followed the instructions we have given, you will have overcome the first difficulty of seeing an object through your microscope. But why quit the use of the coarse adjustment, and apply the fine adjustment just as the object became distinct? For this reason: the fine adjustment has a much finer screw than the coarse adjustment, and by turning its head you will more easily hit upon that desirable point where the object is exactly in focus, and can be seen most clearly. A half-turn of the milled head, up or down, will throw the object out of focus, make it less clear and distinct, and convince you that you have hit upon the exact focus of the lens.

Fig. 3.

Whilst you are admiring the tongue of a fly, seen for the first time in your own microscope, we have a few words to offer about the objective, or object-glass, which you have taken out of the box, and placed upon the instrument, and used in looking at your first object.

The object-glass is called a half-inch objective, because its magnifying power is about equal to that of a lens with a focus of half an inch. But this object-glass is itself a compound of three glasses or lenses. Unscrew it from the tube and take it in your hand. You will now observe that you can unscrew a portion, and take off the lower or outer lens (*a*, Fig. 3). The two left may be used as an object-glass of 1 in. power. Take it in hand again, and unscrew another portion (*b*), and what you have left is now an object-glass of about $1\frac{1}{2}$ in. power (*c*); so that, you will observe, in one combination of lenses you have three powers, $1\frac{1}{2}$ in., 1 in., and $\frac{1}{2}$ in., which may be represented as follows:

One lens	— equal to	$1\frac{1}{2}$	inch	power.
Two lenses	,,	1	,,	,,
Three lenses	,,	$\frac{1}{2}$	,,	,,

If, however, when purchasing your instrument, you desire to possess glasses with a higher magnifying power, you may have, instead of the above combination, and at the same price, a triplet, or combination of three powers, the highest of which will be equal to a $\frac{1}{4}$ in., and which will divide into two other powers, one of which will be $\frac{2}{3}$ in., and the other $\frac{1}{3}$ in., which may be represented thus:

One lens	— equal to	$\frac{2}{3}$	inch	power.
Two lenses	,,	$\frac{1}{3}$	,,	,,
Three lenses	,,	$\frac{1}{4}$	,,	,,

Either combination, therefore, may be had; but if our advice were sought, we should recommend the first or lowest powers to any youth commencing with the microscope.

In order that some idea may be formed of the magnifying power of these glasses, we have ascertained that they magnify objects, each power as many diameters as are placed opposite to them in the following table:

$1\frac{1}{2}$ inch power . .	(one lens) . .	35	diameters.
1 ,, . . .	(two lenses) . .	75	,,
$\frac{1}{2}$,, . . .	(three lenses) . .	150	,,
$\frac{2}{3}$,, . . .	(one lens) . .	90	,,
$\frac{1}{3}$,, . . .	(two lenses) . .	175	,,
$\frac{1}{4}$,, . . .	(three lenses) . .	300	,,

By 150 diameters it is meant that the tongue of a fly, for instance, viewed with the $\frac{1}{2}$-in. power, is magnified so that it appears 150 times as wide or as long as it really is.

Having explained how this microscope is to be used, and what it is capable of performing, we will enumerate the remainder of the appliances which are supplied with the three-guinea instrument.

There is a pair of brass hand-tweezers for picking up little objects that you may desire to examine, which it would be difficult to raise with the thumb and finger. (Fig. 4.)

Then there is a pair of stage forceps for holding a minute insect for examination under the microscope, which is held fast at *b*, whilst the arm, *a*, is placed in a hole in the brass stage. The forceps can be turned round freely in almost any direction, so that the point, *b*, at which the insect is held, may be brought under the object-glass, and so turned that all parts of the insect may be examined readily. (Fig. 5.)

Finally, there is a "live box," the top of which can be raised (not unscrewed) and a drop of water containing any very small water-flea, or other minute aquatic insect, can be placed therein, the cap replaced, and when the "live box" with its contents is put on the centre of the stage, the little prisoner may be examined, sporting about in its native element. (Fig. 6.)

FIG. 5.

FIG. 6.

FIG. 4.

There are one or two special recommendations which the instrument we have been describing possesses, and which will commend it to all who are acquainted with what is requisite in a good instrument.

The stand is very firm and steady, so that there is no possibility of its overbalancing itself. The rack movement is smooth and easy, and the rack-bar is triangular. The screw at the bottom of the tube (for the reception of the object-glasses) is the "universal screw," so that any of the objectives made by the very best makers, and, indeed, everybody's object-glasses, will fit the instrument. The stage is constructed so as to receive either a condenser or polariscope apparatus, and the whole packs conveniently into a neat mahogany box which may be carried in the hand. So that, for its price, it is as excellent an instrument as any one could wish to place in the hands of a youth, and one that no one need be ashamed of using himself.

FIG. 7.

Hitherto our observations have been confined to the examination of objects of a transparent nature, with the light thrown through them; but there are many objects so opaque that they cannot be examined in this manner, but must have the light concentrated upon them by means of a "bull's-eye condenser." This is a separate piece of apparatus not included with the microscope above described, and may be purchased for about six or seven shillings. It is to be placed between the lamp and the microscope, and so adjusted that the rays of light pass from the lamp through the lens, and are condensed upon the object, which by this means is brightly illuminated. The lamp should not be more than 6 or 8 in. from the lens of the condenser. Any of three glasses or lenses. Unscrew it from the tube and take it in your hand. You will now observe that you can unscrew a portion, and take off the lower or outer lens (*a*, Fig. 3). The two left may be used as an object-glass of 1 in. power. Take it in hand again, and unscrew another portion (*b*), and what you have left is now an object-glass of about $1\frac{1}{2}$ in. power (*c*); so that, you will observe, in one combination of lenses you have three powers, $1\frac{1}{2}$ in., 1 in., and $\frac{1}{2}$ in., which may be represented as follows:

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The next matter for serious consideration is the collection of objects; and this need cause no uneasiness, for objects may be found everywhere. The house and garden will furnish a supply for weeks, especially if during the summer and autumn months; and when home is exhausted, a short walk is certain to afford something.

No one who possesses a microscope should go out without a bottle or box in his pocket, to contain any object which may come in his way. A very useful bottle is figured, which costs about $1\frac{1}{2}d.$ (Fig. 8, reduced.) By all means eschew stoppered bottles: corks are infinitely better, as well as cheaper. A

Fig. 8.

Fig. 9.

larger bottle will be required for dipping objects out of the water, with a wide mouth and a rim—what is called a "two-ounce" bottle—an India-rubber band, and a walking-stick. The India-rubber band will fasten the bottle to the end of the stick, and a collecting-bottle will be ready made. (Fig. 9.) If the bottle is fitted with a good cork, it may be carried home full of the results of the walk. Two or three small pill-boxes in the pocket are often found useful; but, above all, never forget the pocket-lens.

The structure of plants afford very interesting objects, almost without limit, such as the cuticle or outer layer of leaves. This may often be stripped from fresh leaves by the finger and thumb; but there are two more certain methods. One method consists in putting the leaves to be operated upon into a vessel of water, and allow them to remain until, in consequence of partial decomposition, the cuticle will separate itself from the leaf, or may be easily removed. By an occasional examination it will be readily determined when the soaking has been carried far enough. When such is the case, the cuticle may be floated off or removed with a camel-hair pencil. A fortnight is generally long enough for this operation.

A speedier method is to boil the leaves in a test-tube with diluted nitric acid for a few minutes; but we would commend the slower but equally certain process of maceration, especially to young people, acids being dangerous fluids to experiment with. The forms of cells in the cuticles of leaves are very variable, and any of the ordinary leaves of plants will furnish illustrations. They will also exhibit the stomata or orifices of the leaf surface.

The Lilac is a good leaf to exhibit these, the cuticle of under surface having a great many, and the upper surface but few. The cuticle of the under surface of the leaf of the Holly, and also of the common Laurel, should be obtained. A commonly cultivated exotic plant, called *Yucca gloriosa*, affords another form of cell and stomata. Some leaves are clad with very beautiful hairs, which can be removed with the cuticle. Of these, another cultivated foreign plant, *Deutzia scabra*, or its companion species, *Deutzia gracilis*, furnishes star-shaped hairs. Stalked hairs of this character abound on the woolly leaves of two or three species of Arabis common in gardens. (Fig. 10.) The mealy Guelder Rose and the Virginia Stock furnish also hairy cuticles. The cuticles of the petals (or floral leaves) of the Geranium and Pansy, and many other plants, form exceedingly beautiful objects

FIG. 10.

The cellular structure of the pith of the Elder, and even more beautiful star-like cells of the pith of the common Rush, afford examples of the cellular tissue of plants.

The spiral vessels may also be obtained from the stems of herbaceous plants, such as the Hogweed and Rhubarb. By maceration in water, the spiral strings may be drawn out easily. The maceration should be continued till the stems are quite soft. In some cases the spiral is simple, or composed of one single thread; in others several threads form a band. The leaf-cells of the common Bog-moss *(Sphagnum)* should not be forgotten, though of a different character. These require no maceration.

To transfer these delicate structures to the glass slide requires care. They should be first cleansed, under water, of all impurities, extraneous tissue wiped away with a camel-hair pencil, and, in the case of spiral tissue, two needles, with the heads inserted into wooden handles, may be used to separate the threads. The glass slide may be passed under the object as it lies in the water, and then gently raised out of the water with the cuticle or other tissue floated out smoothly upon it. The slides should first have the water drained from them by resting a minute or two on the edge or on one end, and then laid flat to dry. If the objects are to be examined at once, the glass cover may be placed over them as soon as removed from the water, and the object transferred to the microscope; but if the object is to be preserved for future examination, it must be mounted. The process of mounting varies with different classes of objects, and the manipulation can only be perfected by experience.

The dissection of all objects requires a little help from a lens: if this is held in one hand, and only one hand left free, a great inconvenience will be encountered; but a simple contrivance to hold the pocket-lens will leave both hands free to use the needles. If a penholder, or other rounded rod of wood, be inserted in a heavy block, and the pocket-lens be made to slide up and down on this, by passing

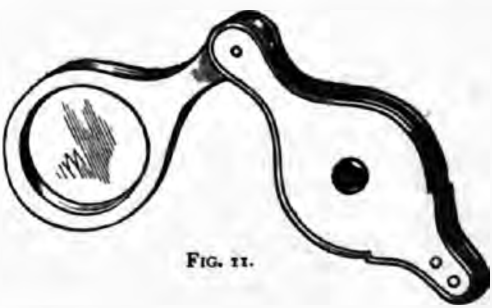

FIG. 11.

the rod through the hole in the handle of the lens, it may be so elevated or depressed that the object under the lens will be just in focus, and may be dissected with both hands at liberty. Some persons use a watchmaker's eye-glass for the purpose of dissection instead of a pocket-lens. (Figs. 11, 12.)

FIG. 12.

Sections of wood and other hard portions of plants, although very instructive and beautiful when well done, are not to be recommended to the young amateur. It is hardly possible to cut good sections of wood without a section-cutting machine, and there are hundreds of other good objects which entail no such trouble, so that we will leave all experiments in wood-cutting for the future.

There are many objects, both in the vegetable and animal kingdom, which may be mounted dry as opaque objects; and as this is the easiest method of mounting, we will describe how it is done. Pieces of wood, 3 in. long, 1 in. in width, and about $\frac{1}{12}$ in. in thickness, with a hole in the centre about $\frac{3}{4}$ in. in diameter, may be had for about one shilling per dozen (Fig. 13). Take one of these, and a piece of "dead black" paper 1 in. square, paste the black paper over the hole in the wood, with the black side to the wood. Turn the wooden slide over, and you have a cell $\frac{3}{4}$ in. in diameter, $\frac{1}{12}$ in. deep, with a black bottom. In this cell the object is to be mounted. For this purpose, gum tragacanth dissolved to a mucilage in water is preferable to gum arabic. The pollen of the Hollyhock, or small seeds, or little Beetles may be mounted by placing a little gum tragacanth mucilage on the centre of the black paper with a camel-hair pencil. Lay the object upon the gum: it will adhere after gentle pressure, and must be left exposed till thoroughly dry. Cover the cell with thin glass a little larger in diameter than the cell: $\frac{7}{8}$th squares will do well enough. A little Canada balsam or gold-size under each corner will secure it in its place.

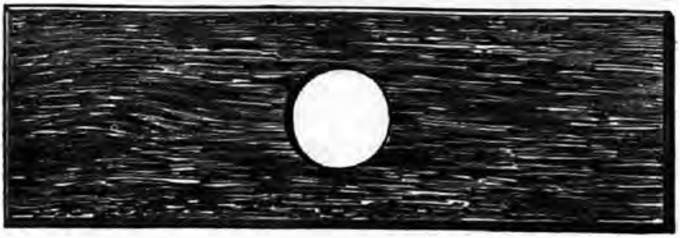

FIG. 13.

FIG. 14.

When the glass is fixed the slide may be covered with ornamental paper, or left uncovered, as taste may dictate. A small gum-ticket should be fixed at one end of the slide, and the name of the object, and any other information, written thereon. If the objects and the mounting are not quite dry before the slides are covered and put away, then *beware of mould*, for your best slides may be ruined. (Fig. 14.)

We come now to an enumeration of a few such objects, of a vegetable origin, as may be mounted in cells, to be viewed as opaque objects with power of 1 in. Vegetable seeds are easily obtained in the autumn, and afford a great variety; as, for example, those of the Dandelion, surmounted by the feathery pappus by means of which they float about like parachutes; the seeds of the common Chickweed, of the Sweet William, and the Clove Pink. The seeds of the Poppy are also characteristic, and those of the Snapdragon, or Antirrhinum, the Mulleins, and of that favourite garden flower, the Eschscholtzia, must not be forgotten. To these may be added Coreopsis, the Larkspur, St. John's Wort, and the less-known Eccremocarpus, Sphœnogyne, and *Paulownia imperialis*. In fact, all small seeds should be examined, for we do not know yet, except in a few instances, what seeds are suitable and interesting objects. By all means we would strongly recommend the correct and explicit naming of all objects which may be mounted. Unnamed objects, or those named vaguely as "antennæ of gnat," "scales of butterfly," or "tongue of fly" are little better than rubbish. It is not difficult, in these days of scientific journals, to learn what species of gnat, butterfly, or fly affords the object, and then it possesses an interest and a value. Objects named only in the vague manner above indicated would prejudice the possessor in the estimation of any sensible man.

Small portions of the leaves of many plants may also be mounted in the cells, and will exhibit the hairs to advantage. Ferns also may have a fragment of the under surface of the fronds, showing the fructification, similarly treated. The pollen of the Hollyhock, Mallows, and many other plants; the capsules of Mosses, some kinds of mould and other fungi, should not be forgotten. Amongst animal life, small Spiders, Beetles, the Eggs of Butterflies, heads, wings, wing-cases, small shells, gall-insects, larvæ of various kinds, and all sorts of minute insects may be mounted in the same manner; indeed, all small opaque objects of any kind, of which Nature is prolific everywhere.

Mounting objects in fluid for higher powers is a much more difficult operation, and one we should not advise any amateur to attempt until he is well able to mount opaque objects satisfactorily. It requires a long experience before the difficulties of mounting in balsam or fluid can be overcome. Different classes of objects also require different modes of treatment, and some a long course of preparation by soaking in liquor potassæ, spirits of turpentine, or other fluid. If we give an outline of the process of mounting in balsam, it will be merely with a view of briefly indicating rather than attempting to teach.

Canada balsam is the most common medium for mounting. Take a sheet of paper, and mark thereon with ink the outline of a glass slide, 3 in. by 1 in. Carefully, by drawing lines from one angle to its opposite, ascertain the middle of the space, which will be indicated by the crossing of the lines. Having cleaned a glass slide, lay it upon the ruled space; let fall a single drop of Canada balsam upon the slide in its centre, just over the intersecting lines, which will be seen through the glass. Insert the object—a tuft of hair, a scale, or whatever else it may be—in the drop of balsam. Having cleaned a cover of thin glass of the requisite size, say $\frac{5}{8}$ in. diameter, place it on the balsam; press the cover gently, and the excess of balsam will flow out around it. Care must be taken that no bubbles of air are left beneath the cover. Place the object on one side for a week to dry. At this period, if desired, a black line of cement, asphalte, or varnish may be laid around the edge of the cover with a camel-hair pencil. Do not omit to attach a label, number, or name to the slide as soon as mounted, or it may be forgotten. Some persons prefer, and for some objects it is preferable, to place the object first upon the glass slide, in the centre, and let the drop of balsam fall *upon* the object. Some also prefer, instead of pure balsam, to mix old and thick balsam with chloroform until of such consistence that a drop will fall easily from a thin rod. Young persons without experience will find "hard picture copal varnish" better than either, being less liable to enclose little bubbles of air.

Some objects are only seen to advantage whilst living, and a good variety may be obtained from ponds, ditches, or small pools of water, containing water-weeds. These may be found adhering to the duckweed, anacharis, myriophyllum, under surface of water-lily leaves, or floating freely in the neighbourhood, according to their habits. The Green Hydra will be found in such situations, adhering to weeds, and also the fresh-water Polyzoa and some Rotifers; the Crown animalcule, Floscules, Melicerta, Plumatella, &c., and, floating freely, the Water-Fleas, Cyclops, larvæ of various kinds, Water-Mites, and small Annelids. Vegetable organisms of a very interesting kind are to be collected from floating scum, or coating the mud. Diatoms and Desmids, the ambition of microscopists in these days, are very widely and generally distributed, and green Confervæ abound in every stagnant ditch. The rolling Volvox will in itself afford amusement and instruction for many an hour. All these should be examined whilst still fresh and living.

Objects to be looked over at leisure are almost unlimited. All insects intended for preservation, wholly or in part, should be kept in spirit and water, about two parts of water to one of spirit. They may be taken out and dissected or examined at any time, and in this manner tongues and feet of flies, claws and mandibles of spiders, stings and mouths of bees and wasps, antennæ and legs of beetles, and very many others, may be kept in store for wet and wintry seasons, so that the microscope never need be unemployed for want of objects. A long list of common objects, with short descriptions and a great many figures, under the name of "One Thousand Objects for the Microscope," is sold for one shilling by the publisher of this volume, and contains all that kind of information which it would be quite impossible to include within the limits of this article.

Finally, we would give two or three general precepts, which it is desirable should never be forgotten. Let your object be presented to the microscope in the best manner possible for ascertaining what you wish to observe; let your light be good, steady, not too glaring, but properly adjusted and directed; and always examine every object first with the lowest power, going gradually to the highest. These are the first elements of success. In addition, we may suggest three things which should not be done. The microscope should not be left exposed to the dust and the chances of accident when not in use; the glasses must not be wiped with harsh, dirty, or gritty rags or leather, but with a soft clean piece of wash-leather, kept specially for that purpose; and the microscope should not be lifted or carried by the tube or body, but always by grasping the lower portion of the stand. Never forget to have plenty of light, of patience, and of perseverance.

BOTANY.

There is no royal road to any of the sciences, by means of which the student can acquire all the knowledge necessary to become its master, and avoid all the trouble. Neither is it desirable that knowledge should be acquired without labour, for that which costs but little is less valued, and commonly that which entails on us but little labour to learn is soon forgotten. Those who are in earnest in their desire to know something about plants will soon find their difficulties vanish one by one, and at last will have the gratification of looking back with pleasure on what they have achieved. How often have we heard grown-up men and women say, "I wish that I had learnt something of botany when I was young;" meaning thereby that they are sorry at having missed opportunities and advantages for the study of plants in a regular and methodical manner. All sciences *must* be studied in a regular and methodical manner, for there can be no science without method. It shall be our endeavour, as briefly and plainly as we can, to show how something may be learnt about plants, by explaining their structure, and the method employed in their classification. The space at our disposal will not permit us to do more than introduce the subject, and prepare the student to take up a book specially devoted thereto, and read it with understanding and profit.

Let us go into the lane, and pluck the first flower that we see blooming on the hedgerow—it matters not what so long as it is in bloom. It will not answer our purpose to have the blossom only, with just a few inches of the stalk, but the whole plant must be taken up, the fragments of mould carefully shaken from the roots, and the plant laid before us on the table. Hence we do not require anything very large: it may be a daisy, or a buttercup, or a primrose, a speedwell, or a dead-nettle, but we must have the whole plant. An oak tree is a plant, but we require nothing so large; duckweed is a plant also, but we desire nothing so small. Nevertheless, what we have to say of one will to a large extent be true of all, for our first object is to learn something which applies to all flowering plants.

The plant lying before us has a root, a stem—perhaps also branches, which are only offshoots or parts of the stem—leaves, and flowers. This is the enumeration of the parts of the plant which anyone unacquainted with botany would give. The stem may be very short, as in the daisy and primrose, or long as in the buttercup and dead-nettle, but to all there is a very decided and palpable root. It is often difficult to determine exactly where the stem ends and the root begins. The root is, in fact, only the lower and underground portion of the stem. Some botanists call the root and stem together the *axis* of the plant; whatever name is adopted, there is a very close connection between them. It will be better for us to regard them as distinct parts in the following remarks.

Before proceeding any further, we must at once assure our reader that we are no believers in botany without hard names or technicalities. Hard they are not, to any except the ignorant, and may be easily remembered if their meaning is understood. All our writing, if we avoided technicalities, would be useless, since any other book on the same subject, in which the terms employed in the science are used, would be just as unintelligible as though we had not written at all. The one great object, therefore, which we have in view is to make the workman acquainted with his tools, their names, and how to use them. The apprentice will learn to distinguish a plane from a hand-saw before he constructs a writing-desk or a chest of drawers.

After this brief digression we come back to our root again, and must ask our reader to think of all the different forms of root which he has ever seen, and class them together in his own mind under two groups, namely, those which are simple, or are merely single continuations downwards of the stem, and those which are compound, or composed of two or more parts starting from the same point. As, for example, the radish, the carrot, the turnip, the dandelion, and the speedwell have all single roots. They may be branched as they go down into the soil, but they are only single continuations of the stem. On the contrary, the dahlia, the onion, and many of the grasses possess a bundle of roots starting from the same point, which are sometimes branched, and sometimes are not. Following the plan which we have suggested, our pupil will soon arrive at the conclusion that, although the kinds which we have suggested, and many more which he may think of, are all roots, they have a very different appearance; and whilst it is quite correct to call them all roots, if we would distinguish one kind from another, we must have a name for each which would indicate its character, without giving us the trouble of making a drawing of the root, or using a long description. Here, then, we see the first necessity for the use of words or terms which all botanists will understand. Being agreed that for the different forms of roots different words should be employed, we will enumerate the most common.

A carrot or a parsnip are familiar examples of a kind of root which is thick and fleshy above, gradually tapering downwards to a point, like an inverted cone. Hence such a one is appropriately called a *conical* root. But if the root, instead of being largest at the top, thickens towards the middle and then diminishes again downwards, so that it decreases in both directions, like the roots of many varieties of radish, it becomes spindle-shaped, and is called a *fusiform* root. The turnip has a root, however, which resembles neither of these, and when well grown is nearly the shape of a boy's top. This may be called a turnip-shaped root, but the term generally employed is *napiform*, the word "*napus*" being the Latin for "a turnip." The common form of simple root, which proceeds downwards as a continuation of the stem, without enlarging, but becoming gradually thinner and thinner, often much branched, occasionally with only thread-like rootlets issuing from its sides, is known as a *tap*-root. It is not distinctly conical as in the root of the carrot, and is the commonest form of root amongst herbaceous plants.

Of compound roots, or those in which a bundle of little rootlets proceed from the base of the stem, a tuft of grass, or, still better, a stem of wheat or barley, affords an example. These rootlets, or little roots, being thin and thread-like, the tuft is called a *fibrous* root. When the rootlets are thickened, so as not to be thread-like or fibrous, but are still clustered together in a kind of bundle, it is called a *fasciculated* root, from the Latin word "*fasciculus*," which is often employed in botany, and means "a little bundle." There are modifications of form in the rootlets which compose the fasciculated root, as in the dahlia, in which each rootlet is thick, fleshy, and of a fusiform shape; in some others a portion only of the rootlets are thickened or swollen either once or several times throughout their length.

It will not be out of place here to remark that the bulb of the onion, the white lily, and many similar plants, is not a root, but a kind of bud composed of scales closely overlapping each other, and growing upon a button-shaped stem, from the under surface of which the fibrous root is produced. The potato (that portion which is cooked as a vegetable) botanists do not class as a root, but as a *tuber*, or swelling of the underground stem. Some roots last only one year, and are said to be *annual;* others last two years, and are called *biennial;* whilst others continue in vigour a longer period of time, and are said to be *perennial.*

The roots of plants serve a twofold purpose—to attach the plant to the soil, and to furnish it with the means of sustenance. For the latter purpose, the extreme ends of the thin fibres of the rootlets are of a more delicate and spongy texture, and by their means water, and the materials diffused through water, are taken up and conveyed to the plant. These spongy ends of the rootlets are called the *spongioles.*

Certain plants possess the power of producing additional roots, or organs having some of the functions of roots, according as they may be required for the purposes of the plant. These organs are termed *adventitious* roots, which, in the ivy, are like suckers growing from the stem to attach it more firmly to the tree or wall which supports it. In a species of Indian fig called the *banyan* these adventitious roots droop like ropes from the branches till they reach the ground, when the lower, or growing point, buries itself in the soil, makes a true root, and that which was at first but a swinging rope becomes an additional stem, scores of which may be produced by one tree, furnishing it with fresh means of support.

From the root of our plant proceeds the stem. This is another of the parts to which we have referred as essential to flowering plants. Sometimes the stem is so short that it can scarcely be distinguished, but it is commonly a very prominent feature. Whether this stem stands erect, or supports itself by twining around or clinging to another, or lies prostrate upon the ground, it is still a stem. If we cut across any stem, branch, or twig of a woody plant, such as a tree or shrub, we shall find, amid a great variety in detail, a uniformity in plan in all British trees and shrubs. The outer circle or circumference will be the *bark;* the inner or central point, the *pith;* and between this pith or *medulla* and the outside bark, the woody portion is deposited in layers, which appear as rings when a section of the stem is made, with lines called *medullary rays* cutting them from the centre to the circumference.

This is the structure of all *exogenous* plants; and as all British trees and shrubs are exogenous, it is the structure of all British trees and shrubs; another type of structure exists in the stems of *endogenous* plants, as in the palms of hot climates; and a third type in tree-ferns. Although the latter are not natives, we cannot on that account omit from a sketch of botany (though but a brief one) the principal features in the stems of the two groups or classes of flowering plants which are known botanically as *exogens* and *endogens.*

ENDOGEN.

EXOGEN.

Having given figures of the section cut across a stem of each kind, it will be seen that their appearance is very different. There is no true external bark in that called the endogen, no definite central pith, no rings of wood, and no medullary rays traversing the wood from the centre to the circumference.

But why are they called *exogens*, and why *endogens?*

The circles of wood shown in the section of an exogenous stem disposed one outside the other, represent periods of growth and repose. In temperate climes like our own each circle represents the wood which the tree has produced during the growth of one year, and which is deposited outside the growth of the previous year. Hence the outer circle is always the last formed, so that the newest wood is on the outside. Additions to the circumference of the stem, therefore, are made in an outward direction.

Exogen is a word of Greek origin, meaning "to grow outwards," and is applied to those plants which make additions to the thickness of their stems by layers of wood deposited the one outside the other at every period of active growth. In such stems there is an outer bark which may be separated from the wood, and between this bark and the wood all additions to the bulk of the stem are made.

Endogen is also a word of Greek origin, and its meaning is "to grow inwards." It was given to the class of plants to which it is still applied upon the assumption that all additions to the bulk of the stem were made from the centre. The exterior of such stems have no separable bark, and the interior consists of a soft cellular substance, in which bundles of a harder and more woody texture are produced; these are at first directed to the centre, but afterwards crossing the older bundles, pass outside them. The section above given represents these bundles cut across, and the manner in which they accumulate towards the circumference of the stem.

It has been said that all stems are not erect. It may be added that all stems are not produced above the surface of the soil, for some few have a subterranean habit, and others scarcely creep above it. If we watch the growth of strawberry plants in our garden, we shall observe what are termed "runners" (botanically *flagellæ*), which are stems running along the surface of the soil, rooting at the joints, and still running on. Or, if we attempt to root out the garden-mint, we shall find similar runners under the surface (called in this case *soboles*), sending down roots at the joints, and sending up leaf-bearing branches to the surface. Yet again, the purple flag or common iris affords an example of another kind of immersed or semi-immersed stem running upon the surface, or near it, and bearing thread-like roots from the under surface and tufts of leaves at the extremities of all the numerous branches. This kind of subterranean stem is a *rhizome*, though most commonly called a root by all except strict botanists. The most anomalous of all subterranean stems is that of the potato, and we doubt if some botanists have their consciences quite at rest on the subject. The tubers are regarded as swellings of an underground stem, and this opinion is strengthened chiefly by the fact that these tubers are capable of producing buds, a power which true roots do not possess. A negative character of roots may thus be noted: they do not possess scales, which are modified leaves; or buds, which are rudimentary leaves; or nodes, joints, or points, whence buds are developed.

Having disposed of roots and stems, as far as the limits of this work will permit, we next proceed to the leaves, and these are so variable in form, passing into each other by such gentle gradations, that we shall only be able to indicate the most prominent types. If we take the leaf of an oak, a lily, and a hart's-tongue fern, we shall see in each of these, especially if we hold them up to the light, certain thicker portions like threads traversing the leaf: these are usually called the *veins*. In the oak-leaf the veins are much branched and spread over the leaf in a kind of network: such kinds we will call *net-veined* leaves; in the lily-leaf the veins run parallel, side by side, from the bottom towards the top of the leaf, with finer veins crossing from one to the other of the longitudinal veins: a leaf with such a veining, or venation, we will call a *parallel-veined* leaf. In the hart's-tongue fern the veins, although all going direct towards the margin of the leaf, divide in a regular manner into two parts like a fork: such leaves as possess this type are called *fork-veined* leaves. Of these three kinds of veining or venation, the net-veined leaves belong to exogens, the stems of which we have already described, the parallel-veined leaves to endogens, and the fork-veined leaves to ferns. As the ferns are *not* flowering plants, we shall leave them for more special notice hereafter. The veining of leaves is by no means an uninteresting subject; there is a beautiful variety in their mode of distribution through the leaf, and some of the prettiest natural objects ever exhibited under a glass shade are the skeleton leaves of plants. In the growing leaf all the spaces between the veins are filled up with cells, which contain, amongst other things, the green *chlorophyl*, or colouring matter, of the leaf, and these are covered by the delicate and transparent cuticle or skin. The hairs of many shapes, the glands, stings, scales, or other minute appendages of leaves, are all beautiful and worthy of examination under the microscope, but we must reluctantly pass them by. From the structure of the leaf we must pass to its form.

If it is the reader's good fortune to peruse these pages during any of the summer months, he will not require to go far or search very diligently for a plant of the common scarlet geranium. Let him look at it, and he will observe that the leaves are attached to the stem by a long stalk. There is the leafy expanded portion, which is the blade, or *lamina*, and the footstalk, which botanically is called the *petiole*. On each side of the petiole at its base, where it joins the stem, is a little, scaly, triangular, leaf-like blade, without a foot-stalk. These are not leaves, but appendages to the leaves, called *stipules*, to which we shall return presently. Let us go in search of all the different-shaped leaves which we can find, and ascertain how far we can give names to the principal forms, so that by a name which all botanists can understand we may distinguish one kind of leaf from another, as a carpenter knows his Jack-plane from his hand-plane or his moulding-plane.

We shall observe that all our leaves may be classed in two groups. The leaves of the geranium, dandelion, daisy, holly, maple, hawthorn, hazel, plum, apple, &c., we place on our left hand: these are all simple leaves. The leaves of the horse-chestnut, the ash, the mountain-ash, the acacia, trefoil or clover, wood-sorrel, &c., we will place on our right hand: these are compound leaves. Now let us examine the great differences in the two groups. In the group of simple leaves on our left hand the blade or lamina of all the leaves, whatever their form, or however deeply they may be cut at the edges, are not cut down to the mid-rib, or great central vein of the leaf; hence we call them *simple*. In the other group on our right hand, each leaf is divided into two or more parts or leaflets, which look like smaller leaves clustered together upon the footstalk or petiole. In the clover there are three of these leaflets; in the horse-chestnut, five or seven; in the ash, a great many. But in all these instances there is but one leaf, which is composed of several leaflets: these are compound leaves.

The simplest form of simple leaves are those of fir trees, which are long and narrow, like needles, sometimes called "pine-needles," three or five bound together at the base in a little bundle. The name by which such leaves are known is *acicular*, from a Latin word meaning "needle-shaped." In the yew tree the leaves are less needle-shaped, being broader below and coming to a sharp point at the apex; they are awl-shaped, and the term by which they are distinguished is *subulate*, which has that meaning. For our next example we leave the large trees and descend to grasses, or little plants which possess leaves resembling the leaves of grasses, such as the grass-leaved stitchwort, in which the leaves are long and narrow, of the same width throughout, except at the two extremities, and these are said to be *linear*, or resembling a line. (Plate A, fig. 1.)

Leaves are called *lanceolate* when their form resembles the head of a lance, broadest in the middle and attenuated towards each end; of such a leaf the lanceolate plantain affords an example. (Fig. 2.)

Egg-shaped leaves, which are broadest near the base and narrowed upwards, are said to be *ovate* (Fig. 3); but if the footstalk is reversed, and the lamina, though still egg-shaped in outline, has its broadest part at the apex, it is called *obovate* (Fig. 4). There are constantly to be found forms of leaves which are intermediate, and glide insensibly from one to another of those which we have enumerated; indeed, the forms of leaves are almost infinite, and all we can

PLATE A.

hope to do is to establish a few types. There are, for instance, oval and elliptical leaves, and leaves which are nearly round. In all such cases it is better to refer them to the mathematical forms which they most closely resemble, and call them by their names. Circular or orbicular leaves have generally the petiole or footstalk attached in the centre of the under side of the disc, and are called *peltate*, not from the form of the leaf, but from the mode in which the petiole is attached (Fig. 17).

The few remaining forms of simple leaves with which we can associate names are: those which are kidney-shaped, and hence are called *reniform* (Fig. 6); heart-shaped leaves, which are termed *cordate* when the petiole is attached at its broadest extremity (Fig. 5), but *obcordate* when the smallest end is attached to the petiole, as in the case of each leaflet of the wood-sorrel (Fig. 7). Other leaves are named after the objects to which they are supposed to bear the closest resemblance, as spoon-shaped, or *spathulate*, in the daisy (Fig. 10); arrow-shaped, or *sagittate*, in the wake-Robin, and especially in the water-arrowhead (Fig. 8); fiddle-shaped, or *panduriform*, as exemplified in the fiddle-leaved dock.

All the simple leaves above enumerated have their edges but little, or not deeply, cut. There are, however, very many forms of simple leaves which are irregular, and so deeply cut as at first to resemble compound leaves. Five-angled leaves, such as those of the ivy, are *quinquangular* (Fig. 13), and those with a larger number of angles are described by the number of angles which they possess. Halberd-shaped leaves with two small lobes at the base are called *hastate* (Fig. 11). Leaves with lobes at the base are common, and vary much in their form (Figs. 21). Three-lobed leaves in which the leaves are nearly equal are called *trilobate* (Fig. 9); and with five lobes, *palmate*, because they resemble the fingers and palm of an open hand (Fig. 14). But the larger number of these deeply-cut leaves are too complex and variable to be named definitely, except by the number and form of their lobes or their incisions.

The group of leaves on our right hand, and which we characterized as compound, must now receive a little attention. The first example which we observe is a *ternate* leaf composed of three leaflets: these leaflets may be *obovate* as in clover (Fig. 12), or *obcordate* as in the wood-sorrel (Fig. 7), or indeed of any other form. If each leaflet is again divided into three parts it is *biternate*, or if thrice divided in a like manner, *triternate*. When there are five leaflets spreading like five fingers, the leaf is called *digitate*. By far the largest number of compound leaves are more or less of the *pinnate* type, such as the leaves of the ash (Fig. 15): the name *pinnate* is given to them because the arrangement of the leaflets on each side of the petiole or footstalk resembles a feather (Latin "*penna*"); when the leaflets are in pairs placed opposite to each other on the footstalk (as in the ash), the leaf is said to be *oppositely pinnate*, but when an alternate arrangement is followed it is *alternately pinnate*.

The arrangement of leaflets may be still more complex by being further subdivided. In this case each leaflet of a pinnate leaf is itself pinnate, and when so divided the leaf is termed *bi-pinnate* (Fig. 18). If the subdivisions are carried still further, and each leaflet is again divided, the leaf is called *tri-pinnate* (Fig. 19). When the divisions are carried beyond this, the leaf is called *supra-decompound*.

Any attempt at describing more intricate forms of compound leaves would tire and bewilder the reader, without adding in the least to his botanical knowledge. The theory and philosophy of leaf-genesis and leaf-structure may be quite as well postponed till the student has acquired more practical botanical knowledge, and then he will find it in more advanced books, and be able to read it with greater pleasure and profit.

It has been stated above, in more especial reference to the geranium leaf,

FIG. 18.

FIG. 19.

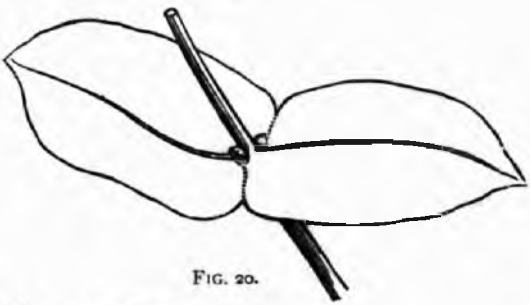

FIG. 20.

FIG. 17.

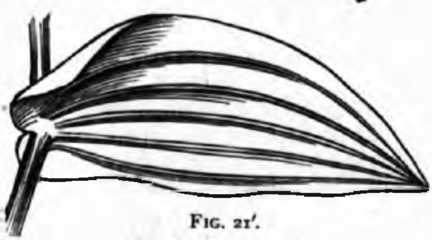

FIG. 21'.

FIG. 23.

FIG. 21.

FIG. 22.

that the lamina or blade was supported upon a footstalk or petiole. This is not always the case. If the common teazle is examined, the leaves (which are placed opposite to each other on the stem) will be found to have the lamina or blade of one leaf united at the base to that of the other, forming a kind of cup or hollow of the leaf around the stem.

When pairs of leaves unite thus at the base, they are said to be *connate*. The upper pairs of leaves in the caper-spurge, and in one species of honeysuckle, are connate (Fig. 20). The blade or lamina of the leaf is, in some instances, continued down the stem of the plant for some distance, and is said to be *decurrent;* in other instances it only surrounds and embraces the stem, and is *amplexicaul* (this is derived from a Latin word "*amplexus*," which means in English, "embracing.") (Fig. 21'.)

Once more we must return to our pile of leaves on the table. This time it matters not whether they are simple or compound, since our observations will be confined to their edges, irrespective of their general form. If we take up the ivy-leaf, we find that the margin is perfectly smooth or *entire;* but in very many other instances the edges will be jagged or notched, finely or coarsely, and in different ways in different plants. In many instances the edges of leaves are notched or toothed like a fine saw, or *serrate;* but when the teeth are larger, and each tooth is again notched or serrated, the margin is described as *bi-serrate*. More rarely the teeth around the edge of a leaf, instead of having one side longer than the other, have both sides equal, and are said to be *acutely crenate*. If, instead of being pointed, the teeth are rounded or convex, the edge of the leaf is *crenate;* but if concave depressions alternate with pointed teeth, in such case the margin is called *dentate*. The edge of a leaf may be *ciliated*, or fringed with delicate hairs like eyelashes, or irregularly waved and *sinuate*, like the leaves of the common oak. The leaves of the dandelion are like none of these, but the large teeth are directed backwards, not unlike the teeth of a pit-saw, whence they are termed *runcinate* (Fig. 22). Usually, if the serratures of a leaf are small, they may be referred to one or other of the forms above indicated; but if large, they are more variable, and described as *lobes*.

The arrangement of the leaves around the stem should be carefully observed, because there is more variety in this than would at first be imagined. We have already intimated that some leaves are arranged in pairs *opposite* to each other, and others singly and *alternate*. It will also be found that three or more leaves will grow in a circle or *whorl* around the stem (Fig. 23), and that when the stem is square and the leaves in pairs, each alternate pair will be directly above each other, which is called *decussate*. If a young branch is plucked from an oak, and we look down upon it, the leaves will in that position seem to be in a whorl of five leaves, but examined sideways they will be found to be single, and so arranged that five consecutive leaves will describe a spiral passing twice around the stem before a leaf is found placed directly over the first, and this will be the sixth. In other plants the spiral contains fewer or more leaves, and goes either once or several times around the stem before a leaf is reached which is placed directly over the leaf from whence the spiral is traced.

Modifications or appendages of leaves take the form of stipules, tendrils, and thorns. When first alluding to the leaf of the scarlet geranium, we directed attention to the pair of triangular leaf-like appendages which were placed, one on each side, between the bases of the petioles of the opposite

FIG. 24.

FIG. 25.

FIG. 26.

FIG. 27.

leaves. These appendages are the stipules, which in some cases are so small as to be reduced almost to hairs, whilst in others, as in the garden-pea, they are much larger than the leaflets or leaves. If we pluck a stem of grass, and remove one of the long narrow leaves, the entire petiole will be found converted into a kind of sheath which embraces the stem or *culm* (Fig. 24). In such plants as the wood-angelica and the wild carrot the base only of the petiole embraces the stem, and this form is called an *ochrea* or boot (Fig. 25). The wild briar, and other wild roses, have stipules adherent to the petiole, or *adnate* (Fig. 26), and some plants have no visible stipules. In the hawthorn they are leaf-like or *foliaceous* (Fig. 27). When they are present the plant is described as *stipulate*, and when absent, *exstipulate*.

Thorns are sometimes alterations of stipules, sometimes projections from the cushion upon which the base of the petiole rests, and sometimes terminate small branches.

The whole blade of a leaf is occasionally absent, and the leaf becomes transformed into a tendril. In the case of pinnate leaves, only the upper leaflets will sometimes become tendrils, and in other cases the stipules may be converted into tendrils. It is interesting to examine the tendrils of different plants, and to endeavour to ascertain what other organ has been converted into these forms. It must be borne in mind that all the parts of plants can be referred to some change or modification in either the stem or the leaves.

Flower-buds proceed from the *axils* of leaves. The axil is the angle formed by the junction of the leaf with the stem. Such leaves are termed floral leaves or *bracts*. Occasionally the bracts are of the same colour and form as the remaining leaves of the same plant, but generally they are smaller, and altered in form. In a few instances they are coloured.

The common arum or wake-Robin, called also "lords and ladies," has a curious form of bract, which is hood-like, and encloses several flowers. It is more properly denominated a *spathe*. If we gather a daisy or a dandelion, we shall observe just beneath the head of flowers, and closely pressed to the under side, a whorl or circle of little green leaves or bracts, and this whorl of bracts is termed an *involucre* (Fig. 45). The cap of an acorn is a kind of involucre composed of numerous scaly bracts.

The gayest and most attractive feature in the majority of plants is the flower; and though so variable and in some cases so curious in its form, it is not difficult to refer all the parts composing it to four organs, two of which are external and two internal: the former are the *floral envelopes*, and constitute the showy portion of the flower; the latter are the *essential organs*, and are principally concerned in the production of the fruit and the reproduction of the species. If we return again to our scarlet geranium, we shall notice beneath the scarlet leaves (petals) of the flower a long greenish tube, expanding at the top into five green spreading lobes: this is the *calyx*. It occupies the same position as the involucre of the daisy. Take another example. In the primrose the pale sulphur-coloured portion, consisting of a tube and five spreading rays, is the *corolla* of combined petals, and the green tube in which the tube of the corolla is inserted is the calyx. In both these instances the calyx is green, but if we take another familiar example in the fuchsia, we shall find the calyx is coloured. The beautiful pendent blossoms of the fuchsia (if we take the common red and purple variety) has externally a crimson tube with four spreading crimson lobes: this is the coloured calyx, and within this is the purple *corolla* or petals. The two external or floral envelopes, therefore, are called the *calyx* and the *corolla*, of which the latter is most usually only coloured, but in some instances both. The fuchsia may sometimes be seen with the lobes of the calyx partially or wholly green. The lower portion of the calyx is either united into a tube, as in the scarlet geranium, or all the parts, or *sepals* as they are called, remain separate and distinct. In some instances, as in the mallow, there is a double series of sepals, forming a kind of double calyx, of which the outer series is termed the *epi-calyx*. As might be anticipated from the variety of form in flowers, the form of the calyx is very variable. In the nasturtium it is spurred, in the Chinese primrose it is inflated, and also in the bladder campion; but in composite flowers, to which the dandelion and daisy belong, the calyx is reduced to fine hair-like threads. The bright yellow eschscholtzia, which is such a favourite in gardens, has a singular kind of calyx. As the flowers open, the conical calyx which encloses the corolla breaks away at the base, and is borne upwards like a cap or extinguisher on the petals, and is soon thrown off.

The inner series of floral envelopes or corolla, which is generally the showy portion of the flower, consists either of several distinct parts or leaves, called petals, or all these are more or less united together into one piece. When the petals are distinct, so that they can be plucked off one by one, some of them are occasionally larger, or of different shape from others in the same flower, and called *irregular*. Other corollas have the petals all alike, and are, therefore, said to be *regular*. If we take a wild dog-rose, a bramble-flower, or a strawberry-flower, we can count in each five separate and distinct petals, of the same size and form (Fig. 28). These flowers have, therefore, a regular corolla of distinct and separable petals, and botanists would call such a one a "regular polypetalous corolla." But supposing that we collect a pea-flower, and pull off the petals, we still find that there are five, and that we can separate them one from the other; yet they differ in size and form: first the one large erect upper petal called the *standard*, then the two side petals called the *wings*, which are smaller, and finally the *keel*, of two petals, sometimes partially united. All these together form an *irregular* corolla of distinct and separable petals, or, technically, an "irregular polypetalous corolla" (Figs. 29 and 58).

When the petals of a corolla are all united into one piece of a regular and symmetrical form, as in the bluebell, heather, convolvulus, or primrose, it constitutes a regular corolla with united petals, or in three words, a "regular monopetalous corolla." But, though regular, these vary much amongst them-

FIG. 28.

FIG. 29.

FIG. 30.

FIG. 31.

selves, for the corolla of a bluebell is bell-shaped or *campanulate* (Fig. 30); that of many kinds of heath is urn-shaped or *urceolate*, being contracted at the mouth; the corolla of the convolvulus is funnel-shaped; that of the primrose and phlox flattened or salver-shaped (Fig. 31); and some others *tubular*, with scarcely any expansion at the mouth. All these are, nevertheless, regular in their form, but there are others which are irregular.

If we examine a daisy, we shall find not only that what is commonly called the flower is a cluster of more than a hundred flowers (Fig. 32), but that these

FIG. 32.

FIG. 34.

FIG. 33.

FIG. 35.

are of two forms. The yellow flowers in the centre, which are termed "the florets of the disc," are regular and tubular (Fig. 33); whilst the white flowers (composing the fringe—"florets of the ray") are irregular and *ligulate* or strap-shaped (Fig. 34). Let no one despise the little daisy, for it has a good botanical lesson concealed amid its numerous florets for any who will pluck it in pieces and master its mysteries.

A similar structure prevails in the dandelion, and other flowers of the natural order of *Compositæ* (compound flowers). The ligulate or strap-shaped florets afford one example of an "irregular monopetalous corolla." That common garden flower, the yellow calceolaria, has another form in which the lips are hollowed out like a slipper. The dead-nettle, ground-ivy, and mint have another form in which the corolla has two unequal lips, and is called *labiate* or lipped (Fig. 35). A still closer resemblance to a closed mouth will be found in the toadflax and snapdragon. All these are forms of an "irregular monopetalous corolla."

Before quitting this subject, we will repeat two or three short remarks which should be well impressed on the memory.

The corolla of flowers is sometimes all in one piece, and is then called a *monopetalous* corolla; but when divided into separate and distinct petals, it is called *polypetalous*. If the form is regular, or the petals all alike in shape and size (though they may differ in colour), the corolla is called *regular;* but if the upper part of a corolla has a different form or size from the lower, or the petals are unequal, the corolla is said to be *irregular*. In some plants—the garden tulip, for instance—there is apparently only one floral envelope, composed of six equal sized petals, coloured alike, and hardly to be distinguished from each other. Three of these are outside the three others, and belong to the calyx, the inner three petals forming the corolla. In such cases it is not usual to distinguish the sepals from the petals, or the calyx from the corolla, but to call the whole six flower-leaves together a *perianth*. This is another word which requires to be remembered: it is true there are many of them, but they are the alphabet of botany, and when once mastered, the rest becomes comparatively easy.

We must once more return to our scarlet geranium to help us in understanding the other two kinds of organs which belong to a flower. If we pick off the petals from a flower plucked from our pet geranium, we shall see therein, standing at the top of the tube, six thread-like bodies side by side: five of these are all alike, the sixth, which stands in the middle, is different. The five are called *stamens*, and the one which is unlike any of the rest is the *pistil*. There are other flowers, equally common, in which we shall be able to distinguish them better. Let us try a honeysuckle or a primrose. A stamen consists of a thread-like stalk, which is called the *filament*, and a thicker, somewhat oblong head, which is the *anther* (Fig. 36). Sometimes the filaments are more or less united, either at the base only, or nearly throughout their length, and in a few instances are so short as scarcely to be seen. The *anther* is by far the most important part of the stamen: it contains a mass of fine granules, which is dispersed like dust when the anther opens. This dust is the fertilizing principle, and is called the *pollen*. In orchids the pollen is compacted together in waxy masses. The *pistil* generally consists of three parts: a base, more or less swollen, which is the *ovary;* an apex, variable in form, which is the *stigma;* and an intermediate support called the *style* (Fig. 37). The last-named is sometimes absent, and the style is sessile, or seated upon the ovary. The stigma consists of a viscid or sticky surface, to which the pollen-grains, when shed from the anthers, adhere. The ovary, which afterwards, when fertilized, becomes the fruit, is a cell containing one or more little bodies called *ovules*, which, when developed, are the seeds. When the pollen is shed from the anthers it adheres to the stigma, on which it falls or is conveyed by insects. Soon after it is attached to the stigma, each pollen-grain sends a little tube down the style into the ovary, and the end of this tube passing into one of the ovules, the contents of the pollen-grain are transferred to the ovule, which

FIG. 38.

FIG. 36.

FIG. 37.

FIG. 39.

FIG. 40.

FIG. 41.

FIG. 42.

FIG. 43.

FIG. 44.

FIG. 45.

becomes fertilized, and the empty pollen-cases are dispersed. If the ovary is cut across with a sharp pen-knife, the number of ovules which it contains may be counted, and the manner in which they are arranged determined; both of which are often required to be known in the examination of a plant. Sometimes the ovules are attached to the walls of the ovary, and sometimes at the centre. Sometimes the ovary has no division, and at others it is divided into two or more cells. These are called one-celled, two-celled, or many-celled ovaries, as the case may be.

Before following the ovary to its development into fruit, we must return again to the flowers and observe the manner in which they are arranged upon the stem. This is called the *inflorescence*. The stalk which supports a flower is its *peduncle*, and when there is no stalk it is *sessile*, or seated upon the stem. The most simple kind of inflorescence is a *spike*, in which the flowers have scarcely any peduncles, and are grouped around the upper portion of the stem or *axis* (Fig. 38). The common plantain, used for feeding caged birds, is a familiar example. The catkins of the willow, poplar, and hazel are a variety of spike which is *deciduous*, or quickly falling away, and containing male flowers, or flowers with stamens but no pistils. The hop and fir-cones are also varieties of spikes with scales.

If the flowers are arranged in a similar manner on the stem, but each flower has a perceptible peduncle which are all of the same length, the inflorescence is called a *raceme* (Fig. 39). The flowers of the currant, berberry, &c., are produced in racemes. A *panicle* is a kind of compound raceme in which the peduncles are branched, each pedicel or branch of which bears its flower (Fig. 40). Several kinds of grasses produce their flowers in panicles. There is a kind of inflorescence called a *corymb*, in which the peduncles are simple, springing from different points on the axis, as in a raceme, but the lower peduncles are lengthened, so that all the flowers are brought nearly to the same level (Fig. 41). If the peduncles are branched, it becomes a *compound corymb*.

One of the most complex forms of inflorescence is the *cyme*, which should be studied in its mode of development. It is common in the stitchwort family (Fig. 42). The stem terminates in a flower, then branches arise from the axils of a pair of bracts a little lower down: these are each surmounted by a flower. In turn each of these secondary flowers are supplemented by branches from the axils of their bracts, and thus the process is repeated till the shoot is exhausted.

A very characteristic inflorescence is the *umbel*, in which all the flowers are supported on peduncles of equal length, springing from the same point; but if each peduncle supports a secondary umbel, the result is a *compound umbel*, as in the carrot, parsnip, hemlock, angelica, and many other common plants (Fig. 43), which are hence called *umbelliferous*, and constitute a very natural and generally easily recognized natural order.

Another very large group of plants have an inflorescence like the daisy and dandelion (called a *capitulum*) in which numerous flowers are compacted together upon a button-like receptacle, on which they are sessile. These form the natural order of *Composite plants* (Figs. 32 and 45.)

It has been already remarked that the ovary when mature becomes the fruit, and that the ovules ripen into seed. What is commonly termed *fruit* includes in some instances other parts of the plant, so that "fruit," in its botanical acceptation, does not always agree with the fruit of the gardener and the cook. For example—the bean and pea are fruits in botanical acceptation, but are not so recognized in the kitchen; whereas the strawberry includes also the pulpy receptacle, and the gooseberry and apple have the calyx and ovary united in what is termed the fruit.

As fruit ripens it may divide or open, as the pea and the wallflower, and is then called *dehiscent;* but if, as the cherry and filbert, it does not open, it is termed *indehiscent.* Of each of these there are several kinds according to their structure and character; and, as the fruit is of great importance in the classification of plants, the distinctions should be carefully remembered.

We will commence with "dehiscent" fruits, or those which open as they approach maturity. If we confine ourselves to British fruits, these will number five kinds. The *follicle*, or little bag, which opens down the inner side (ventral suture), and never down the back (dorsal suture), as in the common

FIG. 46.

Section of Fig. 47.

FIG. 47.

FIG. 49.

FIG. 50.

FIG. 48.

columbine (Fig. 44); the *legume*, opening either down the front or back, or along both sutures, as in the pea and bean (Fig. 46); the *capsule*, which opens by valves or pores (Fig. 47), and occasionally by a lid, of which the foxglove, the poppy, and the henbane are examples; the *siliqua*, a kind of flat capsule opening by two valves (from below upwards), leaving the seeds attached on both sides of a central partition (Fig. 48), as in the wallflower, cabbage, and shepherd's-purse; the cone or *strobilus*—although scarcely belonging to this group—consists of a dense scaly spike, each scale with seed at the base; when mature, the scales fall back and permit the seeds to escape.

It will be observed that all the five kinds above enumerated are *dry*, and not pulpy fruits. Some of the "indehiscent" are pulpy, and some kinds are dry. Of indehiscent or unopening fruits which are dry, we may enumerate five.

Before doing this, it will be necessary to explain that the seed-envelope (or that portion of the fruit which enclosed the seed) has three layers, which are sometimes blended together and sometimes separable. When these layers are distinct, the outer is the *epicarp*, the inner is the *endocarp*, and the middle is the *mesocarp;* whilst the whole together, whether divisible or not, is the *pericarp.* If these four kinds of *carp* are well secured, we may proceed with indehiscent fruit which are not pulpy.

An *achene*, or *achenium*, is a dry fruit in which the pericarp may be readily separated from the seed. The fruit of the sunflower is an achenium. A *caryopsis* has the pericarp inseparable from the seed, as in a kernel of wheat. The bran which is sifted from flour is the pericarp of wheat. A *utricle* has the pericarp inflated, as in the goosefoot. A *glans* has a hardened pericarp, with bracts at the base or enclosed in an involucre, as in the acorn and chestnut. A *samara* has the pericarp winged, as in the elm, the ash, and the maple. (Fig. 49.)

The pulpy unopening or indehiscent fruit are very easily remembered. Of those which contain only one seed there is only the *drupe*, which includes the cherry, plum, and all one-seeded pulpy fruits. The raspberry and blackberry fruits are aggregated little drupes, of which a large number are arranged about a receptacle (Fig. 50). The pulpy fruits with more than one seed are sometimes divided into four kinds, but we shall consider them as two—the *berry*, in which the seeds are immersed in a pulpy mass, as in the gooseberry, orange, and melon, and the *pome*, in which the seeds are enclosed each in a separate cell, as in the apple and pear.

A word or two about the seed, and this portion of our work is accomplished. The seed contains within its own special covering the *embryo*, which may occupy the whole or only a part of the interior. This embryo consists of the *radicle* or young root, the *plumule* or young stem, and the *cotyledons* or seed-leaves of the future plant which is to be developed from the seed. All these sometimes form but a minute point just distinguishable by the naked eye. When the seed germinates the plumule proceeds upwards, the radicle downwards, and the first leaf or pair of leaves which appear above the soil are the cotyledonary or seed-leaves.

There has been much talk in the world of science during past years about genera and species, and we must have a few words on the same topic, but more in the way of explanation than controversy. It is quite essential (if we would find readily the name of one plant out of a thousand) that some method should be pursued, or we shall not succeed. This method is classification, or the grouping of similar things together.

When, for instance, we look at a bank of primroses, no two flowers are absolutely alike, any more than two men or two boys are alike; yet they are so near alike that we say at once that all are primroses, that is, that all belong to the same *species*. To such a species, any number of individuals nearly alike, a botanical name is given, and it is called *Primula vulgaris*. The first is the *generic* name, and the last the *specific* or name of the species. If we next go into a meadow which is yellow with cowslips, we soon satisfy ourselves that all are cowslips, and not primroses (supposing that they are really distinct), and conclude that they belong to a different species; we can distinguish them, and call them by another name: botanically they are *Primula veris*. Now, there are very many features in which cowslips resemble primroses, so that the botanist unites them, with some others, into a group which he calls a *genus*, under the name of *Primula*, which is the generic name. The genus *Primula* contains one species called *veris* or "true," and another called *vulgaris* or "common," and a third called *farinosa* or "mealy."

The use of botanical names will now become apparent. If we had never seen a cowslip, and only knew the primrose, we should not know from its name whether it was like a primrose or a daisy; but if we use the botanical names, and say we know *Primula vulgaris*, but although we do not know

Primula veris, we know from the name that it is nothing like the daisy, but resembles the primrose or *Primula vulgaris*, because it belongs to the same group or genus, and has the same generic name of *Primula*.

This system of classification is carried still further. There is a common little scarlet flower called the pimpernel or "poor man's weather-glass," which is named botanically *Anagallis arvensis;* and another equally pretty but quite distinct species, the bog pimpernel, which is *Anagallis tenella*. Both these plants have the first name alike, so that they belong to the same genus—that of *Anagallis;* but the second name is different : hence we infer that they are different species but of the same genus. There are, however, some few points of structure in which the plants of *Anagallis* resemble the plants of *Primula*, so these again are united with others into a group of genera, called a *natural order*, under the name of *Primulaceæ*, or the primrose family. So that, after all, scientific names have their uses, and the study of a science like this is a study of order, admirable both for its discipline and its influence, as well as the certainty of its results.

We must now endeavour, by means of the knowledge acquired, to comprehend the distinctions between the principal natural orders of British plants.

All our plants are of two kinds: flowering plants or *Phanerogamia*, in which the flowers are exposed and evident; and flowerless plants or *Cryptogamia*, which appear to be flowerless because the organs which serve the purposes of flowers are concealed. To the former belong all our forest and timber trees, shrubs, and garden flowers; and to the latter ferns, mosses, fungi, lichens, seaweeds, &c.

With the Cryptogamia we have at present nothing to do, and therefore all our remarks will apply to flowering plants. Flowering plants may also be grouped under the two classes called *Exogens* and *Endogens*. Some botanists recognize others, but we shall adhere to these. The difference in the stems of woody exogens and endogens has already been indicated, but there are other general features which may be enumerated, and which will serve to strengthen each other, and compensate for exceptions.

In exogens the stem has a separable bark, a central pith, concentric layers of wood, and medullary rays. The leaves have reticulated veins, which branch and interlace each other in a kind of network. The flowers usually have both the calyx and corolla divided into four or five parts, or into twice or thrice, or some other multiple of those numbers; and the seed-leaves are produced in pairs, whence they are termed *dicotyledons*, or with two cotyledons or seed-leaves.

In endogens the stem has no separable bark, no distinct central pith, no concentric zones of wood, and no medullary rays. The leaves have parallel veins running side by side from base to apex, or from the midrib to the margin of the leaf. The flowers are divided upon a tripartite plan, with three sepals to the calyx and three petals to the corolla, or six parts to the perianth, or twice, three times, or some multiple of three; and there is but one seed-leaf, whence they are termed *monocotyledons*, or with one cotyledon or seed-leaf.

Some of these distinctions may fail in certain exceptional cases, but the whole will not fail together. The first thing we must determine of a plant is, whether it is an exogen or an endogen, or more accurately, whether it is dicotyledonous or monocotyledonous. The words are long enough and hard enough, but the distinctions are easy enough, and soon to be acquired. We will take it for granted that the plant examined is dicotyledonous, since they comprise the largest number of species, and will pass on to the divisions of dicotyledonous plants.

Here we must characterize the four sub-classes into which this class is divided, and bravely encounter four more long names. The first is called *Thalamifloral* exogens, the second *Calycifloral* exogens, the third *Monopetalous* exogens, and the fourth *Monochlamydous* exogens. If we endeavour to ascertain the meaning of these, although they will not become shorter, they will seem to be less hard to remember.

If we were to call the *Thalamifloral* "disc-flowered," the *Calycifloral* "calyx-flowered," the *Monopetalous* "one-petalled," and the *Monochlamydous* "one-covered," we should have names apparently less pedantic, but we would not by that means come much nearer to their meaning. In the first sub-class of exogens the petals of the corolla are distinct from each other and from the calyx or outer circle of floral leaves. The stamens are said to be *hypogynous*, that is, the bases of the filaments are so attached that they seem to spring from underneath the ovary or basal portion of the pistil. The woodcut may serve to render these distinctions more comprehensible. (Fig. 51.) It is a section cut down a thalamifloral flower. *p* represents the petals, *c* the calyx, *s* the stamens, and *o* the ovary at the base of the pistil.

Calycifloral exogens are those in which the petals are also usually distinct, but the stamens, instead of being hypogynous (as in the above), are either *perigynous* or *epigynous*. Now, by "perigynous" it is meant that the stamens stand around the pistil, but that the bases of the filaments do *not* originate from beneath the ovary. By "epigynous" is meant that the bases of the filaments of the stamens spring from or are seated upon the ovary. Thus a similar section of a calycifloral flower has the structure indicated in Fig. 52. The letters refer to the same organs as in Fig. 51.

It will be observed that in both these sub-classes the petals are separate and distinct one from the other. In a few instances they are absent.

In the sub-class of Monopetals the petals are united, either at the base or all together into one piece or corolla. (See Figs. 30 and 53.)

In the last sub-class, or Monochlamyds, the perianth is really or apparently simple; that is, there only seems to be one circle of floral envelopes instead of two, the calyx or corolla being absent, and sometimes both.

If we endeavour to place the features of these four sub-classes in a clearer light, by eschewing all we can of the technicalities, we should say that in two of the four groups the outer and inner leaves of the flower are generally present, and that the inner leaves are not joined to each other, but may be plucked off separately. We may add that the chief distinction between the two groups is the manner in which the stamens are attached. In the first group their bases are attached *under* the ovary, and in the second *around* or *upon* the ovary.

In the other two groups one has both kinds of floral leaves or envelopes, and the other has but one or none. In the group possessing both calyx, or outer circle, and corolla, or inner circle, of floral leaves, the inner circle or corolla has the leaves joined together at the base, or form a kind of tube. Bearing these distinctions in mind, we shall examine each group separately through its subdivisions.

The thalamiflorals are divided, according to the structure of the ovary, into two sections. In the smallest section the ovary is said to be *apocarpous*, and in the other section *syncarpous*. By an "apocarpous" ovary is meant an ovary in which each carpel, or modified leaf of which the ovary is composed, remains distinct; and by a "syncarpous" ovary, one in which all the carpels are united into one compound ovary. Thus a buttercup has an apocarpous ovary, which looks like a cluster of ovaries, because each carpel is distinct. This is seen better in the fruit, from its larger size, of which we give a figure. (Fig. 54.) The poppy has a syncarpous ovary, all the carpels being united into one compound ovary. The structure is the same in the fruit, which is a larger and mature state of the ovary, so that we figure the fruit in preference to the ovary. Each of these sections of thalamiflorals contains several natural orders; as, for instance, the first section, in which the ovary is apocarpous, includes the

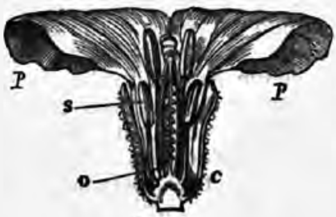

FIG. 51.

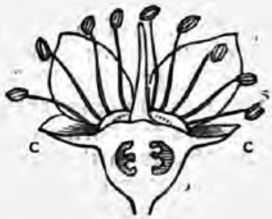

FIG. 52.

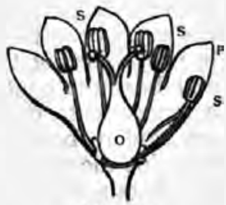

FIG. 53.

FIG. 54.

FIG. 55.

FIG. 56.

FIG. 57.

FIG. 58.

Ranunculaceæ or ranunculus family, the *Berberidaceæ* or berberry family, and the *Nympheaceæ* or water-lily family. Each natural order includes several genera—often a great many, sometimes only one or two. The *Ranunculaceæ* include a great many different genera, but all of them have a certain number of petals to their flowers, with a large and indefinite number of stamens. This is true of the buttercup, it is true of the anemone, of the aconite, of the meadow-rue, and of the columbine; yet all these plants differ so much in other features that they belong to different genera. The genus *Ranunculus* includes all the species of buttercup or crowfoot, and from this genus the whole order derives its name. The common meadow crowfoot or buttercup (*Ranunculus acris*) belongs to the natural order *Ranunculaceæ*, and the apocarpous section of thalamifloral exogens. It belongs to exogens because of the net-veined leaves and twin cotyledons or seed-leaves; to thalamiflorals, because the petals are distinct, and the stamens spring from under the ovary; to the apocarpous section, because the carpels in the ovary are separate; to the natural order *Ranunculaceæ*, because of the definite number of petals and the indefinite number of stamens; and to the genus *Ranunculus*, because the one comprise the largest number of species, and will pass on to the divisions of dicotyledonous plants.

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It will be observed that in both these sub-classes the petals are separate and distinct one from the other. In a few instances they are absent.

In the sub-class of Monopetals the petals are united, either at the base or all together into one piece or corolla. (See Figs. 30 and 53.)

In the last sub-class, or Monochlamyds, the perianth is really or apparently simple; that is, there only seems to be one circle of floral envelopes instead of two, the calyx or corolla being absent, and sometimes both.

If we endeavour to place the features of these four sub-classes in a clearer light, by eschewing all we can of the technicalities, we should say that in two of the four groups the outer and inner leaves of the flower are generally present, and that the inner leaves are not joined to each other, but may be plucked off separately. We may add that the chief distinction between the two groups is the manner in which the stamens are attached. In the first group their bases are attached *under* the ovary, and in the second *around* or *upon* the ovary.

In the other two groups one has both kinds of floral leaves or envelopes, and the other has but one or none. In the group possessing both calyx, or outer circle, and corolla, or inner circle, of floral leaves, the inner circle or corolla has the leaves joined together at the base, or form a kind of tube. Bearing these distinctions in mind, we shall examine each group separately through its subdivisions.

The thalamiflorals are divided, according to the structure of the ovary, into two sections. In the smallest section the ovary is said to be *apocarpous*, and in the other section *syncarpous*. By an "apocarpous" ovary is meant an ovary in which each carpel, or modified leaf of which the ovary is composed, remains distinct; and by a "syncarpous" ovary, one in which all the carpels are united into one compound ovary. Thus a buttercup has an apocarpous ovary, which looks like a cluster of ovaries, because each carpel is distinct. This is seen better in the fruit, from its larger size, of which we give a figure. (Fig. 54.) The poppy has a syncarpous ovary, all the carpels being united into one compound ovary. The structure is the same in the fruit, which is a larger and mature state of the ovary, so that we figure the fruit in preference to the ovary. Each of these sections of thalamiflorals contains several natural orders; as, for instance, the first section, in which the ovary is apocarpous, includes the

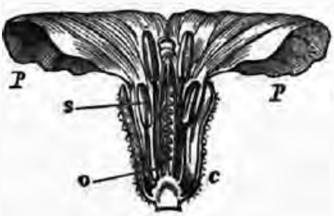

FIG. 51.

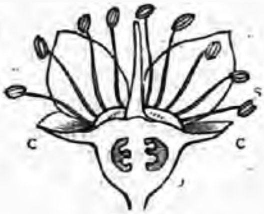

FIG. 52.

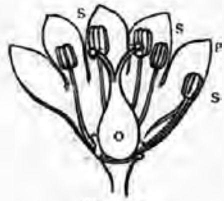

FIG. 53.

FIG. 54.

FIG. 55.

FIG. 56.

FIG. 57.

FIG. 58.

Ranunculaceæ or ranunculus family, the *Berberidaceæ* or berberry family, and the *Nympheaceæ* or water-lily family. Each natural order includes several genera—often a great many, sometimes only one or two. The *Ranunculaceæ* include a great many different genera, but all of them have a certain number of petals to their flowers, with a large and indefinite number of stamens. This is true of the buttercup, it is true of the anemone, of the aconite, of the meadow-rue, and of the columbine; yet all these plants differ so much in other features that they belong to different genera. The genus *Ranunculus* includes all the species of buttercup or crowfoot, and from this genus the whole order derives its name. The common meadow crowfoot or buttercup (*Ranunculus acris*) belongs to the natural order *Ranunculaceæ*, and the apocarpous section of thalamifloral exogens. It belongs to exogens because of the net-veined leaves and twin cotyledons or seed-leaves; to thalamiflorals, because the petals are distinct, and the stamens spring from under the ovary; to the apocarpous section, because the carpels in the ovary are separate; to the natural order *Ranunculaceæ*, because of the definite number of petals and the indefinite number of stamens; and to the genus *Ranunculus*, because the one-seeded carpels form a globose head, and the petals have a scale or hollow thickened spot at the base.

The section of thalamiflorals with syncarpous ovaries contains a great many natural orders, so that these are generally divided into two sub-sections according to the internal structure of the ovary, which must consequently be cut across with a sharp pen-knife and examined with a pocket-lens (see "The Microscope," Fig. 11), which can be purchased for 1*s.* or 1*s.* 6*d.* If we cut across the ovary of a poppy, and then look at the section through a lens, we shall observe that the ovules are clustered upon little projections from the inner surface of the walls of the ovary. These projections are termed *placentæ*, and represent the edges of the united carpels. When the placentæ project from the inner surface of the walls of the ovary, but do not reach to the centre, the ovary contains but one cell or cavity, and the placentæ are called *parietal*, or projections of the wall (Fig. 57)., But if the placentæ extend to the centre, and bear the ovules at the centre (Fig. 55), dividing the ovary into cells or compartments, or if the ovules are borne around a central column, the ovules are said to be *axile* (Fig. 56), as in the pink family. The first sub-section contains the poppy family, or natural order *Papaveraceæ*, the crossworts, with four petals, as the turnip, cabbage, mustard and cress, &c., which belong to the natural order *Cruciferæ*, the mignonette family, the violet family, and some others. The second sub-section includes the pink family or natural order *Caryophyllaceæ*, the mallow family or *Malvaceæ*, the geranium family or *Geraniaceæ*, and some others.

The Calycifiorals differ from the thalamiflorals in the manner in which the stamens are inserted. In the present sub-class the stamens are either placed around or upon the ovary. Taking advantage of these two modes, we may recognize one section of calycifiorals in which the stamens are perigynous, or placed *around* the ovary, and another in which the stamens are epigynous, or placed *upon* the ovary.

The first section includes about a dozen natural orders represented in Britain. the second contains only four or five.

The most prominent orders in the first section are the pea-flower family, or *Papilionaceæ* (this is, in fact, only a portion of the order *Leguminosæ*, the remaining tribes of the order not being represented in Britain). The flowers are irregular, of the papilionaceous type, that is, they are supposed to resemble a papilio or butterfly at rest (Fig. 58). Then there is the order *Rosaceæ*, with regular flowers and a great number of stamens, as in the rose, blackberry, strawberry, pear, apple, hawthorn, &c.; the gourd or cucumber family (natural order *Cucurbitaceæ*); climbing plants with unisexual flowers, that is, the stamens in one flower and the pistil in another; the gooseberry and currant family (natural order *Grossulariaceæ*), containing shrubs with regular flowers, four or five stamens, and succulent fruit; and eight other orders.

The epigynous section includes the large order of umbelliferous plants, which may generally be distinguished amongst British plants by the flowers and fruit being borne on umbels, as in the carrot, parsnip, hogweed, parsley, &c.; the ivy family (or *Araliaceæ*), which only includes the ivy in Great Britain; the mistletoe family, of which we have only the common mistletoe as a representative; and the cornel family (natural order *Cornaceæ*), of which we possess only two species of cornel or dogwood.

We come now to the third sub-class above named, which contains the monopetalous exogens, in which the petals are united either at the base or all together into a single corolla. In order to refer a plant readily to one of the twenty-three natural orders which this sub-class contains, it will be well to divide them into separate groups, of which two will answer our purpose, viz.:

1. Those in which the corolla is epigynous, or upon the ovary. (In these instances the ovary is inferior, or below the corolla.)

2. Those in which the corolla is hypogynous, or surrounds the ovary. (In these the ovary is called superior, or above the insertion of the corolla.)

The monopetalous flowers with an *inferior* ovary have in some orders the stamens attached to, and borne upon, the inner surface of the tube of the corolla, and in others the stamens are not so attached. The stamens are attached to the corolla in the honeysuckle family (or *Caprifoliaceæ*), the bed-straw family *(Rubiaceæ)*, the valerian family *(Valerianaceæ)*, the teazel family *(Dipsaceæ)*, and the large composite family *(Compositæ)*, to which order the daisy and dandelion belong. The stamens are free, or not attached to the corolla, in the bluebell family *(Campanulaceæ)* and the heath family *(Ericaceæ)*.

Monopetalous flowers with a *superior* ovary may have the corolla regular or irregular, the orders in which the corolla is *regular* being the most numerous, and includes the primrose family *(Primulaceæ)*; the holly family *(Aquifoliaceæ)*, which only contains one British species; the jessamine family *(Jasminaceæ)*, which is represented in Britain only by the ash and the privet; the periwinkle family *(Apocynaceæ)*, which includes the two species of periwinkle; the gentian family *(Gentianaceæ)*; the polemonium family, with one British species; the convolvulus family *(Convolvulaceæ)*; the borage family, *(Boraginaceæ)*; and the nightshade family *(Solanaceæ)*. The orders in which the corolla is *irregular* are the butterwort family *(Lentibulaceæ)*, the broomrape family *(Orobanchaceæ)*, the figwort family *(Scrophulariaceæ)*, the labiates, or mint and thyme family *(Labiatæ)*, and the verbena family *(Verbenaceæ)*, which contains but one British species. There are also two orders associated with the monopetals having regular corollas, in one of which *(Plumbaginaceæ)* the ovary is simple but bears five styles, and in the other the flowers are small and usually borne on dense spikes (the plantain family or *Plantaginaceæ*), each flower having four stamens.

The fourth and last sub-class of exogens have apparently but one series of floral leaves, the calyx and corolla being united into a perianth, or both are absent. This sub-class contains a large number of orders, which include most of our forest trees and some herbaceous plants.

The endogens, or monocotyledonous plants, still claim a passing notice. It should be observed that in most of the exogens *(dicotyledons)* the parts of the flowers are in fours or fives, or some multiple of those numbers, whereas in endogens those parts are usually in threes or some multiple of that number, as, for instance, three or six petals and three or six stamens. There is, however, an exception to this rule in one group, in which there is either no perianth or it consists of four small sepals. This group contains the bulrush, arum, duckweed, and grasswrack families. There is also another group in which the perianth, or envelopes of the stamens, consist only of chaffy scales, as in the grasses and sedges. The rest constitute two groups, in one of which the ovary is superior, and in the other the ovary is inferior. Those in which the ovary is superior contain one order in which the ovary is apocarpous, that is, the modified leaves of which the ovary is composed are all distinct, forming, when matured, a compound fruit. This is the alisma family, which includes the arrowhead, water-plantain, &c. The other orders with a *superior* ovary are three: the lily family *(Liliaceæ)*, the rush family *(Juncaceæ)*, and a little order with but one British species named *Restiaceæ*.

The orders in which the ovary is inferior are five. In one the perianth is very irregular, and the stamens and pistil are combined into a single column: this is the orchis family *(Orchidaceæ)*. Another order consists of water-plants *(Hydrocharideæ)*, of which the anacharis is one species, the frogbit another, and the third and last is the water-soldier. One order includes but one species of climbing plant, the black briony, and the order is named *Dioscorideæ*. There remain, therefore, only two other orders which require to be distinguished from each other. In one order *(Iridaceæ)* the number of stamens is three, and in the other *(Amaryllidaceæ)* the number of stamens is six in each flower.

Thus far we have briefly characterized the classification of flowering plants. The limits of the present work would not permit us to do more; but what we have accomplished will, we trust, serve as a key to the comprehension of some book which contains the descriptions of the orders, genera, and species of British plants, such book being usually termed a "Flora." Until the elements of botany which we have set forth are mastered, the "Flora" will, for all practical purposes, be a sealed book. Herein is presented the most tedious and least interesting portion, but essential as letters to one who would learn to read. After the wilderness cometh a Paradise. Whoever has toiled with us to this resting-place may take heart, for his future progress in the study of plants will be comparatively easy and amply reward him for the labour of the past.

COLLECTING AND PRESERVING PLANTS.

A collection of dried plants is not only very useful and instructive, but care and neatness in the execution may make such a collection very pretty. Such collections are usually called a *herbarium*, and every British botanist is ambitious to possess a herbarium of British plants. For such a purpose a few plain rules and instructions are all that is necessary, provided a good will is ready for the work.

Having resolved upon forming a collection, it will be prudent to prepare the tools beforehand, and these should consist of the pocket-lens already described, a tin box or vasculum, such as a japanned sandwich-box. We once knew an enthusiastic youth who made extensive collections in an old candle-box, slung at his back with a piece of twine. A few quires of paper of a spongy nature, so as to absorb moisture (such as grocers employ for wrapping sugar will answer the purpose), but the size should be a little larger than that of the paper on which it is purposed ultimately to mount the specimens. A very good size for a sheet when folded in half is 17 in. by 11 in., or it may be this size and not folded, which is perhaps most convenient. A stout deal board for the top and the bottom, and this also half an inch larger each way than the paper, should be provided. Three or four bricks tied up in brown paper will serve as weights, each brick forming a parcel. This will be all that is really essential until the plants are dried and ready for mounting.

As ferns are very good plants to commence with, and perhaps the easiest of any to preserve, we will apply our remarks to them, and when the method of drying is acquired by experiments upon them, other plants may succeed.

The collection of ferns for transplanting and the collection of fronds for preservation as botanical specimens are to be pursued at very different periods of the year. It may be premised that for botanical purposes fronds destitute of fructification are worse than useless, unless they belong to species which produce distinct fertile and barren fronds, and in which the characters and appearance of these fronds materially differ. In such cases the two kinds of fronds should be collected and preserved together.

The period for collecting ferns for the herbarium is, therefore, manifestly that when the fructification has nearly attained to maturity, and it is always better to collect them on a dry day than on a very wet one. The collector should go out prepared for collecting ferns, if he desires that his herbarium should present a neat and respectable appearance when completed. Some recommend a vasculum, some a bag, and some a large book under the arm; but commend us to two ½-in. deal boards, about 11 in. by 17 in., with a strap and buckle for each end, and twenty sheets of good bibulous paper, cut to the same size, and placed between them. Having selected a good frond or two for preservation, taking care not to break the stipe or stalk, but to separate it from the rhizome or root-stock, bend back the stipe just below the lowest leaflets of the frond, breaking the woody portion, but not dividing it from the rest of the frond, and lay it carefully between a sheet of your bibulous paper, and secure it with the spare paper between your boards; then proceed in search of more. Fronds which with their stalks are not too long for the paper should be laid in without bending.

In selecting fronds for preservation, it is not the largest that are required, but it is rather advisable to collect such specimens as will lie comfortably between the papers without bending than to aim at procuring *fine* specimens, which may only prove to be a nuisance. A perfect frond of 9 in. in length is better than a folded or otherwise mutilated one of 19 in. In selecting fronds, the fruit should not be too ripe, or instead of spores you will only find empty cases, not to mention the rusty dust that will continually tint your papers. It is better that the spores should be scarcely matured. Then, again, it should be noticed whether the frond is eaten by insects, broken, or in any other way imperfect. Such specimens are to be avoided if others can be obtained. Finally, the specimens selected should be well grown, and not distorted, unsymmetrical, or exhibit a tendency to sporting, or departure from the general type of the neighbouring fronds.

Having collected what specimens are required and conveyed them home, the next process consists of drying them for the herbarium. This is accomplished by removing them from the papers in which they have been collected and transferring them to fresh paper. Some persons are content with a stout unsized paper, such as employed by grocers for wrapping sugar, others will proceed to blotting-paper, whilst the majority will admit that Bentall's botanical paper is decidedly the best. The ferns should be transferred to a sheet of drying paper; two or three thicknesses, or even four or five, may be placed upon it, and then another specimen, and thus *ad libitum*. When all are in this manner transferred, the pile should be placed in a press, or with a stout board above and below, loaded on the top with some heavy weights—stones, bricks, old books, or anything applicable for the purpose. Twenty-four hours at the least, and forty-eight at the most, they should remain unmoved. At the expiration of this period each specimen should be transferred to a dry sheet of paper, with three or four thicknesses of dry paper between each specimen, and again put under pressure for the same period. The damp paper from which the specimens are taken should be at once dried in the sun or before the fire. It is always advisable to change the sheet for each *variety*. The specimens should be laid on the paper with the under or fructifying surface uppermost, and the barren side of the frond applied to the paper. Small strips of gummed paper, about 1 in. in length, and not more than $\frac{1}{8}$ in. in width, should be laid across the principal and secondary ribs or branches of the frond, and each end fastened down to the sheet of paper; other pieces may, in like manner, be placed across the tips of the fronds, or wherever else appears to be necessary to secure the specimen to the paper. It may be suggested that too many such slips disfigure the specimen, and if there are not sufficient it cannot be retained in its place. Experience must be the best teacher. Some object to fastening the specimens to paper at all, others recommend gluing them down by the whole surface. Both these plans appear to us to be equally objectionable. If the specimens are loose, they are not only in danger of being broken or damaged, but of being misplaced and dissevered from the label which belongs to them. If wholly glued down, they cannot under many circumstances be removed from the paper, either to be transferred to other paper or for closer examination or comparison.

Each specimen having been mounted, the label which accompanies it should be fastened down beside it. This may be pasted. Finally, its generic and specific name should be written legibly at the lower *right*-hand corner. All the specimens belonging to one genus should then be collected together and placed between the folds of a sheet of paper, $\frac{1}{2}$ in. wider and longer when folded than the half-sheets upon which the specimens are mounted. These "genera covers" may be of the same paper, or a smooth brown paper may be employed for the purpose. On the outside of the genera covers, at the lower *left*-hand corner, the name of the genus should be written in a good bold hand. The whole may be transferred to a deal box, the front of which is movable as well as the lid, being hinged to the bottom, so as to fall down and lie flat on the table. The lid may be so contrived as to hold the front in its place when closed. A deal box, 9 in. deep, 13 in. wide, and 20 in. long will hold a good collection, and if this ever should prove too small for the number of specimens obtained, a second box of the same dimensions will remedy the evil.

If it is considered desirable, a little camphor may be kept with the specimens, but the best preservative will be to look them all over, and thus allow the air to have access to them, once in every six months. With such precautions a collection may be preserved uninjured for years, provided always that it is kept in a *dry* place—not moderately, but *thoroughly* dry--or "mould" may injure irremediably what insects have spared.

A neat little collection of ferns, of smaller pretentions, and less clains to be regarded in a scientific light, may be arranged in a kind of album or scrap-book, with "guards" introduced by the binder sufficient to compensate for the extra thickness caused by the insertion of the specimens. A tinted paper is often used in the manufacture of these books, which good taste may transform into a very interesting volume for the drawing-room table.

In collecting flowering plants it is essential that the plants should be collected when in flower, and, if possible, specimens in fruit should be collected and dried therewith. This will seldom be possible, but a later visit to the same spot may furnish fruiting specimens, which may be dried and placed with the flowering portion. Wherever the plant is small, or of moderate size, the whole of it, including the root, should be gathered, as this will make the specimens more valuable for reference and comparison, and give a better idea of the plant. If the seeds are being shed, they should be collected and placed in a small envelope, which may be fastened on the sheet beside the plant when it is mounted for the herbarium. Stems which are too thick to lie flat, especially such as are woody, should be pared down at the back with a sharp knife, care being taken not to interfere with the front or exposed portion of the specimen.

CAUTION.—Never omit to place a label with every specimen, stating where it was found, and the date of the month and year in which it was collected. A good collection in all other points is almost valueless if this caution is not regarded.

Never put dried plants away, or enclose them in a box, until *thoroughly* dry, or they will become mouldy. Take care to keep them, when dried, in a dry place.

FERNS.

Ferns are *not* flowering plants, but they belong to a class in the vegetable kingdom distinct from exogens and endogens, in which the flowers are concealed, hence called "*cryptogamia.*" We cannot say that they have no reproductive organs, although they are destitute of true flowers. Some persons call the cryptogamia "flowerless plants," including ferns, mosses, liverworts, lichens, fungi, and algæ under that name. It is to the ferns only that we desire to direct attention, and for this our remarks on the flowering plants will have prepared us. As the dicotyledonous plants have leaves possessing a network of veins, or reticulated venation, and the monocotyledonous plants a parallel venation, so ferns have veins which fork or divide in a regular manner into two parts like the prongs of a fork, and are said to have a *furcate* venation. Amongst foreign ferns this character is not so universal as in English species. There is another peculiarity in ferns which deserves to be remembered: when the leaves of a fern first appear above the soil, the upper part is usually coiled inwards like a watch-spring. (Fig. 1.) There are only two or three British species which do not fold in this manner. Moreover, the spores or seeds of ferns are borne on the under surface of the fronds, or, in a few instances, upon modified or metamorphosed fronds. The leaves of ferns are called *fronds*, because they combine the functions of stems with those of leaves.

The fronds of ferns are borne on a stalk, or "stipe," so that when we speak of the "stipe" of a fern, we mean thereby what would be called the "leafstalk" or petiole of a flowering plant. The bases of the stipes are attached to a rootstock or rhizome, and it is only in some foreign species, called "tree-ferns," that an erect stem is produced.

It has been said above that the spores or seeds are borne on the under surface of the fronds, or occupy the whole surface of special and metamorphosed fertile fronds. These constitute the fruit or fructification, and appear as brown dots or lines or in confluent masses. These dots or lines, when seen by a lens, are found to consist of clusters or tufts of brown capsules, which are the *thecæ* or spore-cases. A single capsule is called a *theca*, but a cluster of them is termed a *sorus*. These clusters, or *sori*, are sometimes naked, but more commonly covered, especially in their early stages, with a membrane is always advisable to change the sheet for each *variety*. The specimens should be laid on the paper with the under or fructifying surface uppermost, and the barren side of the frond applied to the paper. Small strips of gummed paper, about 1 in. in length, and not more than ⅛ in. in width, should be laid across the principal and secondary ribs or branches of the frond, and each end fastened down to the sheet of paper; other pieces may, in like manner, be placed across the tips of the fronds, or wherever else appears to be necessary to secure the specimen to the paper. It may be suggested that too many such slips disfigure the specimen, and if there are not sufficient it cannot be retained in its place. Experience must be the best teacher. Some object to fastening the specimens to paper at all, others recommend gluing them down by the whole surface. Both these plans appear to us to be equally objectionable. If the specimens are loose, they are not only in danger of being broken or damaged, but of being misplaced and dissevered from the label which belongs to them. If wholly glued down, they cannot under many circumstances be removed from the paper, either to be transferred to other paper or for closer examination or comparison.

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Ferns are *not* flowering plants, but they belong to a class in the vegetable kingdom distinct from exogens and endogens, in which the flowers are concealed, hence called "*cryptogamia.*" We cannot say that they have no reproductive organs, although they are destitute of true flowers. Some persons call the cryptogamia "flowerless plants," including ferns, mosses, liverworts, lichens, fungi, and algæ under that name. It is to the ferns only that we desire to direct attention, and for this our remarks on the flowering plants will have prepared us. As the dicotyledonous plants have leaves possessing a network of veins, or reticulated venation, and the monocotyledonous plants a parallel venation, so ferns have veins which fork or divide in a regular manner into two parts like the prongs of a fork, and are said to have a *furcate* venation. Amongst foreign ferns this character is not so universal as in English species. There is another peculiarity in ferns which deserves to be remembered: when the leaves of a fern first appear above the soil, the upper part is usually coiled inwards like a watch-spring. (Fig. 1.) There are only two or three British species which do not fold in this manner. Moreover, the spores or seeds of ferns are borne on the under surface of the fronds, or, in a few instances, upon modified or metamorphosed fronds. The leaves of ferns are called *fronds*, because they combine the functions of stems with those of leaves.

The fronds of ferns are borne on a stalk, or "stipe," so that when we speak of the "stipe" of a fern, we mean thereby what would be called the "leafstalk" or petiole of a flowering plant. The bases of the stipes are attached to a rootstock or rhizome, and it is only in some foreign species, called "tree-ferns," that an erect stem is produced.

It has been said above that the spores or seeds are borne on the under surface of the fronds, or occupy the whole surface of special and metamorphosed fertile fronds. These constitute the fruit or fructification, and appear as brown dots or lines or in confluent masses. These dots or lines, when seen by a lens, are found to consist of clusters or tufts of brown capsules, which are the *thecæ* or spore-cases. A single capsule is called a *theca*, but a cluster of them is termed a *sorus*. These clusters, or *sori*, are sometimes naked, but more commonly covered, especially in their early stages, with a membrane called an *indusium* or involucre. The presence or absence and form of this cover is of great importance in determining the genus and species to which a fern belongs. The variations in form and mode of attachment of the covers *(indusa)* will be alluded to by-and-bye. But to return to the thecæ or spore-cases: each spore-case is somewhat globose, generally with a short stalk, and girt by an elastic ring. This ring may pass over the top of the spore-case (Fig. 2) in a vertical manner, or around it horizontally or obliquely (Fig. 3). In some ferns the spore-cases are destitute of a ring, but split down the centre into two valves (Fig. 4). The interior of the spore-cases are filled, when ripe, with the minute, brown, dust-like spores or seeds.

The ferns which we shall have to describe may in the first instance be divided into two primary groups, each containing several genera or groups of species. The distinguishing feature in this separation will be that in one group the thecæ, or spore-cases, are not surrounded by any *annulus*, or ring, which is much the smallest group, and includes but three genera, and which may be named *exannulate*, or "without a ring." The other and larger group has spore-cases *always* surrounded or girt by a ring, and this we shall call *annulate*, or "with a ring."

First of all, we will examine the small group which we have called

EXANNULATE *(without a ring)*.—As already observed, only three genera constitute this group, of which two have the spore-cases borne on a special frond, and in the other the spore-cases are borne on the changed upper portion of an otherwise barren frond. In this group it will be observed that the thecæ or spore-cases are *not* borne in clusters on the backs or margins of unaltered, or but little altered, fronds, but are confined to a special portion of the plant, in which the whole surface so set apart is devoted to its spore-bearing office. The spore-cases are themselves globose, splitting across the centre into two valves, to permit the spores to escape. The principal features which may be employed to distinguish the three genera which compose this group are: the spore-cases are arranged on a simple and unbranched spike in adders' tongues *(Ophioglossum)*; the spore-cases are arranged on a compound or branched spike in moonworts *(Botrychium)*; the spore-cases are clustered upon the branched or metamorphosed upper portion of an otherwise barren frond in Osmund ferns *(Osmunda)*. (Fig. 5.)

The general character of the spore-cases in this group are represented in Figs. 4 and 5.

The second and larger group contains all the genera which are—

ANNULATE *(with a ring)*.—That we may render the characters of this group plainer it will be necessary to resort to a further subdivision into minor groups.

If the spore-cases of all the species could be examined in succession, it would be observed that in a few of them the ring is *oblique*, whilst in the majority of them the ring is *vertical*. Thus we are enabled to remove the sub-group with oblique rings for future consideration, and for the present deal only with those genera in which the ring is vertical.

As the sub-group still reserved is a large one, it will be essential to find some other character which is common to a few of the genera and not present in the others. If we look at the clusters of spore-cases, which we have already observed are called *sori*, and which are arranged on the back or at the margins of the fronds, it will be observed that in some instances the tufts are quite naked, whilst in others they are covered with, or surrounded by, a membrane


FIG. 1.


FIG. 2.


FIG. 3.


FIG. 4.


FIG. 5.


FIG. 6.


FIG. 7.


FIG. 8.

of variable form. This enables us to constitute two sections of our sub-group, in which

Section I.—The tufts of spore-cases are naked;

Section II.—The tufts of spore-cases are covered *(indusiate).*

The *first* section, with naked tufts, contains three genera, which may be distinguished by the following characters: the clusters are circular, and the margin of the frond is flat (not reflexed), in the polypodies *(Polypodium).* The clusters are at first circular, afterwards spreading one to the other and becoming confluent, the margin of the frond bent back (reflexed), in the parsley fern *(Allosorus).* The clusters are elongated or linear in the Jersey fern *(Gymnogramma).*

By attention to the above characters, it will be easy to refer any fern with naked *sori*, which is a native of Great Britain, to its proper genus.

The *second* section, with covered or *indusiate* tufts, or clusters of spore-cases, contains eleven genera, so that it will be necessary to separate those with true or evident coverings from those in which the covering is imperfect. If, with this limitation, we examine the seven genera in which the clusters are truly and manifestly covered, we shall find that in two of these the clusters are *circular*, in four of them the clusters are *elongated*, and in the seventh they form a continuous line down the frond. Thus we may state their characters:

Clusters circular.—Covering kidney-shaped in the boss ferns *(Lastrea).* (Fig. 6.)—Covering circular in the shield ferns *(Polystichum).* (Fig. 7.)

Clusters oblong or linear.—Covering oblong, kidney-shaped, and fringed at the outer margin, lady fern *(Athyrium).* (Fig. 8.)—Covering straight in spleenworts *(Asplenium).* (Fig. 9.)

Clusters in pairs.—Covering opening down the centre between the twin clusters in hart's tongue *(Scolopendrium).* (Fig. 10.)—Spore-cases concealed amongst brown chaffy scales in the scale fern *(Ceterach).*—Finally, the clusters of spore-cases form a continuous line along the back of the frond between the midrib and the margin, with a linear covering, in the hard fern *(Blechnum).* (Fig. 11.)

It will be observed that in all the above seven genera, in which there is a true covering, the fructification is *dorsal;* that is, it is borne on the back of the frond. In the four following genera, in which the covering is imperfect, the fructification is *marginal*, that is, it is borne along the edges of the fronds. In two of these the cover is formed by the bending back of the margin of the frond. The whole margin rolled back forms a covering in the bracken *(Pteris).* (Fig. 12.)—Lobes of the margin folded back form the covering in the maidenhair *(Adiantum).* (Fig. 15.)

In the remaining two genera, having an imperfect or modified covering, one of these has a kind of special *indusium* attached behind, and covering the spore-cases as if with a hood, in bladder ferns *(Cystopteris).* (Fig. 13.) The other has a roundish, somewhat cup-shaped receptacle, with fringed margins *(Woodsia).* (Fig. 14.)

Thus far we have given the prominent characters of all the genera of British ferns in which the spore-cases are surrounded by a vertical ring. It has already been observed that there remains a small group, consisting only of two genera, in which the ring is oblique, and these are still further characterized by the thin membranaceous texture of the fronds. In this group the tufts of spore-cases are enclosed in a kind of receptacle. This receptacle is urn-shaped in the bristle ferns *(Trichomanes).* (Fig. 16.)—The receptacle is two-valved in the filmy ferns *(Hymenophyllum).* (Fig. 17.)

In order to affix these characters more permanently on the memory, they are given in the form of a table: *

First Group.—The spore-cases *without* a ring.

Spore-cases or seed-vessels borne on a separate frond, in a simple spike	*Adder's Tongue.*
In a branched spike	*Moonwort.*
Spore-cases or seed-vessels borne on the upper part of a barren frond, which is branched	*Osmund Ferns.*

Second Group.—The spore-cases surrounded by a ring.

In the following the ring is vertical:

Spore-cases naked.

Spore-tufts circular and distinct	*Polypodies.*
Spore-tufts running together	*Parsley Fern.*
Spore-tufts elongated	*Jersey Fern.*

Spore-cases covered.

With a proper cover:

Spore-cover kidney-shaped, attached at the edge .	*Boss Ferns.*
Spore-cover circular, attached at the centre . .	*Shield Ferns.*
Spore-cover kidney-shaped and fringed . . .	*Lady Ferns.*
Spore-cover straight, opening towards the midrib .	*Spleenworts.*
Elongated tufts of spore-cases in pairs, side by side, covers opening down the middle	*Hart's Tongue.*
Tufts of spore-cases concealed amongst brown scales	*Scale Fern.*
Tufts of spore-cases arranged in a long line . .	*Hard Fern.*

* The young botanist must bear in mind that many of the terms employed here are not rigidly and scientifically correct, but are the nearest approximation which popular language permits.

With a false or imperfect cover:
- Formed from the reflexed edge of the frond . . *Bracken.*
- Formed from reflexed lobes of the frond . . . *Maidenhair.*
- Spore-cover forming a hood . . . . . *Bladder Ferns.*
- Spore-cover cup-shaped and fringed . . . . *Woodsia.*

In the following the ring is oblique:
- Spores contained in a cup-shaped receptacle . . *Filmy Ferns.*
- Spore-cases contained in a two-valved receptacle . *Bristle Ferns.*

FIG. 9.

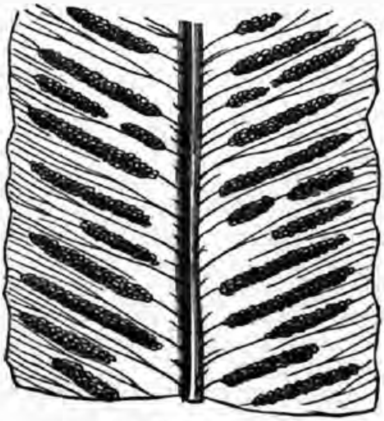

FIG. 10.

FIG. 13.

FIG. 14.

FIG. 11.

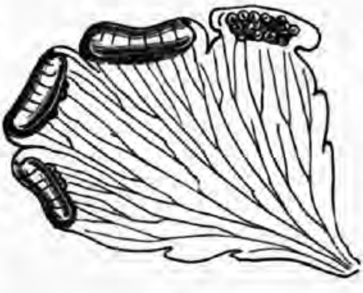

FIG. 15.

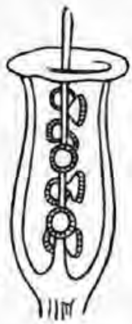

FIG. 16.

FIG. 17.

FIG. 12.

The commonest ferns of lowland districts are the bracken, male fern, lady fern, common polypody, black spleenwort, hart's tongue, shield ferns, marsh fern, and royal fern, the two last in marshy places. The Brake or Bracken is so common and well known that it would be superfluous to enter upon a description. The spore-cases are arranged in a single narrow line along the edge of the frond, with the margin of the frond curled back to cover them. The scientific name is *Pteris aquilina.*

The Male Fern is common on hedgebanks, in woods, and all sheltered situations. The fronds are feathery and from two to three feet in length, growing in a tuft from the top of the rootstock. The footstalk is scaly and the outline of the frond spear-shaped. The fronds are divided in a pinnate or feathery manner, and each of the pinnæ or leaflets are again subdivided in the same way. The spore-cases are in tufts on the backs of the fronds, often confined to the lower portion of the leaflets. These are nearly circular, with a kidney-shaped covering, or indusium. The scientific name is *Lastræa filix-mas.*

The Lady Fern delights in damper situations—moist woods, beside ditches and streams—and is of a more delicate habit than the male fern. The fronds average nearly the same size, and are also produced in tufts at the top of the rootstock. The spore-cases are not so circular as in the male fern, and the covering or indusium is almost horseshoe-shaped, distinctly fringed at the outer edge. The latter character (that of the spore-cover) is sufficient to distinguish the present from any other British species. Its botanical name is *Athyrium filix-fœmina.*

The Polypody flourishes on old hedgebanks, stumps, pollard trunks, thatched roofs, and similar situations. The rootstock is creeping, and from the size of a quill to that of the little finger. The fronds are produced singly on long footstalks, often aggregated in large patches. The fronds are narrow, and divided *nearly* to the midrib in a feathery manner. The tufts of spore-cases are large and without any covering. By the above features it is easily recognized, and can scarcely be confounded with any other British fern. The scientific name is *Polypodium vulgare.*

The Black Spleenwort is also common on hedgebanks, especially on a sandy soil, and a stunted form occurs on old walls. The fronds are usually acutely triangular, on long blackish wiry footstalks, and produced in tufts, looking something like a tuft of parsley, but darker in colour and more rigid. The spore-cases are often profuse, and in the young state are in distinct oblique lines, but when mature nearly cover the under surface of the fronds. The botanical name is *Asplenium adiantum-nigrum.*

The Hart's Tongue is found on hedgebanks, old walls, the sides of wells, and in a variety of situations. The fronds are glossy, smooth, and undivided, long and narrow, almost strap-shaped, on long footstalks. They are produced in tufts, the outer ones curling over to the ground, and the central standing nearly erect. The spores are arranged in parallel lines, proceeding obliquely on either side of the prominent midrib towards the margin. Each of these lines consists of a double series of spore-cases, which are at first covered with a thin membrane, but which soon ruptures down the centre between the twin clusters and exposes the spore-cases. The scientific name is *Scolopendrium vulgare.*

The Shield Ferns are perhaps less common than any of the species above enumerated, but they are by no means uncommon. There are two species (the third, or holly fern, is confined to mountains): one is called the prickly shield fern, the other the soft shield fern. These two shield ferns greatly resemble each other, and by some botanists are regarded as the same species. They are found in similar localities, on shady hedgebanks, and may be distinguished from the male fern and other species of *lastrea* by the form of the indusium, or cover to the clusters of spore-cases. In the shield ferns the cover is circular and attached by the centre, whilst in *lastrea* it is kidney-shaped and attached at the sinus, or notch at the side. The soft shield fern is of a softer texture than the prickly shield fern, and the leaflets are angular at the base and stalked, whilst in the prickly shield fern the leaflets are wedge-shaped at the base and *not* stalked. The botanical name of the soft shield fern is *Polystichum aculeatum*, and of the prickly shield fern *Polystichum angulare.*

The Marsh Fern is confined to marshes and boggy places. (Fig. 18.) The rootstock is slender and creeping, and the fronds produced singly, but aggregated in large patches. The fertile fronds are the largest. The leaflets are compound, long and narrow, and arranged in a feathery manner; throughout their whole length they are cut nearly to the midrib into long narrow lobes. The leafy portion is not longer than the naked footstalk. In some English counties this fern is very rare.


FIG. 18.

The Royal Fern is also confined to similar localities. It is one of the most magnificent of British ferns, sometimes eight feet high and upwards. The spore-cases are not borne at the back of the fronds, as in the other species that we have enumerated, but, instead thereof, the upper portion of a frond becomes changed or metamorphosed. The pinnæ are shortened and contracted at first, appearing as if blighted; ultimately the whole upper portion of the frond assumes a rusty brown colour, and seems converted into a panicle of closely-packed spore-cases, each of which is borne on a short stalk, without a covering, and opens vertically into two valves.

There are other lowland ferns which are plentiful in certain localities, but restricted in their distribution. Of these may be mentioned the adder's tongue, spring boss fern, broad boss fern, crisped boss fern, wall spleenwort, scale fern, and hard fern.

The Adder's Tongue has an erect stem of from 6 in. to 12 in. in height, terminated by a club-shaped head, in which the spore-cases are embedded in two opposite rows, one on each side of the spike. When mature, the spore-cases split across the centre and discharge the enclosed spores. From the side of the erect stipe or stem a barren frond is borne. This barren frond is leaf-like, sheathing the stem in its lower portion, and expanding upwards into a more or less obtusely ovate or egg-shaped form. The adder's tongue delights in damp meadows and loamy pastures, and is in perfection in June and July. Its scientific name is *Ophioglossum vulgatum.*

The Spiny Fern has a stout branching rootstock, from which the fronds are developed in tufts of from 1 ft. to 3 ft. in height. Their outline is long and narrow, scarcely spear-shaped, with feathery branches of nearly equal length, except near the apex of the frond. The footstalk occupies about half the entire length of the frond, and the leafy portion is flat. The leaflets are arranged in a feathery manner along the branches; these are of an elongated oblong outline, deeply cut into numerous lobes, each lobe being in itself surrounded by sharp-pointed teeth, or little spines, whence the name of the fern is derived. The leafstalk is clad throughout with little scattered pointed scales. The tufts of spore-cases are rather small, and their covering kidney-shaped, with a waved margin destitute of glands. Its botanical name is *Lastrea spinulosa.*

The Broad Boss Fern is found in shady lanes and damp woods. It has a large rootstock, from which the fronds are developed in tufts, curving outwards in an arched manner, and forming spreading clumps of long feathery fronds, from 1 ft. to 4 ft. in length. The footstalk is thick at the base and densely covered with pointed spear-shaped scales. The outline of the fronds, though very variable, is usually spear-shaped, and the branches are disposed in a feathery manner. The leaflets have an oblong outline, deeply cut and lobed, each lobe having its margin set with spiny teeth. The covering of the spore-cases is kidney shaped, and has the margin fringed with stalked glands. The scientific name is *Lastrea dilatata.*

The Crisped Boss Fern is found on shady banks and damp woods in the west of England. The fronds are in tufts, from 1 ft. to 2 ft. in length. The footstalk is scaly, and the outline of the leaf triangular. The branches are disposed in a feathery manner, the lowest pair being the longest, and decreasing upwards. The leaflets are oblong and disposed also in a feathery manner along the branches, those on the lower side being larger than those on the upper. The edges of all are notched, sometimes deeply into lobes, and at others only into short teeth. The edges of all the leaflets are curled inwards, so as to give a characteristic crisped appearance to the fronds. The tufts of spore-cases have kidney-shaped coverings, fringed at the edge with stalked glands. These glands contain an essential oil, which communicates its odour to the plant when bruised. It is sometimes called the hay-scented fern. The scientific name is *Lastrea æmula.*

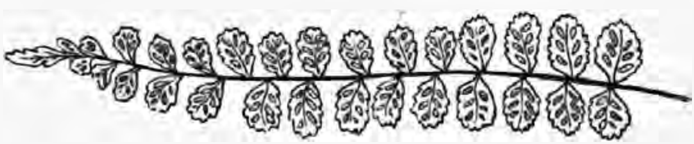

FIG. 19.

The Wall Spleenwort occurs on old walls, amid ruins, and in rocky districts. It bears a great resemblance to the green spleenwort, from which it may be distinguished chiefly by the blackish leafstalk. The roundish leaflets being nearly in pairs along the midrib or leafstalk, diminishing in size towards the apex. The fronds are produced in tufts from the crevices of walls, &c., and are seldom more than 6 in. or 7 in. in length, often less. Two or three elongated tufts of spore-cases are developed on each side of the midrib of the leaflets. These often become confused together as they approach maturity, and almost cover the under side of the leaflets. The scientific name is *Asplenium trichomanes.* (Fig. 19.)

The Scale Fern, sometimes called "rusty-back," is also a lover of old ruins and crumbling walls. It grows in a close tuft from a short, thick, scaly rootstock. The fronds are from 4 in. to 6 in. in length, deeply cut on each side into rounded notches nearly down to the midrib, so as to form a series of

FIG. 20.

rounded lobes. The upper surface is of a dull green, and the under surface a rusty brown, from the numerous brown scales which conceal the spore-cases. The fronds are thick and leathery, and the appearance of the fern is quite distinct from that of any other British species. Its botanical name is *Ceterach officinarum.* (Fig. 20.)

The Hard Fern is not uncommon, but local. It is found on heaths, in woods, and rocky localities, generally in the neighbourhood of water. The fronds are of two kinds, the fertile being the longest, and are erect in the centre, the barren on the outside lying on the soil like a rosette. The outline is long and narrow, deeply cleft on each side nearly to the midrib into narrow lobes. The fertile fronds are divided quite down to the midrib, but the lobes are narrower, with a greater distance between them. The footstalks of the barren fronds are short, but those of the fertile fronds are nearly half the length of the frond. The spore-cases form a narrow line on each side of midrib of the lobes of the fertile fronds. The scientific name is *Blechnum spicant.*

The ferns that are confined to rocky and mountainous situations are the moonwort, beech fern, alpine polypody, oak fern, limestone polypody, parsley fern, mountain boss fern, wall rue, green spleenwort, brittle bladder fern, and the filmy ferns. In one or two instances these are found under favourable circumstances in lowland districts, as, for instance, the moonwort in pastures and the wall rue on old churches, but they flourish more naturally in higher stations. Some of the rarer species hereafter indicated are also mountain-lovers.

The Moonwort is a very singular-looking little plant, and at first would scarcely be taken for a fern. It usually occurs in mountain pastures and moors. The whole plant is from 5 in. to 7 in. in height, sometimes less, the upper portion forming a compound spike, bearing the spore-cases, which have neither ring nor covering, and burst when mature into two valves, somewhat after the manner of the adder's tongue and the royal fern. From the latter it is readily distinguished by its size, and from the former by its compound spikes and lobed fronds. The barren frond, of which there is usually but one to each plant, is divided on each side into a series of fan-shaped lobes, of which from four to six or seven pairs occur upon a frond. The scientific name of this fern is *Botrychium lunaria.*

The Beech Fern is found beneath the spray of waterfalls and in damp rocky places. It has a wiry creeping rootstock, and the fronds have a nearly triangular outline. They are from 8 in. to 12 in. in height, of which the footstalk occupies at least one-half. The upper portion of the frond is divided nearly to the midrib in a feathery or pinnate manner, whilst the lower portion forms distinct leaflets, deeply notched into lobes. The lowest pair of leaflets are directed downwards, which gives a peculiar appearance to the frond. The spore-cases are borne in rounded tufts, without coverings, on the under surface of the fronds. Its botanical name is *Polypodium phegopteris.*

The Alpine Polypody has very much the appearance of a small lady fern. The rootstock is short, with a tuft of fronds at the crown. These fronds are borne on short scaly footstalks, and are from 9 in. or 10 in. to 2 ft. or 3 ft. in length. They are not only divided into separate distinct leaflets along each side of the midrib, with a spear-shaped outline, but each of these leaflets is again divided to the centre in a feathery manner into lobes, or segments, called *pinnules*, and is therefore called *bi-pinnate.* The pinnules, or ultimate

FIG. 21.

subdivisions, are between oblong and egg-shaped, and sharply toothed along the margins. So deeply cut are the marginal teeth in some cases, that the frond has the appearance of being again pinnate—*tri-pinnate*, or three times divided in a pinnate manner. The circular spore-cases on the under surface of the fronds are without coverings. This fern is common in some parts of the Scotch mountains, often in company with the lady fern. The scientific name is *Polypodium alpestre.*

The Oak Fern is not uncommon in mountainous localities, in the chinks of stone walls by the roadside in Wales, and amongst rocks near dripping springs. It has a slender creeping rootstock, from which arise the graceful triangular fronds, borne on slender dark-coloured stipes, which are twice the length of the leafy portion. The fronds are triangular in outline, divided into three nearly equal branches, the outline of which is also triangular. Each branch has its lower portion divided into distinct leaflets, which are again divided nearly to the central vein in a feathery manner. The upper portion of the branches is cleft into lobes, gradually becoming more divided towards the base. The tufts of spore-cases are circular and scattered, without coverings, on the under surface of the fronds, but many of the fronds are usually barren, especially when growing in a damp favourable situation. The scientific name is *Polypodium dryopteris.* (Fig. 21.)

The Limestone Polypody somewhat resembles the oak fern in the form of the fronds, which are triangular, and the surface has a mealy appearance. The clusters of spore-cases are near the margin on the under surface, and destitute of coverings. This fern has a predilection for calcareous soils, and is not uncommon in the rocky parts of Derbyshire and a few other localities. The botanical name is *Polypodium Robertianum.*

The Parsley Fern resembles, as its name imports, a tuft of green parsley, and is found chiefly in mountainous localities in the north of England and Wales. The fronds are of two kinds. The early fronds are barren and about 6 in. or 7 in. in length, two-thirds of which is occupied by the stalk; the rest has a long triangular outline, branched and divided intc a great number of wedge-shaped leaflets, which are notched at the end. The fertile fronds are rather longer, and the leaflets narrowly oblong. The clusters of spore-cases, though when young distinctly circular, on the backs of the leaflets, soon spread to each other and cover the entire surface. The scientific name is *Allosorus crispus.*

The Mountain Boss Fern has a thick rootstock, from which proceeds a tuft of feathery fronds, from 2 ft. to 3 ft. in height, resembling in arrangement the feathers in a shuttlecock. It has a distinct odour when bruised, and is hence sometimes called the Fragrant Mountain Fern. The outline of the fronds is spear-shaped, with a very short footstalk. The leaflets diminish in length upwards and downwards, so that the lower leaflets are almost reduced to a single lobe. Each leaflet is cut nearly to the mid-rib into long narrow lobes. The lower surface is covered with minute glands, which contain the balsamic secretion to which the odour of the plant is due. The tufts of spore-cases are covered with kidney-shaped coverings, as in other boss ferns. Its botanical name is *Lastrea oreopteris.*

FIG. 22.

The Wall Rue is found sometimes on old churches and ruins in lowland districts, but most freely and commonly in mountainous localities, forming dull green tufts, from 2 in. to 4 in. or 5 in. in length. The tough, wiry leafstalk is comparatively long, and bears at the apex and on each side wedge-shaped leaflets in clusters of threes. (Fig. 22.) There is considerable irregularity in the form of the leaflets, and some deviation in the arrangement of them. The clusters of spore-cases are arranged in lines on the under surface of the fronds, and the covering splits with a jagged or toothed edge. The name by which it is known to botanists is *Asplenium ruta-muraria*.

The Green Spleenwort is a pretty little fern, with fronds seldom more than

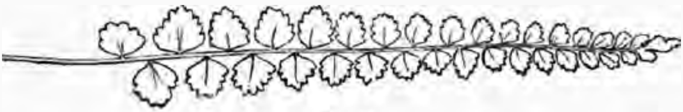

FIG. 23.

6 in. or 7 in. in length, with a central wiry green midrib, or leafstalk, and small egg-shaped leaflets arranged in pairs along it from within a short distance of the root. (Fig. 23.) On the under surface of each leaflet the spore-cases are arranged in lines, at first distinct, but afterwards more or less blending. The fronds are produced in tufts, with wiry rootlets. It is chiefly found in moun-

FIG. 24.

FIG. 25.

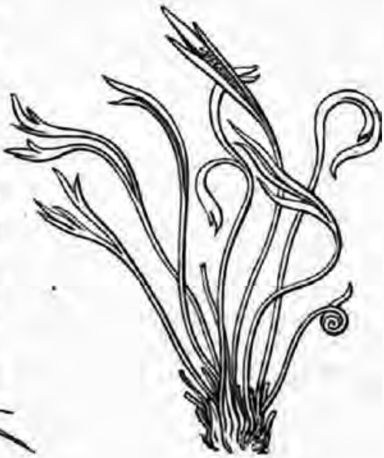

FIG. 26.

tainous districts, and is not so common as the wall spleenwort, from which it may be distinguished by the colour of the leafstalk. It is called *Asplenium viride*.

The Brittle Bladder Fern is one of three oritish species in which the covering of the tufts of spore-cases has the form of a hood. The other two species are rare. This species grows in tufts, usually about 6 in. or 8 in. in height, of which the brittle leafstalk occupies nearly half the length. The outline of the leafy portion is spear-shaped. The branches are usually at some distance apart, and taper towards the extremity, so as to have an elongated, egg-shaped outline, deeply cut into narrow lobes, which are notched at the edges. The tufts of spore-cases are often numerous, rounded, and at first distinct, but by spreading till they meet each other, the under surface of the fronds occasionally appears to be completely covered with the spore-cases. It is found in moist rocky situations in mountain districts, and is known botanically as *Cystopteris fragilis.*

The Filmy Ferns are represented by two species, often found growing together on dripping rocks or beneath the spray of waterfalls. These little plants are so diminutive that they are almost as much like mosses as ferns to the uninitiated, and the delicate texture of the leaves serves to strengthen such an impression. The characters which separate the two species are so technical that it is very probable that the amateur will mistake one for the other. The Tunbridge filmy fern is not more than 2 in. in height, with a creeping, black, wiry rootstock (Fig. 24). Our figure, which is the natural size, will give an idea of its appearance. The receptacles which contain the spore-cases are urn-shaped, and produced at the edges of the fronds. They are flattened, and toothed at the edge. Wilson's filmy fern is about the same size, and has a similar habit, except that the leaflets are often all turned towards one side (Fig. 25.) The spore-cases are contained in similar receptacles, which are *not* at all flattened, and consist of two valves, the edges of which are smooth, and *not* toothed or jagged. The botanical name of the Tunbridge fern is *Hymenophyllum Tunbridgense*, and of Wilson's fern, *Hymenophyllum Wilsoni.*

The species of British ferns which may be considered rare or local are: the little adder's tongue, the Jersey fern (Fig. 27), crest fern, stiff boss fern, crisped boss fern, holly fern, forked spleenwort (Fig. 26), alternate spleenwort, sea spleenwort, rock spleenwort, bristly spleenwort, maidenhair, royal bladder fern, mountain bladder fern, the Woodsias, and the Killarney fern.

FIG. 27.

Arts.

SURVEYING.

Surveying may be defined as the art by which we represent portions of country on a diminutive scale.

It is very rare to find any person at all educated who cannot understand a plan or map, and who, therefore, cannot find his way in a strange country by the aid of a map; but it is not very common to find a person capable of making a map or plan. To make an accurate map of a large portion of country is a long and laborious work, and requires skilled workmen; but to make a plan of a small farm or park is by no means difficult. We will, therefore, proceed to describe the method of making such a map.

Fig. 1.

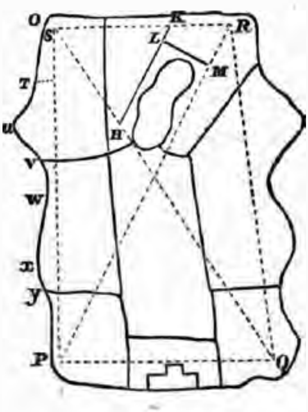

Fig. 2.

We will suppose that A B C D E, Fig. 1, is a small farm or portion of ground which we require to survey, and of which we wish to make a map.

We should first walk over the ground, so as to obtain a general idea of the shape of the farm. If we can find an elevated point on the farm, so as to obtain a bird's-eye view, so much the better. We should then fix upon four points within the farm, and which may be seen from each other, and so situated that they are near the boundaries we wish to survey. O P Q R, Fig. 2, are such points.

At these points, termed "stations," we should place flag-staves, or poles with paper attached to them, or adopt some means for clearly seeing them, and between these one or two short sticks should be placed, so as to mark accurately the straight line joining them.

In selecting these stations we should endeavour to avoid obstacles between them, such as houses, thick woods, &c., so that we could measure between the two points.

Having provided ourselves with a measuring-chain, which is 66 ft. long and divided into 100 parts called links, an arrangement well suited for obtaining acreage: a measuring-tape, or even a common rope divided into yards, will do; also take a staff about 10 ft. long, or 10 links long if using a chain; a note-book with two ink lines down the middle of a dozen or so pages, and we are provided with all the necessary articles for our survey.

We will suppose that we are using a chain, with which ten pins or arrows are used, an arrow being placed in the ground by the chain-leader at the end of each chain, which arrow is taken up by the chain-director as the latter comes up to it; thus the chain-director knows how far he has gone by the number of arrows in his hand.

Starting from the station, O, we write at the bottom of the page in our note-book, which is termed the "field-book," the name of our station and the line

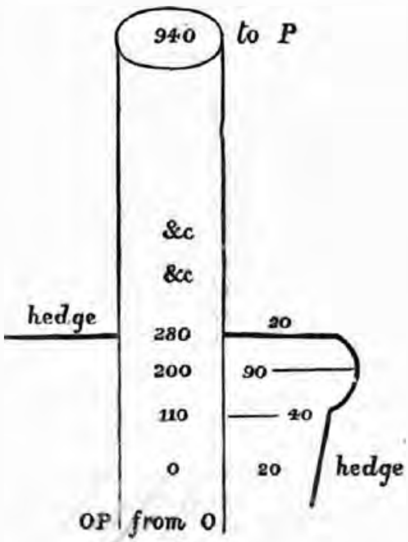

FIG. 3.

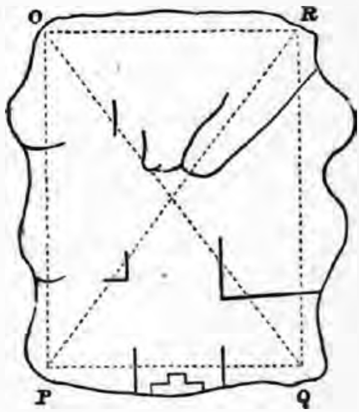

FIG. 4.

along which we are working, thus, "Line O P from O." Before beginning to measure along O P, we should with our staff measure the distance of the hedge from the point O, and insert this on the proper side of our double column in the field-book. Suppose this distance to S to be 20 links.

Next measure along O P, noting where hedges cross the line, and where the hedge on the right bends. At each bend measure to the hedge, this measure being termed an "offset," noting at what distances up the line O P these offsets are taken.

Suppose that at 110 links we measured to the bend T 40 links, at 200 links to the bend U 90 links; at 280 suppose the hedge crossed our line, and we

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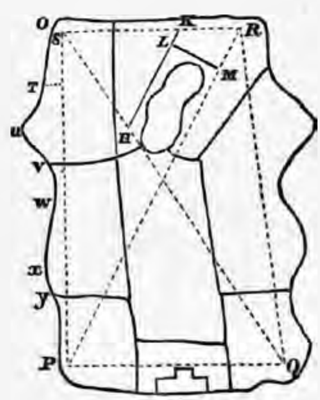

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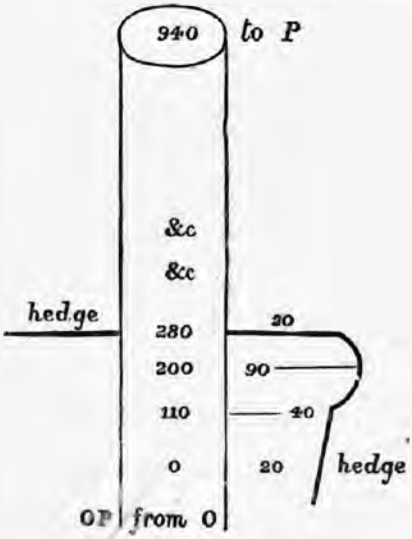

FIG. 3.

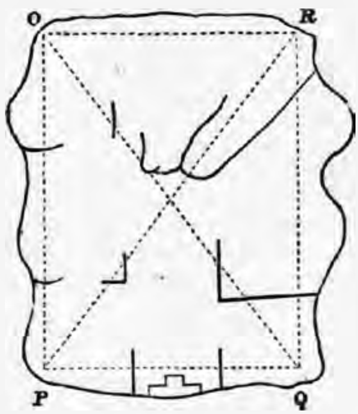

FIG. 4.

along which we are working, thus, "Line O P from O." Before beginning to measure along O P, we should with our staff measure the distance of the hedge from the point O, and insert this on the proper side of our double column in the field-book. Suppose this distance to S to be 20 links.

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Suppose that at 110 links we measured to the bend T 40 links, at 200 links to the bend U 90 links; at 280 suppose the hedge crossed our line, and we measured to V an offset of 20 links. In a similar manner offsets would be measured to *w*, *x*, and *y*, till we come to P, where the total length of our line we will suppose to be 940 links.

Referring to the representation of our field-book, we can see how this result would be booked.

We have from this one line and the offsets sufficient information to enable us to sketch the hedge from O to P, as well as a portion of the cross hedges.

In like manner we should measure from P to Q, Q to R, and R to O, and by means of offsets we obtain the house, hedges, &c., near these lines.

Next measure "check-lines," as they are termed, from P to R and from R to P, noting as before offsets, crossings, &c.

Before we commence details we should test whether our work so far has been done correctly, and this we can discover as follows·

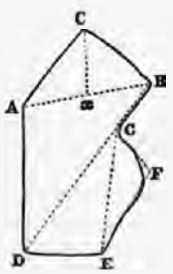
On a piece of drawing-paper, sufficiently large for the scale we have selected, draw the line O Q or P R. Then, taking a distance equal to O P in our compasses, describe an arc with O as a centre, so as to pass near where we suppose P to be; then, with Q as centre and the distance Q P, describe another arc: where this second arc intersects with the first will be the point P. In the same manner fix the point R; then, if the work be correctly done, the distance P R will be the same on the plan as it was found by measurement.

The diagram, Fig. 3, would be the appearance of our plan at this portion of our proceedings, and we should now have to fill up details. These details are all done in the same manner, so we will give but one example, viz., the method of getting the banks of the pond, F, Fig. 1, correctly.

On looking at Fig. 2, we find in the line O Q the letter H; this letter represents the position of a stake in the ground, or a mark cut there, or some station *that we noted as we measured along the line* O Q, this mark being registered in the field-book, and called "bench-mark" (B.-M.), in the following manner: "B.-M. 320, in line O to Q." In like manner the bench-mark K would be noted. We could, therefore, plot the line H K, because we know its termination in the two lines O Q and O R, and we should measure its length and *take offsets* to the pond wherever there was a bend. By proceeding in the same manner with the small line L M, we should by means of offsets get the side that alone remained to be surveyed.

In this manner hedges, &c., could be sketched, and thus the whole of the enclosures could be put correctly on the map.

In order to make a sketch complete, we should tint the streams and ponds light blue, the houses red, and the roads a light burnt sienna colour



When a plan has been made we should know how to obtain what is called *the area* of the fields; that is, how many acres, roods, and perches it contains. To do this is very easy, if we have made our survey with a 66-ft. chain, because 100,000 square links are equal to an acre.

Suppose C A D E F B to be a field, the area of which is required. We cut this field up into triangles, such as A B C, A B D, D E C, C F E. Then by dropping perpendiculars, such as C *x*, we measure A B, and multiply this by half C *x* (these measures being taken off our plan), and the product will be in square links. Suppose we thus obtain 325,674 square links, by striking off five figures to the right we obtain 3 acres, and the 25,674 will be decimals of acres, which we can multiply by 4 to obtain roods, and 40 to obtain perches, thus obtaining our acreage in acres, roods, and perches.

When a hedge bends or twists, we must draw one side of our triangle so as to make a balance between what we throw out of the field and what we take in, care being taken that we use so many triangles as to leave this estimate but for a very small amount.

A very correct survey of a portion of ground of two or three miles square may be made by this means.

Heights and Distances.

Under the head of surveying we may fairly class obtaining the heights and distances of inaccessible objects. To be able to measure the height of a tree or of a building, or to get the distance across a river, is a very useful proceeding, and as this is a very simple problem, we will describe the method.

When the sun shines the tree will, of course, throw a shadow. We can then either pace the length of the shadow, or measure it with our walking-stick, the length of which, in feet and inches, we should always know. We may then place the walking-stick upright in the ground, and should prove (by means of a plummet-line, which may be easily made with a string and a stone at the end) that the stick is upright: then measure the length of the shadow cast by the stick.

Suppose we found the shadow cast by the tree to be 40 paces, and we know our usual pace to be 30 in., then the length of the shadow would be 1,200 in. Suppose, also, the length of the shadow of the stick was 50 in., and the stick was 36 in. long Then by simple proportion we say, "as the length of the shadow cast by the stick is to the height of the stick, so is the length of the shadow cast by the tree to the height of the tree." Putting this in figures it becomes as 50 : 36 : : 1,200 to the height of the tree. By multiplying, as in rule of three, the second and third together, and dividing by the first, we obtain 864 in. for the height of the tree, that is, 72 ft.

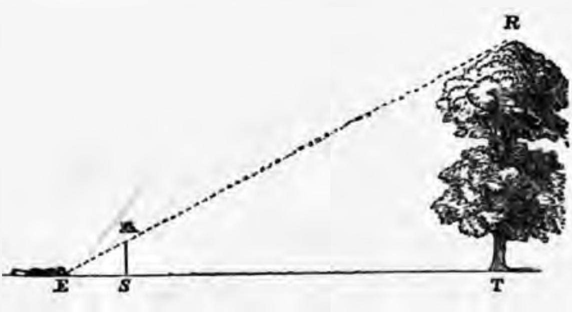


Fig. 5.

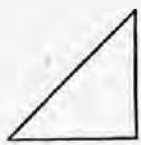


Fig. 6.

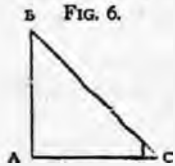


Fig. 7.

In case the sun does not shine, or we cannot conveniently make use of the shadow, another simple method is to place a stick in the ground, then to lie down and place the eye close to the ground, and so that the top of the tree coincides with the top of the stick.

Thus E represents the eye, S K the stick, and T R the tree; and K, the top of the stick, and R, the top of the tree, are in line when seen from E.

Then measure E S, and E T, also S K, the height of the stick. Suppose E S

2 yds., S R, 1 yd., and E T, 50 yds. Then, as E S : S R : : E T to the height, T R; that is, as 2 : 1 : : 50 to 25 yds., or height of tree.

Another method for obtaining the height of an inaccessible object is to get a piece of paper, and by doubling this, cut it into an exact square. Then when the square is made and doubled it will be in this (Fig. 6) form, and the two lesser sides should be equal in length. Double in a small portion of the paper at one end, so that it looks thus (Fig. 7). Then by holding this in the hand, and looking at our own height on the stem of the tree along the line C A, with the eye at C, walk backwards or forwards till the line C B points to the top of the object whose height we require. Then measure from the point on which we are standing to the tree, and the height of the tree will be equal to this distance added to our own height.

The reason of this is that the angle B C A is 45°; therefore the side C B is equal to the side A B.

We can practise this method in a room, or with regard to a house, and can thus impress it on our memory. It is a good plan to have a piece of cardboard cut in the manner shown above, and carried in a pocket-book, to be used when necessary.

It often surprises the uninitiated to find how much we can do by the aid of a piece of rope in regard to distances. To accomplish anything we must first know how to set off a right angle on the ground, and this we recommend to be practised with a piece of thread and two or three pins on the floor of a room.

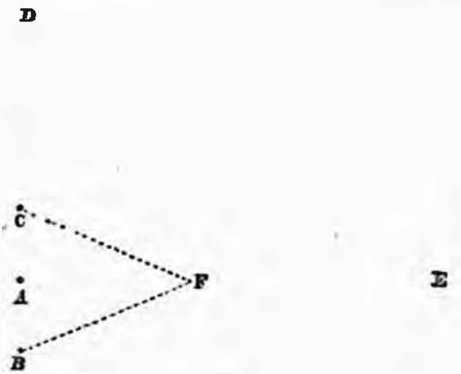


FIG. 7.

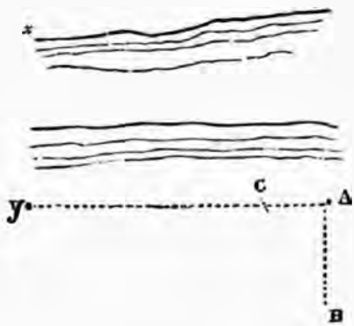


FIG. 8.

First take a piece of thread (or rope) and at the ends make two loops; then suppose it is required to set off a right angle from the line joining D and A and in the direction of E. Make a mark at C in the line A D less than half the length of the rope, also a mark at B equal to A C and in the same line with D, C, and A. Make a mark in the middle of the rope, which middle can be found by doubling the rope in half; then place the loops at the end of the rope over two pickets to be driven in the ground at C and B, and draw out the centre of the rope towards E and until the sides C F and B F are equal, when the line joining A and F is at right angles to the line joining D and A.

By adopting this method we can always set off a right angle from any selected station, and the use we may make of this will now be shown.

Suppose we are on the bank of a river, and wish to know the distance across, or that we see any far-off object, the distance of which is required. By means of two right angles set off carefully on the ground we may obtain the distance in the following manner:

Suppose X Y the distance required across a river, we being on the side Y. From Y set off, as before mentioned, the right angle X Y A, and let Y A be nearly equal to X Y (to be obtained by guess). From A set off A B at right angles to Y A, and at any convenient point down the line A B make a mark at B, where a point, C, in the line A Y is also in line with B and A. Then measure A B, A C, and C Y; by proportion we then have: as C A : A B : : C Y : X Y.

Suppose C A, 40 yds.; A B, 70 yds.; and C Y, 300 yds.; then, as before, as 40 yds. : 70 yds. : : 300 yds. : 525 yds., the breadth of the river.

We may practise this method in a room on a small scale, or on a lawn, and thus impress the process on our mind, and have it ready for use whenever required.

Every person should practise pacing distances, so as to be able to pace correctly, and to know the proportion between his paces and the number of yards he has gone over. The average walking-pace is about 30 in., or five-sixths of a yard. If this pace is used, every 120 paces will make 100 yds., and so on in the same proportion.

There are three good methods of pacing distances: the first is to pace regularly on, and at every 100 yds. to pass a stone or piece of money from one hand to the other, so as to remember the 100 yards; the second is to count only when the left foot comes to the ground, then double the number of paces; the third is to use a walking-stick in the usual way, and every time the point comes to the ground to count one; then multiply the result by four, and we obtain the number of paces.

In connection with pacing, judging distances may be referred to. Every soldier is now instructed in judging distances, and every volunteer ought to know something of this subject. The best method is to practise at some known distance, and judge how much of the details of a man's face we can see at say 50 yards, also at 100, and so on. Another plan we have found very good in practice is to select a point about 22 yds. in front of us, this 22 yds. being selected because it is the proper distance between the wickets, and can, therefore, be easily estimated by all who are cricketers, as all ought to be. Then take another 22 yds., and so on. We get 12 yds. under 100 yds. by taking four such measures, and we can then take a half, and reach close to 100 yds. By this plan we can after a short practice estimate very nearly 100 yds., after which we may estimate a second 100 yards, and so on.

Sometimes we may make the dullest walk interesting by guessing at distance along a road and then counting our paces towards them. We can easily train ourselves so as to estimate within about five per cent.

We can ascertain long distances with very fair accuracy by means of the velocity of sound, so that when a gun is fired and we see the flash, we can ascertain how many seconds elapse between our seeing the flash and hearing the report. Sound travels at the rate of about 370 yds. per second; so that, if provided with a watch that has a seconds hand, we can count the seconds and multiply the number that pass between the flash and report by 370, and we obtain the distance in yards.

We can by this means tell how far a flash of lightning has occurred from our position.

In case we have not a watch, we may count the beats of our pulse; these beats number in health about 70 or 75 per minute, so that we should allow about 305 yards for each pulsation.

We may also hum the time of a quick march, beating the feet in time and counting the number of paces; then multiply the number of paces by 210, and we obtain the number of yards. This latter method we have found a very rapid one and very accurate.

Should the reader be desirous of entering more fully into the subject of surveying, sketching, &c., he should procure some work which treats entirely of this subject, supply himself with a pocket-sextant and a compass, and practise in the manner recommended in the works he may possess. It is also a very good plan to practise drawing a plan of the roads between any two places we know by memory alone, and then comparing our plan with a correct map. We may thus acquire a knack of representing ground from memory alone, which in itself is a very useful accomplishment, and one that aids us considerably when we undertake any regular survey or sketch.

PERSPECTIVE AND SKETCHING.

Perspective is the art of representing on a flat surface objects as they appear in nature, not as they are.

The first step towards comprehending the effects of perspective is to hold up a piece of glass, and look through at two parallel lines which are directed

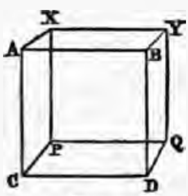


FIG. 1.

nearly towards us. A wall, the side of a house, or a straight road, the sides of which are well defined, will serve for this purpose. It will then be found that as these lines approach nearer to each other, if they are traced on the glass, the farther they are from us.

Unless we understand the most simple rules of perspective, all the drawings or sketches we make are painful to the eye of any real observer of nature.

The first proceeding in perspective is to fix on the *point or points of sight*, the point of sight being the point towards which the parallel lines in nature will each point.

The point of sight, as a general rule, is on the same level with the eye, and directly opposite where we happen to be standing.

We will first take the simple cube, that is, a block of wood or square box, to represent in perspective, as an example of one point of sight.

Suppose A B C D, Fig. 1, to represent a side of a box, this side being placed opposite to us, but slightly to the left. Having drawn the face A B C D, we will draw the horizontal line R S on a level with the eye, and mark S, the point on this directly opposite to us: the sides of the cube, viz., D Q, B Y, A X, will all be directed to the point S, and if produced would meet there. Supposing the cube to be transparent, the sides C P, P Q, P X, would be visible, as shown in the diagram.

We will next take for example the interior of a room, the floor of which is boarded, to show the effect in perspective of parallel lines. Suppose we are standing at F, Fig. 2, then the height of the eye marked at S would be the

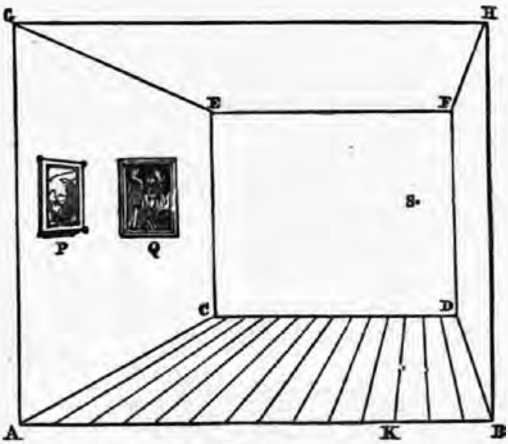


FIG. 2.

point of sight. A B being the breadth of the room, and A G the height, the lines A C, B D, G E, H F, are all directed towards S, and if produced would meet at S. Each of the boards also has its sides directed towards S, and thus appears to decrease in breadth the farther it gets off. As an example of the painful effect of bad perspective, two pictures are shown on the walls, one, P, drawn so that the sides, if produced, would meet at S; the other, Q, so that the sides are parallel to each other: the picture Q at once appears unnatural.

When we have to represent any objects of uniform size on a plane or horizontal surface, such as the sea, for example, our horizontal line will be the distant sea horizon; then this horizontal line will cut the masts of the vessel, or the shoulders of men, or any objects we may represent, at exactly the same height. Thus in Fig. 4 there are four ships of equal size, each farther off than the other, but the horizontal line must cut the masts of each at the same height, as shown at A and B.

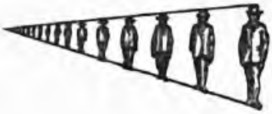


FIG. 3.

FIG. 4.

Again, if the vessels are the same length, and are anchored or sailing parallel to each other, we must draw these between two lines which converge and meet at the point of sight.

These are a few of the simple rules of perspective, which must be attended to in all sketching or representations of nature. Unless we do this all other portions of a sketch are mere failures as representations of nature, and are unpleasant objects for a skilled eye to look at. We will next consider

THE APPLICATION OF PERSPECTIVE TO SKETCHING.

Nearly every person either sketches or would like to be able to do so. To carry in the pocket a sketch-book, and to be able to represent the country in which he travels is a very general wish. Too many persons are, however, deterred from this amusement because their sketches are very unsatisfactory, or take too much time and trouble. The common error of young would-be artists is to take too much trouble about their drawing, to put too much on the paper, and to think too little about the meaning of their lines. A sketch may be made in pencil, and need not take more than five minutes, nor require more than a dozen lines. Here is an example:

FIG. 5.

A line of cliffs is here shown, with a portion of beach and the distant horizon. The cliff-line where it approaches us is drawn towards the point of sight of our sketch, and by this means we obtain the appearance of distance. Again, on the beach we have two or three lines, which as they approach us separate farther from each other, just as in the example of the boards in a room in Fig. 2. If we count the lines in this sketch, we find there are two for the cliffs, three for the beach, and one for the horizon, making six in all. Two or three strokes on the cliff, showing jutting-out portions, merely add to the form of the cliffs; without these we have a sketch of a coast.

Another point to which we may call attention is that all circular lines on the ground appear ovals when seen from a distance; thus a circular bay in our coast sketch becomes a portion of an oval when put on paper.

When any additional life is required in a sketch, we can give this by many means—a man or a tree, a boat or an animal, may all serve our purpose. A flock of birds are represented in our coast sketch, but these are put in in perspective; they get smaller and smaller as they are farther off, just on the same principle that the small vessels did in Fig. 4; and these few items make up a coast sketch which is, at least, not offensive to the eye—for that which truthfully represents nature is never unpleasant to look at, whilst that which falsifies her is ever hurtful to the eye.

A sketch of an undulating country is usually very attractive, but is considered by the young amateur very difficult. The fault here is usually attempting too much. There is an endeavour made to put in *all* that is seen, instead of only the most prominent items.

We should first draw some six or seven lines across the paper, and meeting each other, as shown in the annexed figure, the lines nearest to us being dark

FIG. 6.

and bold, whilst those more distant are finer, these lines representing the undulations of the country.

On these lines we may build up our various objects, taking care that they

FIG. 7.

graduate in size according to their distance. The annexed sketch represents some filling in added to the lines, and would occupy about four minutes in execution.

The lines of a sketch may be divided into three classes: those for the foreground should be bold, those for the middle distance medium thickness, those for the distance very fine and delicate.

Sketching obliges us to be great observers of nature and of natural objects, and we can then represent even from memory such things as vessels or animals, vehicles or trees; but we should, whenever possible, make accurate sketches of any objects which indicate distinctly any locality. Thus the fishing-boats of seaports, the lobster-pots of the coast, any peculiarly-shaped building, &c.,

are all valuable reserves, for a fishing-boat may be found wonderfully useful to give life to an otherwise dull sketch, but this boat must be accurately drawn from any point of view to be of real service. If we have by practice acquired considerable skill in representing any particular objects, such as horses, cows, men, or boats, we need not hesitate about placing these in the foreground of our picture; if, however, we are not skilful in these details, we should place these farther off, or not draw them at all.

Cows and horses add greatly to the life-like appearance of a rough sketch

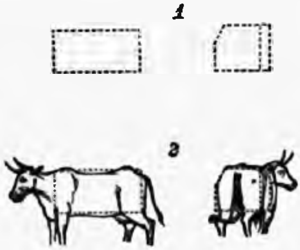


Fig. 8.

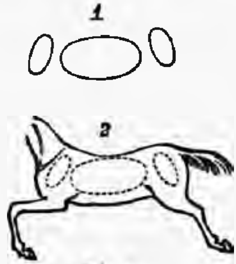


Fig. 9.

and both these can be very readily obtained in the following manner. For cows draw rectangles, as shown in the annexed Fig. 8, with two detached lines as there shown. These serve as frameworks on which the cows may be built, as shown in Diagram 2. Groups of cows may thus be roughly sketched, and with good proportions, especially if attention be given to details. Again, for a horse draw three ovals, as shown in the annexed Fig. 9; then on these build an outline as shown in Diagram 2, all the detail being a mere matter of care and observation.

There are few amusements which call forth more observation than sketching, and few which repay us better. A sketch-book is always interesting: it recalls past scenes and country; explains often better than pages of writing the style of country in which we have travelled, and, in fact, is a pictorial history in itself. In a long experience we never yet heard any person capable of sketching say that he found his skill of no amusement or use, whilst hundreds have stated that they were never at a loss for occupation as long as they could sketch. Again, regrets often repeated have come to our ears from those who, not capable of sketching, have lamented their want of early attention to this art, and who have frequently remarked that, had they only been able to sketch, they could have delighted scores of their friends by a representation of the strange scenes they had witnessed.

Young would-be artists are usually fond of obtaining prints, and on these daubing brilliant colours, thus defacing what was before worth looking at. Let such fancies be put on one side, and in their place let a taste be acquired for real art, when a few weeks or months will enable these daubers to produce something worth looking at, though it be only half a dozen simple lines.

PHOTOGRAPHY.

Photography means, as every one knows, "drawing by light." There are many different methods or processes by which photographs can be taken, but I shall confine your attention to one, as it is best to master one process at a time, so as to avoid confusion.

A sheet of suitable material is impregnated with a substance known as iodide of silver, or with bromide of silver, or with a mixture of the two. This is done in a room lighted only by a lamp giving a yellow flame, as the yellow rays of light have no photographic action; or, if by daylight, the light is coloured yellow by covering the windows with yellow calico. We will call the prepared material "the plate."

The plate, when properly prepared, is placed in a *camera*, and there receives the image (or picture made by the *lens*) of the object which is to be drawn or photographed.

The camera is a wooden box, of a size proportionate to the dimensions of the pictures to be taken. It is usually made in two parts, one of which slides within the other, so that its length can be adjusted within certain limits.

At one end of this box is fixed the glass or lens which forms the image, and at the other is a movable screen of ground glass, on which the picture or image of the object is seen. The length of the box is carefully adjusted each time the instrument is used, so that the picture is quite clear, or "sharp," or, as it is technically termed, "in focus."

The ground glass screen is removed when it is required to take a picture, and in its place is inserted a *slide*, as it is called, which is a small narrow box, containing the plate prepared in the dark or yellow room. This slide is contrived with a shutter in front of the plate, so that while being carried about the room no light can enter it; but when in its position in the camera the shutter can be drawn up, and the plate will then be "exposed" to the inside of the box or camera. The groove into which the slide fits is so contrived that when the shutter is drawn up the plate shall occupy precisely the same position as was formerly occupied by the ground glass. After a certain space of time the plate is removed to the yellow or dark room again, and upon examination no trace of an image can be seen upon it; but a solution of pyrogallic acid * and other ingredients (technically called "developing solution") being poured over it, a curious change takes place: metallic silver is precipitated on those parts of the plate on which the light has acted, more silver being thrown down upon those parts on which light has most acted, and less upon the parts where the action has been less, so that in a little time a perfect picture is made, resembling the image which was seen in the ground glass. The plate is now washed, and those parts of the iodide and bromide not used in the formation of the picture are removed.

* In the latter part of this paper, sulphate of iron is the substance used for a developer. Its action, though of a different nature to that produced by the pyrogallic acid, ends in the same result—the development of the picture. Pyrogallic acid is of more general application to all processes, and therefore it is mentioned here.

Now, as the white and light-coloured parts of the original object must have acted most upon the prepared paper, in virtue of their reflecting more light, and in our picture the white parts of the original are represented by black, and the black parts by white, our picture is now a negative, that is, every tone in it is exactly the reverse of what it should be.

To obtain a copy of this negative, in which all the lights and shades will be in their proper position, is our next object. For this purpose a sheet of a substance, known as carbon tissue, is dipped in a solution of bichromate of potass in the dark or yellow room, and then dried also in the yellow light. A piece of this is now placed in contact with the negative, and exposed for a little time to the light. It is then removed again to the dark room, where, after sundry precautions, it is plunged into hot water, when all those parts of the tissue which are not wanted to form the picture are dissolved away.

I must explain this a little. The carbon tissue is formed of gelatine and black paint (or there may be a little colour in it if thought desirable). The bichromate of potass has this peculiar action on the gelatine—that, by the action of light, it renders it *insoluble*. Now, when the light passes through the negative upon the tissue, it will be seen that very little will pass to affect the gelatine situated just where the white parts of the picture come, because the white parts of the original are black in the negative, and being black they will not transmit much light; but where the dark parts of the picture—that is, the *light* parts of the negative—occurs, much light will pass through to the gelatine and render it insoluble; and so the whole negative will be reproduced, the action of the light being exactly in proportion to the density or colour of the negative.

Now, in order to secure all the tones and gradations of colour which have been imprinted, as it were, upon the tissue, by rendering certain portions of it insoluble, it is necessary to dissolve away the unaltered gelatine from the back, and not from the face upon which the light acted. For this purpose the tissue is cemented, face downward, upon a piece of clean white paper, and then plunged into warm water; the paper on which the gelatine was spread in the first instance now soon comes away, and then, at first slowly, but afterwards more quickly, the gelatine not acted upon will dissolve away, and with it will come all the paint with which it was mixed, until at the last none will be left but what is wanted to make the picture. The finished print, having been washed in a little clean water, is hung up to dry, and may then be considered as so far finished.

A great variety of materials of different kinds, each with its own peculiar advantages and disadvantages, may be prepared to receive the photographic image; but the substance on which we are going to work, as being by far the most generally useful, is known as *collodion*. It is a liquid composed of ether and alcohol, in which is dissolved some soluble gun-cotton and iodide of potassium, with generally a little bromide also; this, when poured over the surface of a sheet of glass, forms a perfectly transparent sort of paper of the most extreme delicacy. It is so delicate, indeed, that it cannot (except with extraordinary precaution) be removed from the glass without being broken and torn. Thus glass is always used as a support to the "film," as it is technically termed, of the collodion negative.

This film is impregnated with the iodide and bromide of silver in the following way: In the collodion are dissolved, as I said above, iodide and bromide of potassium, or cadmium, or ammonium. These are not in any way acted upon by the light, and the bottle of collodion may be kept in any ordinary apartment. When, however, some of the solution is poured upon glass, and a sheet of our paper is made, upon which we wish to take a photograph, it is removed to the dark room, and then plunged into a vessel containing a solution of nitrate of silver. Here a change takes place: the iodide and bromide of silver are formed in the film, and the nitrate of potassium, cadmium, or ammonium is formed in the "bath" solution, as it is technically termed. This change or decomposition is the result of chemical affinity, and is a matter with which we have now nothing to do. The glass plate went into the bath clean and clear, and quite transparent, and in about three minutes, when taken out, the collodionized surface is impregnated with the required "salts," as they are termed, of silver. These give it a yellowish cream colour, varying according to circumstances.

Before describing in detail all the manipulations of taking negatives, it will be well to say a few words on the dark room, and on the chemicals employed, in order that the accounts of these things be not mixed up with other matters.

A room should be provided as large as convenient, all the windows of which, save one, should be permanently fastened up with either thin boarding nailed up so as quite to exclude the daylight, or thick brown paper pasted over them for the same purpose. The other window must be covered over first with a double thickness of thin bright yellow paper, which must be pasted over it on the inside, and then a blind of two thicknesses of yellow calico must be provided, nailed over the inside of the window, and if the sun ever shine upon the glass, it is well, especially in summer time, to provide yet another blind of yellow stuff outside the window. This will be very soon bleached by the sun and air, to say nothing of the rain, so it should be renewed every month or two when much work is to be done.

Near the window a low table must be placed, with a large basin or tray to catch water, and a jug and pail of clean water will also be required, for a supply to use for washing plates, &c. If very much work is to be done, the water should be laid on from a tank fitted up with cock and ball-tap, and a regular sink made, with a waste-pipe into the drain.

Besides the apparatus for working just spoken of, there will be required in the dark room a "dipping-bath," as it is called, full of the "bath solution" (the solution of nitrate of silver). This is usually a narrow upright vessel, a little larger than the plate to be used, and provided with a little arrangement called a dipper, by means of which the glass can be lowered into the solution and brought up again without wetting the fingers. The chemicals which will be required are as follows. Collodion: any dealer in photographic materials will sell it. As it is composed chiefly of very volatile fluids, it must be well corked or stoppered, and care must be taken not to open the bottle too near a flame, lest it blow up, a performance to which it is much addicted. The bath solution consists of 35 or 30 grs. of nitrate of silver in every ounce of water, but it would be well for beginners to buy this solution also ready made: it will not cost them more than to make it.

Developing solution also will be required; this every photographer must make for himself. Take as many ounces of water as may be thought necessary, say about ten; put them in a bottle, add 10 grs. of sulphate of iron (the protosulphate sold with the chemicals) for each ounce of water, and also add 15 minims of glacial acetic acid and 15 minims of alcohol for each ounce of water. When the iron is dissolved the solution will be ready for use.

Another developing solution, or, as it is sometimes called, an intensifying solution, will be wanted in some cases. It is made as follows: pyrogallic acid, 1 gr.; water, 1 oz.; citric acid, 2 gr. When this solution is used, a small bottle, with a 25-grain solution of nitrate of silver, must be at hand, as a few drops of this will be required. A little spoilt bath solution will do very well for this.

To make the "fixing solution," as it is called, that is, the one which is used for clearing off those parts of the yellow film which are not wanted to form the picture, put a quantity of the crystals of hyposulphite of soda into a convenient wide-mouth bottle, and pour on some water, taking care that more crystals are present than the water will dissolve.

Now for work.

Fix your camera on its stand, and set up the object you want to photograph in a good light, say near some convenient window, or, if in fine weather, out of doors will be best. Then without staying for more than a rough arrangement of the subject, return to the dark room and "prepare a plate" thus: take a clean glass from the box (the glasses should be kept clean in the box, being washed with common soda and, after thorough rinsing, carefully dried with clean cloths); place it on a piece of clean paper on the table, and mind that the table where you put the paper down is quite dry. Now pour on the surface of the glass a few drops of spirits of wine; rub them over the surface with a tuft of cotton wool, and then wipe the plate dry with an old but clean handkerchief, and finally polish it well with a wash-leather. Breathe on the surface to see if clean: the breath should not rest for a moment on the glass, but fly off instantly. If it rest it must not show any lines or other strange marks, but must be quite even. Should lines be seen, the glass must be cleaned until they vanish.

When perfectly clean, take the plate up by the forefinger and thumb of the left hand in one corner, the finger under the glass, the thumb over it; the point of the glass will dig into the flesh just under the thumb-nail, and the plate can thus be held quite firmly, but without any danger of contamination from dirty fingers. Now, having previously removed the cork or stopper from the neck of the collodion-bottle, and wiped the lip from any little dried particles which may have adhered to it, seize the bottle with the right hand, and pour upon the centre of the glass (which for this purpose must, of course, be held in a horizontal position) enough of the collodion to cover about one-third of the whole surface. Now cease pouring, and very gently tilt the plate so as to flow the collodion first to the corner right opposite to the thumb, then to the one on the left of that, then to the one at which the thumb is holding the plate. Do not let the collodion touch the thumb if you can help it, and finally pour it all off again into the bottle, from the last corner, which will be the one on the right of the thumb. When the plate is being drained into the bottle, you will see the whole surface of the collodion "film," as it is called, covered with long streaks in the direction in which the drainage takes place. A slight oscillating motion must be given to the glass, just enough to make the little ridges close up and give an even surface to the film. This operation of "coating the plate," as it is technically termed, seems very difficult from the description, but it is really very easy, and will be soon learnt with a little care and attention.

When the collodion ceases to drip, replace the stopper in the bottle, and then remove the last hanging drop on the lowest corner of the glass plate, either with the finger or with a little ball of paper kept for that purpose, and then the glass is ready for immersion in the nitrate of silver bath. Raise the "dipper" from the vessel, and rest the plate on the little ledge provided at the bottom; let the back of the plate be in contact with the dipper; wait for a few seconds to be sure the film is well set, and then with one steady plunge lower the glass on the dipper into the solution. The least pause in this operation will cause a line to be formed across the plate, which will be painfully evident in the finished picture. Cover the bath up, either with a black cloth, or (if one be provided) with its cover, note the time, and then return to your camera and focus the object.

Point the camera at the object to be copied and put the black cloth over your head, and then, first by pushing the sliding body of the camera in or out, roughly adjust the focus of the lens, that is, get it into such a position with regard to the ground glass that the image or picture there is tolerably clear. Now, having clamped the back of the camera with a screw provided for that purpose, reach out the right hand, and with it turn the milled head of the rack-work on the lens, watching the image all the time. In this way the picture may be got perfectly sharp and clear.* Now withdraw the head, remove the ground glass, put the cap on the lens, insert into its place a medium-size stop diaphragm, and then return to the dark room. There is no occasion to hurry over the arrangement of the camera, but the plate should not be left longer than need be in the bath: about five minutes is quite time enough. Having closed the door of the dark room and uncovered the bath, move the dipper and the plate on it up and down a few times, and then lift it right out, seize the plate again in the same corner as before, and having held it a minute or so to drip on a piece of blotting-paper, place it face downwards in the dark slide of the camera. Before closing the door upon it, put a piece of clean blotting-paper at the back.

Now as soon as possible return to the camera, and insert the dark slide in its place, draw up the shutter of the slide carefully with the right hand, holding the left so as to prevent the body of the slide rising too, as, if it did so, the light would enter underneath, and then the plate would be spoilt. Having got the shutter up to the top, bend it forward upon the camera, and then carefully remove the cap of the lens, taking care not to shake the camera in so doing.

You have now arrived at the most difficult part of the whole proceeding. Up to this point all has been easy enough; so much so, indeed, that one or two careful attempts will be all that will be found necessary to ensure success; but now you have a task to perform which is one of real difficulty: you have to judge of the time during which you will expose the plate to obtain the image upon the sensitive surface of the plate you have just prepared. The best I can do for you is to tell you some of the causes which will affect the length of "exposure" which is necessary to be given.

First, the colour of the objects. White, blue, and lilac take quickest; red, yellow, and black very much more slowly, and some tints of them will hardly "do" at all. Then the time of day has much influence, and the character of the weather more; east and north winds make the exposure much longer than when the wind blows from the west or south; and, lastly, the amount

* In taking landscapes, it is a good rule to focus the foreground about 50 ft. from the camera: for buildings, when parallel with the camera, place the sharpest focus about half-way between the centre and the edge of the picture; and, in doing a portrait, focus the eyelashes of the nearest eye.

of light which reaches the object has the greatest influence on the time of exposure.

With all these elements of uncertainty in the calculation, it may seem to some surprising that the exact time can ever be hit properly; but we are fortunately able to tell during the development, or next stage of the proceedings, what relation the exposure given has to the one which the circumstances of the case demanded; thus, although the first plate may be spoilt, a second attempt may with ease be nearly right, and a third will probably be quite so.

Having thus given some exposure to the plate (say, at a very rough guess, from ten to twenty seconds, if doing a moderately white object in a fair light), replace the cap on the lens, and then shut down the sliding shutter of the dark slide, and return with it to the dark room. Having again closed the door, open the back of the slide, take out the blotting-paper and with it wipe the back of the glass; then remove the plate, and holding it again by the same corner as before, pour upon its surface some of the developing solution. Some little care is needed in pouring on the developer. It is best to begin to flow it close to the thumb, and to run the lip of the glass along the edge of the plate nearest to you, pouring the solution all the time and tilting the plate, so as to make the liquid run to the farther side.

When well covered, restore the plate to the horizontal position, and keep the solution flowing backwards and forwards upon it, and while so doing watch the effect. If *no* picture appear in about a minute, and then only faint traces of one, the exposure has been much too short: try three or four times as long; if the picture all flash out at once and the whole surface of the plate assume a grey tone, the picture has been as much *over*-exposed: try one giving only about one-third the time.

The proper effect of the developing solution is as follows: about from ten to twenty seconds after its first application the whitest parts of the picture burst into view, then the tones next in order of whiteness, until, in about one or at most two minutes, the whole picture is developed. When the glass seems pretty well covered with "detail," and the picture looks nearly finished, throw off the solution, and hold it up to the light and note its general appearance. It should be clear and brilliant, the light parts of the original of a firm, dark tone, and the dark parts quite transparent (that is, at this stage only of the yellow colour of the film, with no dark deposit on them). Return the plate to its horizontal position, and again pour on the developer and continue its action till it will act no longer, that is, till it will no more ***bring out detail in the darkest parts of the picture, i.e.***, the transparent parts of the negative.

When the development is concluded, wash the plate with plenty of clean water, and then carefully examine it. There should not be a streak or a stain of any kind upon it; if such should occur in any part, it is almost a sure sign of imperfect manipulation. The light parts of the picture should be almost opaque, but not quite; the extreme black in very deepest shadows should show nothing but the clear unaltered yellow colour of the film; all between these two extreme tints should be filled up with endless minute gradations of light and shade in the most perfect harmony. It will be a very great help at this stage of the proceedings to have a first-rate negative to compare your own with. It is of the most vital importance to secure negatives which shall be all alike in tone.

Now, the fault that will most likely occur in the negative produced in this manner, and with the developer above described, is want of "intensity," or blackness, in those parts which are white in the original. Should such be the case, the remedy is simple: having well washed the plate by pouring water upon its surface in a gentle stream, drain it for a moment, and then flood it with a little of the redeveloping solution,* and when it has well flowed over, pour it back into the glass, and then mix with it a few—say five—drops of the plain solution of nitrate of silver, about 25 grs. to the ounce, stir it well up with a clean glass rod, and then again pour over the plate. Now watch the colour of the image, and if you have a test negative to work by, you can with care get the density quite right in a minute or so. Have ready a jug of water to pour on when the solution has acted as long as required.

Now well wash it, and put it into a dish with some of the fixing or cleaning solution till all the yellow colour has quite gone, and then, after another thorough washing, the plate may be dried, and it is complete. If it is to be printed from much, it should be varnished. The varnish must be poured on in the same way as the collodion, and drained off, as before described. Some varnishes require the plate to be warmed before they are applied; but when this is the case the "instructions" on the bottle will always indicate the necessary treatment.

We have now completed our negative; but before going on to the third part of my paper, I propose to give a few hints, which will be, I hope, of some use in aiding the production of perfect results.

Sometimes the plates "fog" during development, *i.e.*, become enveloped in haze and mist, which pervades those parts of the plate which should be quite clear. If so, first make quite sure that no white light reaches the plate at any time when it should not; next see that there is not too much yellow light in the dark room, and that the sun does not shine on the window; next try a little more acid in the developer; observe also that the collodion is of a decided sherry colour, or darker. Should it be colourless, add a very little tincture of iodine, which will produce the effect required. If none of these succeed, try a new bath solution, or, before you do so, add one drop of nitric acid to the bath, and see if it produces the right effect.

Be sure when you wipe the lip of the collodion-bottle that the little dried pieces do not fall inside. Take care there is no dust on the glass plate when you pour the collodion on it. If the camera should be placed in sunshine, always put a black cloth over the slide before pulling up the shutter, so as to be sure that no light strikes into the groove in which it moves.

When the plate is in the dark slide, care should be taken to keep that end downward which is at the bottom when in the camera. The object of this precaution is to prevent the drainings of the silver solution from running back again over the plate, as they would cause stains.

"*Under*-exposure" is a fault much more common than "over-exposure."

After development the plate should be well washed as directed. It may then be taken out into the daylight without injury, but should be taken back into the dark room before being "intensified."

N.B.—Never be tempted to use "cyanide of potassium" for any operation whatever connected with photography. It is a deadly poison, and is therefore a very dangerous substance to have in the house.

The nitrate bath is one of the most troublesome solutions with which the photographer has anything to do. My advice is to have three distinct bottles

* This redeveloping solution must be used in a clean glass; not the one used for the "iron developer."

of it; one for use, one to try should there be anything wrong with the first, and one a new solution ready should any emergency necessitate its use. Try and do as much with the first as possible. When it is quite out of order, set it on one side, and use the second for the working bath and the third for the spare solution, and then buy a new one. Never by any chance have less than three bottles at hand. Always keep the vessel containing the working bath well covered up. In cold weather use a little warm water to wash out the last traces of hyposulphite of soda from the film. At all times let the washing be as complete as possible. When using the camera out of doors, mind that the light does not fall too strongly on the lens itself. Use a shield roughly made of a piece of brown paper and string, to protect it if necessary.

Do not attempt portraiture till you have had considerable practice in other branches of photography; and when you do try it, be well prepared for an unlimited series of *failures*. The best practice for beginners is to photograph a white marble or plaster statue or bust. Choose a north window, and arrange a table in it; set the statue on the table on a nice cloth, then nicely arrange some neat drapery in the background—a curtain will do very well. The statue should stand about 3 ft. from the window, and rather on one side of it. The camera should be placed, not opposite to the window, but nearly in a line with it; so that the statue, when seen from the camera, will be lighted from one side.

The Carbon Printing Process.

I have determined to describe in this paper the carbon printing process, recently brought to perfection by Mr. Swan, in preference to the old method of obtaining the impressions from negatives, for two reasons: first, and most important, because Swan's process gives results which are permanent and which will not fade; and second, because the process in question is much easier than the old method, and is therefore, in my opinion, better. Were there no other advantages, these would be enough: there *are* many others on which it is quite needless to enter here.

The following instructions will, I think, suffice to enable the reader to make some successful experiments in practice.

Get some—say ten or twenty—sheets of the prepared "tissue." It looks quite white on one side and quite black on the other. Besides the tissue you will want the following—some bichromate of potass—solution strength, 1 oz. to 12 of water; some solution of India-rubber—strength, 12 grs. of rubber to 1 oz. benzole; and a little finely-powdered French chalk. You will also need a small screw press, or a rolling-press will do, but the other is much less expensive; it may be just the size of the pictures you are about to make, or as much larger as you like. You must also obtain a sheet of Carrier's "ready sensitive albumenized paper," to be obtained at any dealer's.

Now for work.

Pour into a dish some of the bichromate solution, and then put in a piece of the tissue, making the solution flow all over it by means of a small brush, or by turning it over and over. The solution should be as cool as possible, and the fingers should not be put into it more than is necessary. The tissue, having been in for about two minutes, is to be taken out and hung up to dry in any way that will admit of a free circulation of air about it. The best way, perhaps, is to hang it over a round rod, such as a walking-stick. It will, under ordinary circumstances, be dry in about from six to twelve hours. Heat must not be applied on any account to hasten the drying. When it is quite dry, a little of the French chalk may be rubbed over it on the black side, and then it may be kept between the leaves of a book for a few days, or used at once. All this must be done in the dark room.

Now put into one of the "printing-frames" a negative with the varnished side uppermost, and on this lay a piece of tissue, with the black side downwards next the film of the negative, push the back of the frame in, and carry the frame out into the light, and there expose it in the shade. At the same time put a piece of the prepared albumenized paper, about the size of a postage-stamp, behind the dark part of some other negative (the face of a small portrait, for instance), and expose this paper close to the tissue in another frame, so that both have just the same light to act upon them. In about half an hour take both frames into the dark room; note exactly how much the paper behind the second negative is coloured. Now proceed to apply to the surface of the tissue (the black surface I mean) a good thick coating of the India-rubber solution; apply the same to a piece of paper about the same size, and leave them both to dry. When quite dry, apply the two surfaces of the India-rubber together, and rub them well with the hand on a smooth board. Place the two together for a moment in the press, and then put them into tepid water, about 80° or 90° F. In about ten minutes the colour from the tissue will be seen gradually coming out all round the edges, and now, if a little corner of the paper that was *originally belonging to the tissue* is lifted by a pin or other means, it will come off from the black layer underneath with great ease. It should not be torn away with any violence; but if it will not come with ease, it must be left a little longer to soak.

Now turn the tissue (or, as it will be in a minute or two, the picture) with its face downwards in the water, and at the same time increase the temperature of the water to about 120° F. This is best effected by an addition of a little boiling water, or the print may be transferred to another dish with water in it of the right temperature.* In a few minutes the black stuff in the tissue not wanted to form the picture will all come away, and on examination the picture will be seen developed in all its true lights and shades, like the original from which it was taken. Now you will see the use of the small test-paper exposed at the same time as the negative: it will enable you ever afterwards to be quite sure of getting a good print, by simply showing you how darkly the image is imprinted upon the carbon tissue. If your print that you have just developed be too dark, try one again, and this time mind you examine the test-paper, and do not let it get too dark. A little practice will soon enable you to obtain these carbon prints with certainty.

But you have not quite done with it yet. When it is fully developed, wash it in a little clean cold water, and then hang it up to dry. When it is quite or nearly dry, apply a coating of clear gelatine solution, made by dissolving Nelson's patent gelatine in water, to the proportion of 1 oz. to a pint or a pint and a quarter. This may be brushed over. When it is quite dry, cut the print square or to the shape required, and then mount it by heavy pressure in the screw press upon either damp paper or card. The picture side must, of course, be placed downwards next to the card.

When it is again quite dry, moisten the back of the paper on which the print was fastened with benzole, and now, after carefully inserting a knife

* Care must be taken not to pour very hot water on the print.

round the edges, the paper may be lifted off, leaving the print permanently fixed to the card. This process is called transferring; there is no difficulty in performing it, and the prints may, by this means, be obtained upon any article to which gelatine will adhere.

A few hints will be of some use to aid in the successful practice of this process.

The tissue, before putting it into the bichromate, or as it is technically called, "sensitizing it," should be kept dry and flat. When sensitized, it may be kept rolled up, as damp will quickly spoil it. Considerable care should be taken to keep the sensitive tissue from the action of light, except, of course, that which is needed for the production of the picture. So long as the tissue is well covered with the India-rubber solution, it does not seem to matter much about its being applied evenly. Care must be taken, however, not to fasten the paper on to the tissue before the two India-rubber surfaces are well dry: about half an hour seems to be the time necessary for the evaporation of the solvent.

When the prints are in the water to be developed, the "covering" paper, as it is called, should not be removed by violence before it is ready to come away with ease, nor should it be left on after the time of its being loose. Not less than fifteen minutes' washing in cold water should be given before the prints are hung up to dry. Several prints may be developed in one dish, but care must be taken not to rub their surfaces, as they are tender while warm.

The best way to wet paper or cards for transfer is as follows: dip them one after another into a dish of water, and then place them in a pile on a sheet of glass, putting another piece of glass on the top, apply a weight, and so *equalize* the moisture.

The proper condition of moisture for effecting a transfer is seen by the surface of the paper being not *wet*, but just slimy with the water. Great brilliancy and finish may be given to the prints by giving them a final wash with Newman's sizeing solution.

Carbon printing is a thing of easy performance, but, like all other photographic processes, it cannot be learnt without practice.

Since the above was written, there have been great improvements made in carbon printing. Mr. J. Johnson has brought out a new patent, and those of our young friends who wish to do much photography, should communicate with him. He has written an excellent work upon the subject, in which the experience of a practical man is given with much clearness. Mr. Johnson's address is 36 Rathbone Place, Oxford Street, London. There is a company formed for the more successful carrying-out of carbon printing, and for the supply of all the materials and instructions necessary. For all other information upon matters photographic—materials, chemicals, apparatus, &c., &c.—I can confidently recommend Mr. Jabez Hughes, of 379 Oxford Street, London.

In conclusion I say, "Go in and win! If you fail, try again!"

GLASS-BLOWING AND WORKING.

A great deal of the apparatus used by chemists is made from glass tubing; and though such apparatus can be bought ready made, it is not only much cheaper, but much more convenient, to make it oneself; for the expert glass-blower can often construct for himself in a few minutes the exact piece of apparatus which he requires for an experiment, and thus avoid the delay and trouble which would be occasioned by sending for it to a shop. We therefore recommend our readers, before beginning the chapter on chemistry which follows this one, to acquire some dexterity in this useful and elegant art.

The glass tubing itself must, of course, be bought. It is sold in sticks of about a yard or two in length, and of widths varying from an eighth of an inch to an inch or more. It costs about 1*s.* 4*d.* per pound. A pound or two of different widths may be procured to commence with, and a great deal of good work can be done even with this small quantity.

TO CUT GLASS TUBES.—For this purpose a small triangular file is necessary. The tube is laid on a table, and a firm, sharp, short scratch made on it with the edge of the file at the point where it is to be divided. It is then held in both hands, one on each side of the scratch, and gently bent *away* from the side where the scratch is. The tube flies into two pieces, and if the operation has been dexterously performed the edges are perfectly level and smooth. These edges may then be held in the blowpipe flame, described below, until they are neatly rounded.

MELTING OF TUBES: THE BLOWPIPE.—Very small and thin tubes may

FIG. 1.

FIG. 2.

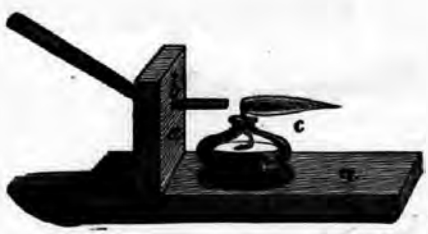


FIG. 3.

be worked tolerably well in the flame of a spirit lamp; but for many purposes this heat is not sufficient, and it is necessary to have recourse to the useful little implement called the blowpipe. The simplest kind of blowpipe is that used by gasfitters, and shown in Fig. 1.

It consists of a tapering brass tube, eight or ten inches long, bent near the small end, and terminating in a fine jet. It may be bought for 6*d.*, and answers very well for most purposes, though better kinds may be obtained. If this little instrument be held in the right hand, the jet brought into the flame of a spirit lamp or candle, just above the wick, and a current of air blown through it, the flame will be found to be curiously altered. The current of air will bend it down at a right angle, it will lose nearly all its brilliancy, and will present the appearance shown in Fig. 2. In the centre a blue cone will be perceived, and this will be surrounded by a pale yellow cone or envelope of flame. The blue or inner flame is the hottest, and is therefore the best for melting most kinds of glass. English flint glass is, however, blackened when heated in this flame, because it contains lead, and the flame reduces this lead to the metallic state, and so blackens it. The blackness will disappear if the glass is heated in the yellow outer flame; but it is best to avoid this kind of glass, and to buy German or Bohemian glass, which is somewhat more difficult to melt, but which contains no lead.

Some little practice will be required before a steady stream of air can be kept up through the blowpipe. If, when the blowpipe is in the mouth, the cheeks are puffed out, it will soon be found easy to breathe through the nose without stopping the blast. The cheeks act as a sort of gas-bag, give the air out steadily, and are from time to time refilled from the lungs.

With this simple apparatus a great variety of most important chemical experiments may be made, and the heat so produced is quite sufficient for any of the processes of glass working here described. But it has this great disadvantage: one hand is always required to hold the blowpipe, and there is, consequently, only one left with which to manage the glass. This difficulty may, however, be got over by a variety of mechanical contrivances, some of them of a very simple character.

TABLE BLOWPIPES.— Fig. 3 represents a little piece of apparatus which

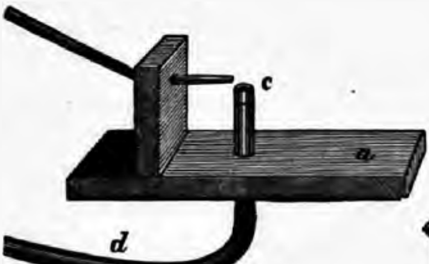


FIG. 4.

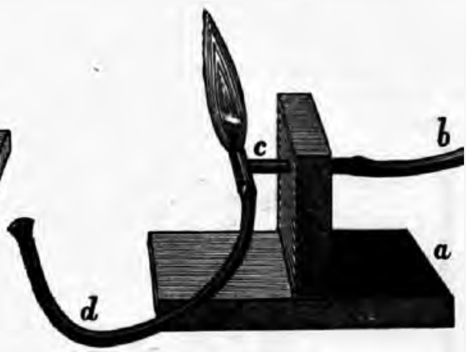


FIG. 5.

any one can make, and which is very convenient and efficient. A little wooden stand, *a a*, is made by nailing two pieces of board together, and a small hole is drilled through the upright piece at *b*. A common gasfitter's blowpipe, bent to the shape shown in the figure, is passed through this hole, and a small glass spirit lamp, *c*, which can be bought for 1*s*., is placed on the other side. The spirit lamp can easily be raised up to the requisite height, and a steady blowpipe flame can then be maintained. For the spirit lamp an oil lamp may advantageously be substituted, and lamps suitable for the purpose can readily be obtained; but a candle is useless, because its height is constantly changing. If you are fortunate enough to be able to use gas, you will find it immensely superior to every other source of heat for this purpose, as it is for nearly all chemical operations. It is very easy to adapt the gas, if only you can procure it. From the tap which yields it, a vulcanized India-rubber tube, *d*, Fig. 4, must carry the gas to the bottom of the brass pipe, *c*, which works pretty stiffly in a hole in the support, *a*. The India-rubber tube must be slipped on to the lower end of this brass tube, and, if necessary, tied on with string. The brass tube may be about eight inches long and one-third of an inch wide, and the upper end should be beaten flat with a hammer, so as to present the edge of a flat flame to the blowpipe, and filed smooth. By turning the gas up or down, a blowpipe flame of any desired size may be obtained. Of course there must be a hole in the table through which the brass tube is to pass.

Gas Blowpipe.—A still more convenient arrangement is shown in Fig. 5. It can be made at a very trifling expense, and gives a most powerful and manageable flame. The tube *b* conveys the gas to the T-shaped brass tube *c*, the longer limb of which fits tightly in a hole in the upright wooden support. This brass tube is made in the manner shown in Section 1, Fig. 6. The limb which passes through the support may be about six inches long, and the shorter limb about three inches. About half an inch of the short limb rises

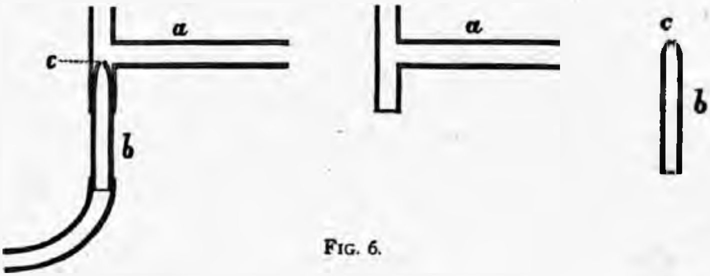


Fig. 6.

above the point where the long one joins. The width should be rather less than half an inch. Into the lower end of the short limb slides tightly a somewhat smaller tube, *b*, about four inches long, and closed at the upper end, with the exception of a jet or orifice, *c*, about the size of a small pin. This smaller tube is fitted with another piece of India-rubber tube, through which air can be blown through the centre of the gas-flame. The gas and air meet at the point where the two limbs of the tube *a* join, and the result is that the flame which rushes out is intensely powerful. By varying the supply of gas and the strength of the blowing, any flame, from a pencil of light an inch long to a torrent six inches long, may be produced. With this apparatus tubes of an inch in diameter can, with practice, be drawn out or bent. If the current of air is supplied by a pair of double bellows, worked by a treadle under the table, the apparatus is complete. The double bellows are, however, expensive to buy and rather difficult to make.

Manipulations with Glass: Bending Tubes. — Glass tubes of not more than a quarter of an inch in width are very easy to bend. It is only necessary to hold the tube in a rather large blowpipe flame, turning it round and round constantly until it softens, and then to bend it gently and slowly upwards. The bend should not be too sharp, and the heat must, therefore, not be confined to one point of the tube. It is better to bend the tube a little way, and then to heat the next portion and bend that, and so on. *a*, in Fig. 7, shows the form of a well-bent tube, and *b* that of one which is too angular.

Large tubes are much more difficult to bend than small ones, and it is almost impossible to bend one of three-fourths of an inch diameter without the outer corner of the angle becoming flattened. The proper form may be obtained

FIG. 7.

FIG. 8.

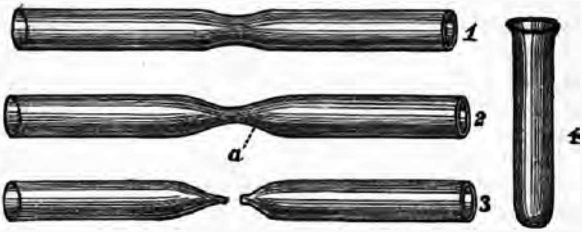


FIG. 9.

by corking one end, softening the flattened corner in the flame, and blowing gently at the other end, so as to force the glass out. The operation requires some practice.

THE SEALING OF TUBES: MAKING TEST-TUBES.—Begin with thin tubing, a quarter of an inch wide. Take a piece about eight inches long, and hold the centre of it in the smallest flame that will melt the glass, turning it constantly round until the glass is quite soft. Then draw the two ends apart, in the manner shown in Fig. 9, keeping the flame directed to the point marked *a*. If this be done slowly the two halves will soon divide, and one of them will have a blunt end with a little knob at the point of it. It is shown at the right

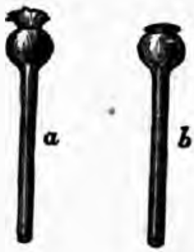


FIG. 10.

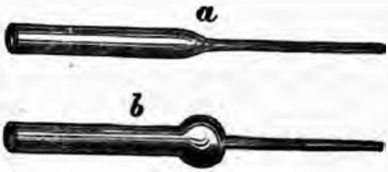


FIG. ·

FIG. 12.

hand in No. 3. This end must now be heated separately in a somewhat larger flame until it is quite soft, and air blown in until the little knob disappears, and a smooth round end, such as is shown in No. 4, Fig. 9, is obtained. It is necessary to heat the end very uniformly and to blow very gently in order to obtain the right form. The edges of the open end of the tube may now be softened and turned outwards a little with an iron wire, and that most important piece of chemical apparatus, the *test-tube*, will have been manufactured.

When it is necessary to seal one end of a tube, a short piece of waste tubing may be melted to it and used as a handle for drawing it out at a point close to the end. A great saving of tube may be effected by this means.

BLOWING BULBS.—Seal one end of a narrow tube in the way described above. Thicken the end by keeping it melted for a short time, and then, when it is quite soft, blow pretty strongly into the other end. The soft glass will expand into a beautiful little globe (Fig. 8) which will be found useful for a variety of purposes. Thermometer bulbs can be made in this way.

LONG FUNNELS. — Blow a good large bulb on the end of a piece of tube of three-sixteenths of an inch diameter. Apply a pointed flame to the end of the bulb, and when it is quite liquid blow strongly through the tube. A round hole will be made in the end of the bulb (*a*, Fig. 10), and if the ragged glass is removed and the edges carefully melted, a long and very valuable funnel, of the form shown at *b*, Fig. 10, will be obtained. Funnels of this kind are called "thistle funnels," from the shape of their heads. They are used for introducing acids into flasks in making gases, and for many other purposes.

PIPÉTTES.—Draw out a thick tube, about half an inch in diameter, into the form shown at *a*, Fig. 11; close the small end by melting, and heat the tube strongly at the point where it begins to get smaller. When it is very soft, blow gently through the open end, taking care to have the glass equally heated all round, and to keep the fine end in a straight line with the other. A bulb will thus be made, and the tube will have the form shown at *b*. The point which had been closed may now be cut off with a file, and you will have a *pipétte*, an instrument by which liquids may be sucked up from one vessel and transferred to another.

OTHER TUBE OPERATIONS.—Tubes of equal size may be joined together by bringing the two level edges in contact in the flame, and pressing them together when soft. If one tube is larger than the other, the end of the smaller one must be expanded with a rod, and the end of the larger drawn in (Fig. 12) before they are melted together.

A T-shaped tube, which is often very useful, may be made in the following manner:

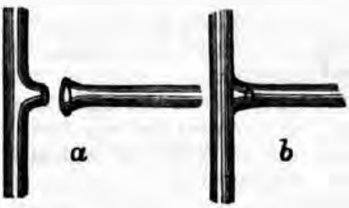


FIG. 13.

A small blowpipe flame is brought against the side of a tube. When the glass at that point is melted, the point of a tube previously drawn out is pressed to it, so as to adhere. The soft glass is then pulled out in the manner shown at *a*, Fig. 13. The edges of the hole are filed smooth, and the end of another tube, which has been slightly opened out, melted on to it. The tube will then have the appearance seen at *b*.

This last operation is a difficult one, and requires a good deal of practice; but it will serve as an example of the variety of apparatus which can be constructed with a little patience and skill. It is astonishing how easy these manipulations become after a time, and every true chemist feels a pride in performing them well and quickly. He likes to do things for himself as much as possible, and is never better pleased than when, by the use of a little mechanical dexterity, he has fitted up an efficient piece of apparatus which has cost him valuable time, and would have cost him still more valuable money had not he made it for himself.

PHILATELY, OR POSTAGE-STAMP COLLECTING.

Collecting the postage-stamps of all countries has been for some time past, and still is, a very favourite pursuit in leisure hours. In almost every family there is some member who has a collection of stamps, in which all the others take an interest, and to which every visitor and friend is asked to contribute. It is astonishing how many ladies, how many gentlemen, how many girls, and especially how many boys are collectors; and the number is daily increasing. There is scarcely a parent who has foreign correspondence that does not carefully remove the coveted stamps from his letters before they are destroyed, and cause joy at home by presenting them to those of his children who collect. Formerly, the merchant, the banker, the diplomatist, or the member of Her Majesty's Government, broke open his foreign communications, and consigned the envelopes, stamps and all, to the fire or to the waste-basket. Now, however, the fire has to consume the envelopes without their stamps, and the waste-basket finds all stamps detached from the fragments it receives. They are destined for a better use than destruction—they find a home in the gay albums that adorn many a drawing-room table, and are there the admired of many admirers.

Its Uses and Advantages.

With boys especially stamp collecting is very popular. They have so many opportunities of obtaining stamps, both at school and at home, that by perseverance they can in a reasonable time make a nice and interesting collection. Few amusements are more instructive and useful. Independently of the excellence of engraving and elegance of design of many of the stamps, useful instruction is almost inseparable from the collection of them. It is of very frequent occurrence that the boy who has the best collection in a school is the head of his class. He has generally the widest knowledge of geography, the greatest acquaintance with the relative value of coinage, a considerable amount of historical information, and is most remarkable for neatness, judgment, and perseverance. He obtains a stamp of some country or island he has seldom, if ever, heard of before, such as Virgin Islands, Nevis, Heligoland, Turk's Island, Bolivia, or St. Salvador; and his curiosity prompts him to consult an atlas as to the whereabouts of these said places. It is a rare case that a boy fails to answer any question respecting a country of which he has a stamp: geography has especial attractions for the stamp collector.

Then, again, he may have a Mexican stamp of the value of 1 *real* (Fig. 1), a Papal States' stamp of the value of a *scudo* (Fig. 2), and a Russian stamp of the value of 1 *kopeck*. He is anxious to know what these foreign denominations are worth in English money. By inquiry and by search, he soon finds out that the Mexican *real* is worth about 6¼*d.*, the Papal States' *scudo*, 4*s.* 2*d.*, and the Russian *kopeck* not quite a halfpenny. This information once obtained, he does not soon forget it.

The boy, too, who has a fair collection, will have a considerable knowledge of history. For instance, he will remember that the postage-stamps of Saxony were first used in the reign of King Frederick Augustus, in 1850, and that it is his head which appears on the set of adhesives that have the head turned

Mexico.

FIG. 1.

Roman States.

FIG. 2.

Saxony.

FIG. 3.

Portugal.

FIG. 4.

Two Sicilies.

FIG. 5.

Parma.

FIG. 6.

Romagna.

FIG. 7

Bergedorf.

FIG. 8.

Bremen.

FIG. 9.

Brunswick.

FIG. 10.

Lubeck.

FIG. 11.

Envelope stamp, S. Germany.

FIG. 12.

Watermark.

FIG. 13.

Watermark.

FIG. 14.

Perforations.

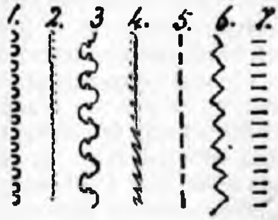


FIG. 15.

Argentine Confederation.

FIG. 16.

FIG. 17.

Austrian Newspaper stamp.

FIG. 18.

Servia.

FIG. 19.

to right on a black oval (Fig. 3), and that the next king was John, whose head is depicted on a set turned to left, in an oval shaded only on one side. He will know that the first stamps used in Portugal were those that have a queen's head turned to left (Fig. 4), and that Donna Maria was at that time Regent. He will tell you that the set with the king's head to right are those issued by Don Pedro, who succeeded to the throne in 1853, and that those with head to left belong to the reign of Don Louis, who was made King in 1861. He has stamps which remind him of the struggle of the Southern States of North America for their independence; and, from the fact of these being no longer in use, he knows that the Confederates failed in their attempt. He has stamps of Naples (Fig. 5), Tuscany, Sicily, Parma (Fig. 6), Modena, and Romagna (Fig. 7); but he knows that in these countries the stamps of Italy alone have been current since 1861: a memorial of that brave battle for liberty, in which the people of these portions of the Peninsula freed themselves from the burdensome yoke of their rulers, and now form a part of Italy under Victor Emmanuel. The present German stamps, which have inscribed on their surface *Norddeutscher Postbezirk*, tell him plainly of that short and sharp conflict in which Prussia so signally defeated Austria, became the first power in Germany, and substituted these stamps for those of Bergedorf (Fig. 8), Bremen (Fig. 9), Brunswick (Fig. 10), Hamburg, Holstein, Lubeck (Fig. 11), Mechlenburg Schwerin, Mechlenburg Strelitz, Oldenburg, Schleswig, Saxony, and Thurn and Taxis. He will, moreover, be at this very time curiously inspecting the new issue of that country of which he has so many different sets, illuminated with the anything but handsome profile of what once was Queen Isabella of Spain.

On the pages of his album set apart for the stamps of the United States of America will be found a 15 *cents*, with the head of Lincoln portrayed; and on the page for Servia will be seen a set on which the head of Prince Michael is roughly represented (Fig. 19). He will know and denounce the means by which these two men were hurried from this earth, and will tell you that both fell by the hand of an assassin—Lincoln in a theatre, Prince Michael in his garden. He will show you, too, another melancholy page. He will point to the stamps which exhibit what is considered a striking likeness of the amiable but unfortunate Maximilian, and he will recount most minutely the details of his mock trial, the circumstances of his wife's absence in Europe, and the tragedy of his being mercilessly shot by his bloodthirsty enemies. Nor are the reminiscences of woe yet complete. While displaying his specimens of the issues of Peru (Fig. 35), he will tell you that they remind him of that terrible earthquake which so lately destroyed a whole town, and launched into eternity thousands of souls. Perhaps, too, he will turn to the stamps of the Virgin Islands, mementoes of another disaster. The suspense caused in England a short time ago, by the brief telegraphic intelligence that one of these islands had been submerged, will be present to his mind; and though this report proved to be incorrect, yet he will not soon forget the accredited account, how lives, and ships, and property were destroyed by a hurricane of unexampled severity.

Such are a few examples of the way in which stamp collecting is useful, instructive, and amusing to boys; and the further they proceed, the more attractive and interesting the pursuit becomes. The knowledge of dates, of wars and victories, of the commerce and produce of countries, of armorial bearings, of laws and improvements, that is derived from the study of postage-stamps, is astonishing in the extreme. Moreover, patience, perseverance, and judgment are learnt by the efforts to obtain stamps, and the arrangement of them after they have been obtained will develope and often create ideas of taste and neatness. No wonder, then, that so many boys are collectors, or, as they are now termed, "philatelists."

Origin and Development of Posts.

It is very advisable that every boy should know something about the history of posts. The first time we find a post mentioned is by the Greek historian Herodotus, who tells us that stations were established on the chief Persian roads by Cyrus, King of the Medes and Persians, and that mounted couriers conveyed from one to the other the royal messages, which were received by word of mouth. The next historian from whom we gather any information respecting posts is Suetonius, who says that Augustus, the Roman Emperor, revived the plan of dispatching messages by relays of couriers. The expression *revived*, suggests the probability that the idea was known and put in practice before the time of Augustus. These posts, however, were only used by royal personages—private individuals derived no benefit from them. Probably Charlemagne, the famous Emperor of the West, who died A.D. 814, was the first to enable private individuals to correspond with one another by means of public messengers.

In the present day it would be considered a strange thing if any of our seats of learning were to organize and undertake a system of postal service; but in former times the University of Paris obtained from Louis X. of France permission to convey to the different towns of the kingdom the letters and property of its scholars. Afterwards it extended this privilege to the general public, and it is said that it profited more by its postal services than by the teaching of those who resorted to it for instruction.

In our own country, as far back as the fifteenth century, mounted couriers carried letters to the various towns, and it was a common exploit of the highwaymen in those days to waylay these couriers and seize the contents of their letter-bags. Couriers, however, were in time superseded by the mail coach, and in 1784 the first mail coach left London for Bristol. For some years this was the general mode of postal communication, till at length the marvellous power of steam was discovered, and railway carriages took the place of mail coaches.

The postage of letters was formerly paid in money, but members of Parliament were exempt from any payment if their signature was attached to the envelope. This privilege was afterwards much abused, for people who had friends members of Parliament used to get as many envelopes signed as would last them a considerable time. The prepayment, too, of letters was compulsory until the year 1794, from which time persons were allowed to pay the postage beforehand or not, just as they pleased.

Franking letters by means of postage-stamps first originated in England. Mr. Rowland Hill, now Sir Rowland Hill, was the means of causing the project to be adopted, though it is generally thought that he was not the first who conceived the idea. He advocated a great change of postal arrangements in a pamphlet which he published in 1837, wherein he proposed to reduce the postage of letters, which on an average cost 9*d.*, and to fix the rate at 1*d.* for every letter weighing not more than ½ oz., to be prepaid by means of stamped envelopes or covers. It was thought at first that this reduction would cause a great loss to the revenue of the country, and consequently, like all reforms, it met with great opposition. So many thousand petitions, however, were presented in support of the proposal, that Parliament at last consented to appoint a Commission to examine the plan. The Commission approved of the idea, which was adopted in 1839, and on the 27th April, 1840, what are now well known as the Mulready Envelopes and covers made tl eir appearance. The design on them was etched by W. Mulready, a member of the Royal Academy, and represents England engaged in correspondence and commerce with the world. The Canton of Zurich in Switzerland was the first to follow England's example in 1843. France, Bavaria, and Belgium did not adopt the idea till 1849, and all the States in Europe had experienced the utility of postage-stamps before Turkey thought fit to issue them in 1863. Among the latest to adopt them are Sarawak, the South African Republic, and Gambia. Nearly every Government in the world now makes use of them, with one very prominent exception: in Persia, where posts were first instituted, postage-stamps are still unknown.

Two Systems of Collecting—English and French.

The collector may enrol himself under either of the two schools, the English or the French, which from their peculiar ideas of what constitutes a postage-stamp may be respectively called "Conservative" and "Liberal." The English school is eminently Conservative, and only collects those stamps which have a plain and perceptible difference from each other, either in design or colour. If any marked change is made by sanction of a Government in the design, or in the colour in which it is printed, or on the paper on which it is printed, the English school maintains that these alterations alone constitute a distinct stamp. The French school, on the other hand, is decidedly Liberal, and holds that everything connected with a stamp should be taken into consideration. It carefully studies, in addition to minute variations of design and colour, watermarks, perforations, texture of the paper, and errors of printing, acknowledging besides every variety of these. The English school makes no distinction between a perforated and unperforated stamp, and does not care about preserving stamped envelopes uncut; the French school even counts the number of dents in the perforation, and collects every stamped envelope entire. It makes a distinction also between those envelopes which have threads or inscriptions across, and those which have neither of these, and it considers as a variety a difference in the colour of the inscriptions. Thus, some of the old Prussian envelopes have a thread running through the embossed stamp, and some with exactly the same design have not this thread. The English school selects either one or other of these, the French makes a point of possessing both. Again, there are two varieties of the set of Prussian envelopes with arms in a small oval, one with the inscription passing through, and the other with the inscription not passing through the stamp. The English school is content with one of these sets, the French collects both. There is also a set of the now obsolete Thurn and Taxis envelope stamps (Fig. 12) with a lilac inscription running across the envelope of each value; and there is a set of the same designs, having the inscription on each envelope the same colour as the particular stamp. The English school thinks it sufficient to have either of these sets, the French considers them so different that both ought to be collected.

The Watermark, or *filigramme*, as it is called in France, is a transparent mark in the paper of some stamps, which may generally be seen by holding them up to the light. Thus, the watermark of our own penny label consists of a crown (Fig. 13), that of our tenpenny is a rose (Fig. 14), and that of our five-shilling is a Maltese cross. It often happens, probably in consequence of error or necessity, that different watermarks are found on stamps that have the same design and are of the same value. Take the twopenny of the present issue of Victoria as an example. Without taking into consideration the numerous shades of lilac, it is found watermarked with a figure of 1, 2, 4, 6, 8, a "V" over a crown, and the value, "Twopence," written in full. The errors 1, 4, 6, 8, were occasioned by the twopenny being printed on paper intended for stamps of the value of 1*d.*, 4*d.*, 6*d.*, and 8*d.* Then, again, the New South Wales twopenny with "Twopence" overarched, is found watermarked with a thick numeral **2**, a thin numeral 2, a thin numeral 1, and a 5, besides being unwatermarked. All these and such-like are collected by the French school.

The Perforation, or dentation, is the name given to the fringe round many stamps, caused by the method adopted by which a stamp may be easily detached from a whole sheet. Formerly the stamps had to be separated by means of a pair of scissors, until a certain Mr. Archer, about 1853, invented a mode of perforating, and sold the idea to Government for some £4,000.

There are at least seven distinct kinds of perforation (Fig. 15), and of most of these there are several varieties of size, &c. No. 1 was the first used, and may still be seen on our own stamps; No. 2 may be seen on such of the stamps of Hanover as are perforated; No. 3 is found on the stamps of Finland; No. 5 is used on the stamps of South Australia, Prussia, and many of the German States; No. 6 may be seen on the La Guaira locals. No. 7 may be seen on some specimens of the 15 *kreuzer* and 30 *kr.* of Thurn and Taxis. No. 5 is made by what is called a roulette, that is, a revolving wheel; the others are produced by a stationary machine. It sometimes happens that a stamp of the same value and of the same design are found perforated in several ways, as well as unperforated. For instance, the 3 *grote* of Bremen (Fig. 9) exists unperforated, with the serrated perforation (No. 4), and with the common perforation (No. 1). So, too, the Victoria sixpenny yellow issue of 1858 is found perforated with roulette (No. 5), with large serpentine (No. 3), with small serpentine, and with a combination of these, namely, with large serpentine at top and bottom and small serpentine at sides. It is also unperforated, thus making five varieties with respect to perforation.

Also there are from fourteen to sixteen different kinds of paper, such as bluish, white, wove, laid, machine-made, yellowish, &c. When a stamp of the same value and design is found on several kinds of paper, each variety is eagerly admitted into the album of the collector of the French school. The New Zealand twopenny is an example of the same design and value existing with different perforations and watermarks, and on different kinds of paper. It is found:

I. Unwatermarked: 1, unperforated on blue, thick, yellowish, and pelure paper (*i.e.*, very thin, nearly tissue); 2, perforated by machine.

II. Watermarked with the letters "N.Z.": 1, unperforated; 2, perforated by machine, two sides having sixteen, and two thirteen dents each.

III. Watermarked with a star: 1, unperforated on thick and on pelure paper; 2, perforated by roulette; 3, perforated by machine, sixteen by thirteen; 4, perforated by machine, twenty-four by eighteen.

It will be seen by these examples to what an extent the French school studies stamps; in fact, they raise postage-stamp collecting almost to the rank of a science. Every boy can please himself whether he become a pupil of the

English or of the French school, whether he be a Conservative or a Liberal philatelist; but under any circumstances he should make himself acquainted with all the varieties, since, among other advantages, he will often find this knowledge of use in detecting forgeries and reprints. Probably the greater number of collectors will choose a middle course, and not adopt the entire tenets of either school, but be Liberal-Conservatives, combining the good points of both systems.

Modes of Arranging Stamps.

The collector can place his stamps in one of the published albums, which have ruled spaces, or he can arrange them for himself in a book whose pages are blank. Those who collect according to the French style must almost of necessity have an unruled album, unless they have other books on purpose for all varieties. The favourite printed albums are those of Moens, Lallier, Oppen, and Stafford Smith: of these Moens' is considered the best. One objection to Oppen's is, that it is ruled so that the stamps should be fixed on both sides of a leaf; and this is not so convenient, nor do the stamps look so well, as when they are placed on one page only of a leaf. Lallier's has ruled spaces for those worthless Hamburg and American locals; but instead of disfiguring a collection with such trash, new issues might be arranged on those pages. The great objection to a ruled album is, that there is no place for new issues which may come out after the album has been printed. In a blank album the stamps may be arranged in any order to suit the taste of the collector. They may be placed in the same order as the printed albums, that is, partly geographically and partly alphabetically, or they may be arranged entirely alphabetically; in either case special care should be taken that two or three pages be left vacant after every country in anticipation of new issues. Some, perhaps, would prefer to divide the blank album into five parts: Europe, Asia, Africa, America, and Oceania, arranging the countries of each in alphabetical order, and including under Oceania, Australia (with its five divisions, New South Wales, Queensland, South Australia, Victoria, and Western Australia), Dutch Indies, New Caledonia, New Zealand, Philippine Islands, Sandwich Islands, and Tasmania or Van Diemen's Land. Others, again, might like best to have every country in alphabetical order, without regard to their geographical position, placing Antigua first, then Argentine Confederation, and so on. There are, also, several other ways of arrangement, but every one can please himself which he will adopt, and suit his own particular taste or fancy.

Method of Mounting.

Another very important point to be considered is, how to affix, or, as it is sometimes called, mount the stamps. Many young collectors are very apt to smear the backs of the stamps with thick gum or paste, and then press them firmly on the spaces allotted to them. This is a very bad plan in every way. In the first place, both gum and paste turn brown after a time, and so discolour the stamps; neither of them, therefore, should be used, if possible; but if gum is used, let it be the best and clearest, and made very thin. India-rubber cement, white starch, or a composition called dextrine, are, either of them, much to be preferred, since they do not turn brown with age. In the next place, stamps should never have the whole surface of their backs gummed to the paper, as is the case when they are affixed to envelopes; first, because they cannot be removed, if required, without being torn or damaging the album; and, secondly, because the watermark and texture of the paper cannot be examined. The best method of mounting stamps is as follows, which is very simple, but rather difficult to describe clearly. Take a slip of thin white paper about half an inch in breadth. Smear it on one side with India-rubber cement, white starch, dextrine, or thin clear gum. When dry, fold the slip in two lengthways, keeping the gummed side outermost. Next, cut it into pieces rather narrower than the stamps required to be mounted; each of these pieces will then be in shape like a hinge, the two outer sides being gummed. Attach one side, by moistening, to the stamp; and, when this is dry, attach the other side to the album: the stamp can then be moved up and down like the lid of a box. The advantage of this plan is very evident. If it is wished to remove a stamp, the greatest damage that can be done by the most clumsy person is to tear the piece of paper which acts as a hinge; and, of course, another hinge can be easily attached, and no injury is done to the stamp. Then, again, the watermark, texture of paper, and perforation can be examined and referred to at any time: this is especially a great convenience to philatelists of the French school. The hinge should be rather narrower than the width of the stamp, in order that, in the case of perforated labels, the perforations may be clearly seen; and it should also be fixed to the top of the stamp, just below the perforation. A narrower hinge would also do, if rather thicker paper be used.

The excellence and convenience of this hinge plan will amply repay any one for the trouble it may occasion; but if any boy should not have time, or think it too much trouble to adopt it, he might slightly gum a very small portion of the two upper corners only of his stamps, and then attach them to the page. If care is taken, they can be removed without much injury: it will be found much the best, however, to make use of the hinge method. Very often it is required to replace an inferior with a good copy, or to alter the arrangement of the album in consequence of obtaining more varieties and new issues, or to move the stamps into another book. Hinges, with the use of any of the adhesive compositions mentioned above, will enable any one to do this easily, without injuring or soiling the stamps in the slightest degree.

Cautions.

The best assistance that can be given to a young philatelist is to point out to him as many as possible of the traps and snares that are laid to catch him on every side. At the very commencement he must be cautioned with respect to—A, forgeries; B, reprints; C, locals; D, essays and proofs; E, impostors; F, photographs; G, revenue stamps; and H, changelings.

A, Forgeries.

Since collecting has become so general, and stamps are in such demand, numerous dishonest dealers in postage-stamps defraud to a very great extent inexperienced collectors by selling imitations of rare stamps at very low prices. They insert in boys' magazines and papers some such advertisement as this: "A bargain! A Packet of Thirty very Rare Stamps for Sixpence! including Pony Express, Sandwich Islands 13*c.*, Costa Rica, Duc di Parma, Yellow Austrian Mercury, View of Sydney, Old Lubeck, Swiss Zurich, Monte Video, Buenos Ayres, and many others. Only 6*d.*, post-free!" Many a boy has spent his pocket-money on such packets, and finds afterwards, to his dismay, that all these mentioned rarities are worthless forgeries. If a boy wishes to purchase packets of stamps, let him be careful to go to a known and respectable dealer. Collectors must not suppose, because some dealers in their advertisements warrant all their stamps to be genuine, that therefore all their stamps *are* genuine. Very often these very dealers advertise rare stamps at so low a price, that this very fact is proof that *all* their stamps are *not* genuine. It is necessary to be very cautious both in buying and exchanging: examine well and carefully, and, in a case of doubt, consult, if possible, an experienced friend before finally accepting. Very many rare and very many common stamps are forged. An observant collector may often know them by their smudginess, and the inferiority of their execution compared with the originals; but sometimes they cannot be detected without a closer and more critical examination. Forgeries, or, as they are sometimes called, facsimiles, are so plentiful that some have counselled young collectors to aim at obtaining no stamp issued earlier than 1861; there are, however, imitations of many stamps emitted since that date, and the only safeguard against being duped is cautiousness and careful study. The few descriptions following will serve as an example of how stamps should be studied; forgeries will differ in some respect from the genuine characteristics mentioned here.

ARGENTINE CONFEDERATION. *Issue* I.—One stamp was issued in April, 1868, namely, a 5 *c.*, large figure, rectangular, and block-printed in vermilion on white paper, un-watermarked (Fig. 16). The rays around the head, representing the rising sun, are made of very fine dots, which do not get thicker at the centre; the fingers of the hand on the left-hand side can be counted, the thumb only of the hand on the right side can be seen; there is a full stop after the figure 5., and also after the word *Centav.;* in the Greek border round the stamp there are eleven complete dents at top, the same number at bottom, fourteen on the left, and sixteen on the right side. (See also " Reprints.")

Issue II.—Three stamps were issued towards the end of 1858, namely, 5 *centavos*, red; 10 *c.*, green; 15 *c.*, blue; with figures smaller than first issue (Fig. 17). The inner portion of the rays is composed of dots not so fine as in the former issue, the outer portion of short lines; two large thumbs are seen on the hands; in the Greek border there are seven complete square dents at top, the same number at bottom, and nine on each side; there is a dot after *Centdv.;* the 5 *c.* is found sometimes with one, sometimes with two dots after the figure 5; the 10 *c.* and 15 *c.* have only one dot after the 10. and 15. respectively. Unlike the former issue, the oval touches the frame on both sides. (See also " Reprints.")

AUSTRIA. *Newspaper Stamps.*—I. 1850. Head of Mercury, blue, yellow, and light rose, all from one die (Fig. 18). The light rose is, perhaps, the rarest stamp in existence. The blue franked one newspaper; the yellow, a parcel of ten; and the light rose, a parcel of fifty. The letters of the inscription are very unevenly printed, and are not all of the same size; the downstroke of the *Z* is broad, and the *s* is small in the word *Zeitungs;* one line in the background looks as if it were a continuation of the outline of the cap, ending between the letters *u* and *n*.

II. 1853. Square, 1 *kreuzer*, black, 1 *kr.*, blue, 2 *kr.*, vermilion, 2 *kr.*, brown (Fig. 36), 4 *kr.*, brown, 4 *kr.*, vermilion; all these are from the same die, with merely the figure of value changed: the 2 *kr.*, green, was of a different design. They are all finely engraved, and the printing is very regular. Of the 1 *kr.*, black, and 4 *kr.*, brown, postmarked copies are rare. (See also " Reprints.")

Un. States of New Granada.

FIG. 20.

Granada Confederation

FIG. 21.

New Granada.

FIG. 22.

Granada Confederation.

FIG. 23.

Mauritius Envelope.

FIG. 24.

Prussian Envelope.

FIG. 25.

Liberia

FIG. 26.

Hanover.

FIG. 27.

Egypt.

FIG. 28.

Shanghai.

FIG. 29.

Cashmere.

FIG. 30.

New Caledonia.

FIG. 31.

Corrientes

FIG. 32.

Reunion.

FIG. 33.

Spain.

FIG. 34.

BERGEDORF.—This town was under the joint protectorate of Lubeck and Hamburg, hence the arms on its stamps are half Lubeck (an eagle), and half Hamburg (a castle); the letters in the four corners, L. H. P. A., stand for Lubeck, Hamburg Post Amt (post-office). The first issue comprised two stamps, namely: ½ *schilling*, black on violet (Fig. 8), and 3 *sch.*, black on rose; they were only in use a very short time, and are consequently very rare. The second issue comprised five, of which the ½ *sch.*, blue, was off the same die as the ½ *sch.* of the first issue. The number of rings, intersecting each other right and left, which compose the circle surrounding the arms, is fifty-five in all the stamps; the circle touches the four sides of the border, the horn touches the tail of the eagle, the summits of the towers do not touch; the arms of the letter E are very short, and the lines of the background are waved but unbroken. (See also "Reprints" and "Changelings.")

BRAZIL.—In 1843 three stamps were issued with large figures of value, namely, 30, 60, and 90 *reis*, on paper not purely white. The background is very finely engine-turned, and there is a single line round the shaded parts of the figures; between this line and the figures the background is also plainly seen: in the forgeries, which are lithographed, this space is white.

BRITISH GUIANA.—The issues of 1850 and 1853 are described under "Reprints." At times some of the English stamps were used until another issue in 1860, and after these had been in use awhile, the stock of some of the values ran out, and several 1 *c.*, pink, 2 *c.*, yellow, and 4 *c.*, dark blue, were issued, type printed in black on coloured paper, with borders of different patterns, and perforated by roulette on two opposite sides only. The letters R., M., A^{c}., B., G., are signed on nearly all, on the pink in black ink, on the yellow in red, and on the blue in white. Sometimes parts of two different types occur on the same stamp, and occasionally on some of the 4 *c.* the lines inside the border are wanting.

GRANADA CONFEDERATION, or NEW GRANADA, or UNITED STATES OF COLUMBIA.—There are no less than eleven issues of the country which has these three appellations, and as young collectors are often puzzled to know the order of some of them, the first four are described and illustrated.

I. 1859. (Fig. 23.) The background is composed of thin wavy lines, the shield is unshaded, the figures of value are small, and in the side of the octagonal frame at the left hand top angle, there are the letters ADIN of the word GRANADINA in the 2½ *c.*, and ADI in all the other values.

II. 1860. Similar design to the former issue, but the figures of value are larger above, and below the shield containing a shield the letters of inscription are smaller, the background is of fine straight vertical lines, and the letters AD are in the left hand top side of the frame (Fig. 21).

III. 1861. Large rectangular stamps, inscription in an oval, ESTADOS UNIDOS DE NUEVA GRANADA, meaning United States of New Granada; in the lower part of this oval there are nine stars (Fig. 20). On the 1 *peso* stamps the value is printed in full, "*Un Peso.*"

IV. 1862. The background consists of dark wavy lines, on which are nine stars, five above the circle and four below. The printing and colouring of these are inferior to the former sets (Fig. 22).

LIBERIA.—Of these elegant stamps there are various imitations. There are three varieties of the genuine, namely, unperforated, perforated, and perforated with a single line round the whole stamp. In the genuine 6 *c.* the toe of the foot of Liberty does not touch the circular border, and the C of CENTS is under the IB of LIBERIA. In the genuine 12 *c.* the foot of Liberty does not touch the border, the part of the spear above the knee is shaded, and the C of CENTS is under IB. In the genuine 24 *c.* (Fig. 26), there are only two breaks in the stone on which Liberty is sitting, and the lower one, which is very small, is just above the level of the bottom of the letter A; nor does the foot touch the border. The genuine postmark is LIBERIA MONROVIA, the forgeries have LIBERIA MONROWA.

MAURITIUS.—The genuine shilling envelope of this country is very rare, and has been obsolete some time. There is a dangerous forgery in existence, which has the the Queen's head and inscription too large, and small balls in the diadem instead of stars. The paper also is of a different sort, and the colour is too dull, the original being a bright rich yellow (Fig. 24).

SPAIN.—The three rare locals for Madrid, 1 *cuarto* (Fig. 34), 2 *c.*, and 3 *c.*, have been variously forged. The forgeries of 1 *c.* and 3 *c.* may be detected by studying the wreath round the oval containing the bear and tree. In the forgeries the small lines down the centres of the leaves are plain and unbroken; in the genuine these lines are uneven all along, and in many places are broken up into dots. (See also "Locals.")

TWO SICILIES: NAPLES.—The issue for the Two Sicilies was the rose-coloured set, with the Sicilian and Bourbon arms. In September, 1860, the Provisional Government printed the ½ *grano* (Fig. 5) in blue, instead of rose, engraving on the die first a T upon the G, thus making it into the value of ½ *tornese*. Part of the G remained visible under the T. In October, 1860, another alteration was made in the die, by erasing the arms in the centre, and engraving instead the cross of Savoy. The colour remained the same (blue), and very slight traces of the old arms could be seen through the cross, and part of the letter G is visible. Both these stamps are rare and valuable, and have, therefore, of course, been extensively forged. Besides other discrepancies in the forgeries, the thick portion of the remains of the G is never accurately imitated. Also, in the genuine, with a magnifying glass may be seen under "½" a very minute G, which is not found in any of the forgeries.

B, REPRINTS.

Reprints are impressions taken from the die after the stamps have become obsolete. Sometimes these dies are obtained in some way by enterprising dealers, who print off impressions, and sell them as original, genuine, unused stamps. Occasionally the officials of the country in which the stamps were once current reprint obsolete issues, and supply dealers with a large number at a very reduced price. Reprints are generally exact copies of the originals, and some have thought they ought to be collected, as showing the last state of the die; but they are of little value, and should be avoided, unless they can in some cases be procured for a small amount, and are kept as the best representations of the originals, if the originals are so rare that they cannot be obtained. Many obsolete issues are reprinted in colours the stamps never bore when current; these are, of course, no better than impostors.

It is requisite to guard against purchasing, or receiving in exchange, as genuine originals, the reprints of the stamps of the following countries:

ARGENTINE CONFEDERATION.—The first issue, 5 *c.*, with large figure of value; also the second issue, with smaller figures (Figs. 16 and 17).

AUSTRIA.—*Newspaper Stamps:* 1. Head of Mercury, blue, yellow, rose (Fig. 18). 2. Square arms, 1 *kr.*, black, 2 *kr.*, brown (Fig. 36), 2 *kr.*, red, 4 *kr.*, BERGEDORF.—This town was under the joint protectorate of Lubeck and Hamburg, hence the arms on its stamps are half Lubeck (an eagle), and half Hamburg (a castle); the letters in the four corners, L. H. P. A., stand for Lubeck, Hamburg Post Amt (post-office). The first issue comprised two stamps, namely: $\frac{1}{2}$ *schilling*, black on violet (Fig. 8), and 3 *sch.*, black on rose; they were only in use a very short time, and are consequently very rare. The second issue comprised five, of which the $\frac{1}{2}$ *sch.*, blue, was off the same die as the $\frac{1}{2}$ *sch.* of the first issue. The number of rings, intersecting each other right and left, which compose the circle surrounding the arms, is fifty-five in all the stamps; the circle touches the four sides of the border, the horn touches the tail of the eagle, the summits of the towers do not touch; the arms of the letter E are very short, and the lines of the background are waved but unbroken. (See also "Reprints" and "Changelings.")

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TWO SICILIES: NAPLES.—The issue for the Two Sicilies was the rose-coloured set, with the Sicilian and Bourbon arms. In September, 1860, the Provisional Government printed the ½ *grano* (Fig. 5) in blue, instead of rose, engraving on the die first a T upon the G, thus making it into the value of ½ *tornese.* Part of the G remained visible under the T. In October, 1860, another alteration was made in the die, by erasing the arms in the centre, and engraving instead the cross of Savoy. The colour remained the same (blue), and very slight traces of the old arms could be seen through the cross, and part of the letter G is visible. Both these stamps are rare and valuable, and have, therefore, of course, been extensively forged. Besides other discrepancies in the forgeries, the thick portion of the remains of the G is never accurately imitated. Also, in the genuine, with a magnifying glass may be seen under "½" a very minute G, which is not found in any of the forgeries.

B, REPRINTS.

Reprints are impressions taken from the die after the stamps have become obsolete. Sometimes these dies are obtained in some way by enterprising dealers, who print off impressions, and sell them as original, genuine, unused stamps. Occasionally the officials of the country in which the stamps were once current reprint obsolete issues, and supply dealers with a large number at a very reduced price. Reprints are generally exact copies of the originals, and some have thought they ought to be collected, as showing the last state of the die; but they are of little value, and should be avoided, unless they can in some cases be procured for a small amount, and are kept as the best representations of the originals, if the originals are so rare that they cannot be obtained. Many obsolete issues are reprinted in colours the stamps never bore when current; these are, of course, no better than impostors.

It is requisite to guard against purchasing, or receiving in exchange, as genuine originals, the reprints of the stamps of the following countries:

ARGENTINE CONFEDERATION.—The first issue, 5 *c.*, with large figure of value; also the second issue, with smaller figures (Figs. 16 and 17).

AUSTRIA.—*Newspaper Stamps:* 1. Head of Mercury, blue, yellow, rose (Fig. 18). 2. Square arms, 1 *kr.*, black, 2 *kr.*, brown (Fig. 36), 2 *kr.*, red, 4 *kr.*, brown, 4 *kr.*, vermilion. The issues also of 1850, 1858, and 1861 have been reprinted. The use of studying perforations is exemplified in the detection of these, for the current issues of 1850 and 1858 were perforated with fifteen dents, whereas the reprints have only twelve; and the originals of 1861 had fourteen, but the reprints have twelve dents. All the old envelopes, too, have been reprinted.

AUSTRIAN ITALY.—The issues of 1850, 1858, and 1861 have been reprinted with the same discrepancies in perforation as in those of Austria.

BERGEDORF.—The first issue, ½ *sch.*, violet, and 3 *sch.*, rose. These are too dull in colour, and not clear enough impressions to represent stamps only in circulation ten days.

BRITISH GUIANA.—I. Issue of 1850: large rectangular; ship sailing to right in shield, value above, BRITISH GUIANA at sides, and the motto DAMUS PATIMUSQUE VICISSIM below; black ink on coloured paper; 1 *c.*, magenta, 4 *c.*, blue.

II. Issue of September, 1853: small rectangular; date 1853 in four corners, ship sailing to left in oval, motto round oval DAMUS PATIMUSQUE VICISSIM, impressed in colour on white paper; 1 *c.*, red, 4 *c.*, blue. Many of the reprints of both these issues are perforated, a fact which leads to their detection at once, since perforation was not at that time applied to the stamps of foreign countries.

III. Issue of 1860: 1 *c.*, rose. The genuine has twelve dents on each upright side, the reprint thirteen.

BRUNSWICK.—The local envelope, hand-stamped in red "St. P. Fr." in a circle. The paper of the reprints is too white, and the colours too bright.

CONFEDERATE STATES OF NORTH AMERICA.—The greater part of these are reprinted, but the colours are generally brighter and the impressions clearer than the originals. The genuine rare 1 *c.*, with portrait of Calhoun, is yellow; the reprint is of a reddish shade, and much more finely printed.

CORRIENTES.—(Fig. 32). The blue of the reprints is brighter than that of the originals, and the stamp that was yellow-green is reprinted blue-green.

FINLAND.—The originals of 1845, with inscription PORTO STEMPEL, have thirty-nine lines in the shield, the reprints thirty-seven. The original oval of 1856 has point of sword between ninth and tenth lines on the shield, the reprints have point of sword between eighth and ninth.

FRANCE.—The stamps of the Presidency and Republic are reprinted, and some of these reprints are even postmarked; many too are reprinted in colours differing from the originals, and sold as proofs.

GRANADA CONFEDERATION.—First issue with figure of value small, and shield not shaded (Fig. 23); also the second issue with figures of value larger (Fig. 21).

HANOVER.—The old sets are reprinted with white gum at the back, instead of the original rose-coloured. Also the device on the local envelope, BESTELLGELD FREI, is stamped on sheets gummed at the back, instead of being on envelopes (Fig. 27).

ITALY.—The old sets of 1851 and 1852, in too bright colours.

MODENA.—The 1 *lira*, and the Provisional set with inscription PROVINCIE MODONESI, and the newspaper stamp with inscription TASSA GAZZETTE.

NAPLES and NEAPOLITAN PROVINCES.—All reprinted.

NATAL.—The oldest set embossed on coloured paper, like blotting-paper.

NEW CALEDONIA.—The type of each of these differs in some respect, since each stamp is engraved separately (Fig. 31).

PARMA.—The Provisional set with inscription STATI PARMENSI, and the three with inscription DUC DI PARMA. (Fig. 6.)

Pony Express.—In more colours than are found in the originals (Fig. 40). (See also "Locals.")

PORTUGAL.—The first set with head of Donna Maria (Fig. 4).

Peru. *Austrian Newspaper.* *Provisional stamp, Naples.* *Schleswig-Holstein.*

FIG. 35.

FIG. 36.

FIG. 37.

FIG. 38.

FIG. 39.

FIG. 40.

PRUSSIA.—The first issue of envelopes. The reprints of 4, 5, 6, and 7 *silbergroschen* have no threads running across the stamps, as is the case in the originals.

REUNION.—15 *c.* and 30 *c.*, black impression on bluish paper (Fig. 33).

ROMAGNA; SAXONY, Issue of 1850; SICILY; and SCHLESWIG-HOLSTEIN, Issue of 1850, 1 *sch.*, blue, and 2 *sch.*, pink (Fig. 38).

TUSCANY.—The genuine issue with the lion are on blue paper with watermark of lines and a loop horizontally across, and also on white paper with watermark of curved vertical lines intersecting. The rare 2 *soldi* and 60 *crazie*, however, are only found on blue paper. The reprints are on unwatermarked paper, but the 2 *soldi* is imitated by a smudgy impression from the altered die of another value, with a watermark of a circle in one corner; the original is very fine and distinct.

UNITED STATES.—All the envelopes of 1853 and 1857. In consequence of the stamps of these countries being reprinted, all unused copies should be carefully examined; and if there is not strong evidence of their being originals, reject them, and accept only those that are genuinely postmarked.

C, LOCALS.

Though collectors should be cautious about these, yet there are some which may be accepted as strictly coming under the term postage-stamps. Locals may, therefore, be divided into two kinds: those which *ought* to be collected, and those which *ought not* to be collected.

I. Locals which ought to be collected, because they are stamps issued for local use, either by a State, or by private companies under the sanction of a State.

BRUNSWICK.—The local for this city consists of the device of "St. P. Fr." in a circle hand-stamped in red, sometimes on the right, sometimes on the left, of an envelope. St. P. Fr. stands for "*Stadt post friemarke*," and the envelope is found in various colours.

CASHMERE.—These stamps are used only in the territory of Cashmere, chiefly in the towns of Serinagar and Jumnoo, and the Government of that country is allowed by our Indian Administration to make a uniform charge of one anna, irrespective of weight, for the conveyance to the frontier of each letter destined for another country, and also for conveying from the frontier each letter arriving from another country. They are the most primitive-looking stamps in existence, and it was a considerable time before the blotchy inscriptions on them could be deciphered. The type of the first issue was circular, and consisted of $\frac{1}{2}$ *anna*, black (Fig. 30), 1 *a.*, blue, and 4 *a.*, blue. These are generally postmarked with such a daub of red or black colour that it is often difficult to see the device in the centre; but in the centre of the $\frac{1}{2}$ *a.* there are three white strokes in a circle, thus ; in the centre of the 1 *a.*, a white crescent and stroke, thus ; and in the centre of the 4 *a.*, one white stroke, thus . The second issue was a rectangular issue of six, namely, 3 *pies*, or $\frac{1}{4}$ *a.*, black; 6 *p.*, or $\frac{1}{2}$ *a.*, blue (Fig. 28); 1 *a.*, red; 2 *a.*, yellow; 4 *a.*, green; 8 *a.*, deep red. The characters in the upper part of the outer oval are Guzaratí, the lower half is Persian. Guzaratí has been called a dialect of the Sanscrit language; but it is in no sense a dialect of Sanscrit, any more than Norman-French is a dialect of Oscan or Umbrian; nor are any of the characters on these stamps Sanscrit. All the stamps have the same characters in the outer oval; but in the inner oval they vary according to the value of the stamp. Of the four lines in the inner oval of the $\frac{1}{2}$ *a.* (Fig. 28), the first two are Persian, for the value and the date; the last two are Guzaratí, for the value and date. The last two lines of the inner oval read in Guzaratí, "*âdh âna*, 1924," *i.e.*, "half anna, 1867." There have been also issued two other labels of the same rectangular type, namely, $\frac{1}{2}$ and 1 *a.*, both blue.

CONFEDERATE STATES.—It is doubtful whether any of these should in strictness be admitted, since they are supposed to have been issued by the local postmasters before the Confederate Post-Office was fully established; but those of Baton Rouge, Charleston, Memphis, Mobile, Nashville, New Orleans, and St. Louis are generally considered genuine. Original postmarked copies are very rare, and the collector must beware of reprints and forgeries.

CONSTANTINOPLE.—A series of three stamps was issued for this city in 1866, namely, 5, 20, and 40 *paras*. They may be obtained postmarked, but are now obsolete.

CORRIENTES.—Three stamps were once used solely in this province, which is now a part of the Argentine Republic, namely, 1 *real*, M.C., blue (Fig. 32), a blue without indication of value, and a yellow-green without indication of value. M. C. stands for "*Moneda Corriente*," and means "current money." Genuine postmarked copies are very rare; beware of forgeries and reprints.

DANUBIAN STEAM NAVIGATION COMPANY.—This company holds a contract for conveying the Austrian mails up the Danube, and is allowed to charge extra for their own benefit. Consequently it issued two stamps, a 10 *soldi*, mauve, and a 17 *s.*, rose, both of the same design. They are found postmarked on the same envelope with the Austrian stamps. The 17 *s.* is obsolete.

FINLAND.—Two towns in Finland, namely, Helsingfors and Tammerfors, have local stamps, issued by a private company with the sanction of the State. The 10 *penni* for Helsingfors is printed in rose and green, the 12 *p.* for Tammerfors in blue and green. *Standspost* is the Swedish, and *Kapungin Posti* the Finnish, for "City Post."

HANOVER.—There are three varieties of the stamps used only for this city. 1. 1850. A post-horn, encircled by the words BESTELLGELD FREI, hand-stamped in blue on a yellow envelope. (Fig. 27). The device was generally impressed on the left-hand lower corner of the envelope. This local being rather rare now, odious reprints and forgeries have appeared (see "Reprints").—2. 1858. The arms of the city, namely, a post-horn with a shamrock above it, encircled by BESTELLGELD FREI, impressed in green on a yellow envelope on the left side.—3. 1861. The royal arms, namely, a horse running towards the left, with BESTELLGELD FREI round it, green impression on yellow envelope. Each of these varieties was of the value of ½ *groschen.*

LA GUAIRA.—These stamps are issued by a company that conveys the mails between the ports of La Guaira and Puerto Cabello, and the island St. Thomas, under a contract with the Venezuelan Government. There are seven values—½, 1, 2, 3, 4 *centavos*, roughly engraved with figure of value in centre; and ½ and 2 *reales*, finely engraved and of a different design. The ½ *r.* exists both in rose and light blue, and the 2 *r.* in green and yellow. These last are very much forged, but may generally be detected from the coarseness of engraving.

MADRID.—There were three locals for Madrid. A 3 *cuartos* bronze, bearing the arms of the city (a bear climbing a tree) in an oval, with a crown above it, was issued in 1852, and this was superseded by a 1 *cu.* bronze in 1853 (Fig. 34). This 1 *cu.* was used till 1854, when a 2 *cu.* green, on which was impressed the arms of Spain, took its place. These stamps have been forged in several ways, and no copy should be accepted unless there is a certainty of genuineness. (See "Forgeries.")

PACIFIC STEAM NAVIGATION COMPANY.—The Peruvian Government gave to this company the contract to carry mails to all places on the coast of the Pacific Ocean. There were only two values—a 1 *real* for half an ounce weight, and a 2 *rls.* for the weight of an ounce, and they were beautifully engraved. It is not accurately known what were the original colours, but probably at first the 1 *r.* was blue, and the 2 *r.* carmine, and afterwards the colours were reversed, and the 1 *r.* was carmine and the 2 *r.* blue. They have been reprinted in pairs in various colours. They have also been extensively imitated, but on a close inspection the inferiority of the engraving of the forgeries is easily perceived. A genuine original copy of either value is now very difficult to meet with.

SHANGHAI.—These strange-looking labels were issued for Shanghai by the Municipal Council, under the protection of the British. There are three issues. I. Eight large roughly-printed square stamps on thin unperforated paper, with value in *candareens*, 1, 2, 3, 4, 6, 8, 12, 16, respectively each of a different colour. II. Four, rectangular, better engraved, smaller size than former issue, and perforated, with value in *can.*, 2, 4, 8, 16 respectively; the design of each value is different. III. Four, of the same size as preceding issue, but with variations in the designs, value in *can.*, 1, 3, 6, 12 respectively, colours differing with each value. The Chinese characters are alike on each stamp of the same value in the three issues, and the explanation of them affords both amusement and instruction. The illustration (Fig. 29) represents a 1 *can.* of the first issue. The Chinese language reads from *right* to *left*, or perpendicularly sometimes. The characters in right top angle (*a*), and left top angle (*b*), read respectively, SHANG, HAI, and signify, as is evident, the name of the town. The characters in right lower angle (*c*), and left lower angle (*d*), read respectively, KUNG, POO, and mean "Office of Works." The characters on right-hand column (*e f g*), read SHOO SHIN ROWAN, meaning "Book Letter Company." The third character on the left-hand column (*h*), reads YIN, meaning silver, and the second (*i*), FUN, signifying *candareen.* All these characters (*a, b, c, d, e, f, g, h, i*) are the same on every stamp, with the one exception, where *mace*, T'SIEN, occurs by error instead of *candareen*, FUN, at (*i*), in a 4 *can.* stamp. The remaining characters on the left-hand column vary according to the value of the label, since they express the value.

It must be borne in mind that the Chinese transact their business by weight of metal, and that the *candareen* is a weight, the value of which is shown by the following table:

13 *cash*	make	1 *candareen*, amounting to about	0*s.*	0¾*d.*
10 candareens	„	1 *mace* „	„	0	7½
10 mace	„	1 *tael*, about 1 oz. of silver	„	6	3

In the illustration (Fig. 29), the character (at *k*) reads YIH, and represents the figure 1; therefore all the characters in the left column read YIH FUN YIN, and signifies 1 *can.* silver. In Chinese, *yih* is one, *uhr* or *liang* two, *san* three, *si* four, *loo* six, *pa* eight. In the 12 *can.* and 16 *can.* there are three characters at *k*, of which the middle one reads T'SIEN, meaning *mace;* the left-hand column of the 12 *can.* reads YIH T'SIEN UHR FUN YIN, signifying 1 *m.* 2 *can.* silver, *i.e.*, 12 *can.;* the left-hand column of the 16 *can.* reads YIH T'SIEN LOO FUN YIN, meaning 1 *m.* 6 *can.* silver, *i.e.*, 16 *can.* It is to be observed that the value in English on many of these Shanghai stamps is printed *candareen* in the singular, when it ought to be *candareens*, plural; that stamps of the same value are found on numerous kinds of paper and in different shades of colour; that T'SIEN (*mace*) occurs by error for FUN (*candareen*) on some 4 *can.;* that there are great differences in the formation of the figure on stamps of the same value, besides some small errors of printing; and that all these variations are much prized by collectors of the French or Liberal school.

STOCKHOLM.—Two stamps were issued for this city of the same design, and both bearing the incription FRIMARKE FÖR LOCALBREF: a black one in 1855 of the value of 1 *skilling banco*, and a brown one in 1862, of the value of 3 *öre.* In 1863 a stamp of a different design was issued, of a brown colour, with the value 3 *öre* inscribed on it.

UNITED STATES.—Probably two local stamps only were issued by Government authority.—1. A 5 *c.*, black, with head of Washington, and inscribed *New York Post-Office.*—2. 5 *c.* and 10 *c.*, black, oblong, with inscription, *Post-Office, Prov., R.I.*—*i.e.*, Providence, Rhode Island. All three have been reprinted in various colours, so only genuinely postmarked copies should be accepted.

WELLS, FARGO, AND CO.—In the early days of collecting, no collection was considered of any value unless it contained a "Pony Express." The stamps that bore this name were those issued by this company while it held from the United States Government the contract for the postal service to California (Fig. 40). The contract expired in 1864, but since then stamps belonging to this company have been found on the same envelope with United States' stamps, and postmarked: they also had an oblong label for newspapers. All have been reprinted, and also forged. In the genuine, the tail of the pony comes nearly to a point.

II. Locals which should *not* be collected, because they are not sanctioned by any Government.

AMERICAN LOCALS.—The greater part of these are base fabrications; some few are reprints. There is no doubt that some locals were at one time in use for prepaying letters from one town to another, or to different parts of the same town, and were employed in consequence of the heavy postal charges of the Government; but they were not sanctioned, though not interfered with, and were soon discontinued when the Government rates were lowered. It is said that the first stamps used in America were some locals issued by D. O. Blood and Co., of Philadelphia, in 1843, the Government not issuing any till 1847. This proved such a successful speculation, that several other firms followed the example. They were all, however, withdrawn when the Government reduced its charges, and declared that it had the sole right of conveying letters along the streets of towns. A few of them are finely engraved, with elegant designs, but the greater part are very inferior in design and printing, chiefly resembling the labels found on cotton-reels. Of those issued by D. O. Blood and Co. (Fig. 39), it would now be impossible to obtain a copy, except on the breaking-up of an old collection.

CANADA.—No private post-offices are permitted in Canada, so that all pretenders to the position of local stamps in that country are forgeries and impostors. Beware, therefore, of the following, which are constantly sold as genuine, namely, "Bancroft's City Express," "Bell's City Post," "Ker's City Post," "Winslow and Co's. Express."

HAMBURG LOCALS.—All these are most atrocious fabrications. They are one hundred and sixteen in number, with inferior designs, bad printing, and ugly colours. Their price is so low, and many young philatelists are so anxious to swell the number of their stamps, that they are enticed into purchasing them. Let no one disfigure his collection by admitting one of these counterfeits. Although in several favourite printed albums spaces are ruled for both Hamburg and American locals, it ought not therefore to be considered necessary to obtain this trash in order to fill up those spaces. As was before mentioned, new issues may occupy the pages intended for those impostors.

NORWAY.—The stamps for Drontheim and Bergen are private speculations, without the sanction of the Government.

SAXONY.—A considerable number of stamps, bearing the inscription *Saxony Express* and *Dresden Express*, are sold as genuine Saxony locals. They are printed on various coloured papers, some being adhesives, some envelopes: avoid them.

SUEZ CANAL COMPANY.—Four stamps are said to have been issued by this company for use in the towns springing up during the making of the canal. *Canal Maritime de Suez* is inscribed round an oval enclosing a ship.

SWITZERLAND.—Many are puzzled as to what country the red stamp inscribed *Rigi Kaltbad* belongs. It is used by the proprietor of the hotel on the Rigi to prepay his charge for conveying the letters of his guests to the nearest post-office at Weggis, about fifteen miles distant. It is not strictly, therefore, a postage-stamp. There is also another of a similar kind, green, and inscribed RIGI SCHEIDECK, J. MULLER.

Besides all these, care should be taken not to accept as postage-stamps the labels of circular-delivery companies, or telegraph or railway companies. Should any one wish to collect these, they ought not to be placed in the same album with postage-stamps, since they are not strictly postal. Many young collectors are not aware of their nature, and are induced by their low price to buy them. The present English telegraph forms may be collected, since the telegraphs are now under the management of the Post Office. Nor should any one admit the Bavarian Instruction or Interpostal stamps, although there are spaces ruled for them in Lallier's album. They are only used to indicate the kind of stamps that are inclosed in the envelopes sent to the different Bavarian post-offices.

D, Essays and Proofs.

Essays are designs for stamps, printed and proposed to a Government in the hope that they may be finally adopted. If they could be obtained genuine, they would perhaps be interesting, though it may be questioned whether they should rank in an album as fit companions for postage-stamps. The English school would decidedly deny them admission. Unfortunately, real essays are difficult to obtain, and what are often sold as such are base attempts upon the credulity of eager philatelists. Some short time ago a pretence was made that a few sheets of a very rare essay were accidently discovered. This was what has since been known as the Prince Consort Essay. It resembles the old penny black of Great Britain, but in the place of the head of Queen Victoria, the head of Prince Albert, her Consort, was engraved. Many believed the tale of accidental discovery, and eagerly purchased a wished-for specimen. The deception, however, did not last long, and it was found that the high-priced and much-coveted Consort Essays were valueless fabrications.

For a considerable period in the earlier days of philately, two rare stamps were thought to have been once in actual circulation. These were the English V.R., so called because the letters V.R. were in the two upper crowns, and the ½ *anna*, red, of India. It has now been ascertained that both these were essays; and when genuine they are still very valuable. The English V.R. was intended to defray the postage of official correspondence, but was never really employed, so that genuine copies are unpostmarked. Every device has been tried to produce an imitation. One plan was to take a black penny stamp, cut out the top corners, and cleverly and neatly insert an R in the right-hand top corner, and in the left an A, with the little bar scratched out, and turned upside down to resemble a V. Another method was to scrape off the little Maltese crosses in the upper corners, and to print V on one, and R on the other corner. Both may be detected by close examination: the originals, too, are on rough watermarked paper, which is not the case with the forgeries. Attempts have also been made to imitate the Indian ½ *a.*, red.

Another essay much prized by those who fancy such things is what is known as the Connell Essay. This was designed by the Hon. Charles Connell, Postmaster of New Brunswick, to fill the place of the ordinary 5 *c.*, green, the stock of which had been exhausted. The device very much resembled the 5 *c.* of the regular issue, with the exception that Connell's head appeared in the oval instead of Queen Victoria's. Connell was dismissed from his position before the essay became a current stamp.

Two more may be mentioned, as having given rise to great discussions as to whether they were ever really issued, namely, the 10 *c.* of Dutch Guiana, and the 10*d.* of Van Diemen's Land. No convincing evidence has been given of their having been in circulation, and they are now generally looked upon as essays. Forgers reap a great harvest by pretended essays. It is often difficult to prove whether so-called essays are genuine or not, and moreover there is no end to the number of them. Of Holland, for instance, there are nearly 1,000 varieties of essays! It is hardly likely that all these are genuine, but if they are, they form a collection in themselves.

Proofs are impressions, in various colours, of designs that have been adopted. They are on thin cardboard, and are generally beautiful specimens of engraving. After being submitted to the approval of the Government for which they were designed, one of the colours is finally decided upon for a particular stamp. Proofs, therefore, hardly come under the designation of postage-stamps, however interesting they may be in other respects. Some consider that they ought to be collected because they are the earliest impressions of dies. The English Conservative school would certainly object to their occupying a place in a postage-stamp album. Like many essays, several stamps that are sold as proofs are quite fictitious. The most successful way in which some designing dealers have duped those who collect proofs is by reprinting obsolete stamps on thin cardboard in different colours, and selling these as proofs. Perhaps the best rule with regard to essays and proofs is to avoid them unless they are unquestionably genuine, and can be obtained as a bargain; under these circumstances, they can, if not retained, be exchanged advantageously with those who collect them.

The collector has always to be on his guard lest he should be deceived. Every now and then stamps appear, professing to be new or lately-discovered issues of different countries. After several have purchased them, it is found that these pretenders are mere fabrications. Care should be taken, therefore, neither to buy or take in exchange any stamps about which there is any doubt, until authentic information concerning them has been received. Among those to be avoided as the speculations of dealers may be mentioned the following:

E, Impostors.

Argentine Confederation.—The large figure, 10 *centavos* and 15 *c.* The first issue was a 5 *c.* large figure (Fig. 16), and it is alleged that a 10 *c.* and 15 *c.* large figures were also designed and printed, but never, for some reason or other, circulated. It was pretended that several sheets of these were found lately, and great controversies have taken place as to their genuineness. It is now generally believed by the best and largest collectors that they are impostors.

Austria.—*St. Andrew's Cross.*—These consist of a white St. Andrew's cross on grounds of various colours. They are merely impressions of the wood-blocks which filled up the frames from which the old Austrian stamps were printed. For this reason they are generally termed complimentary labels, and it is evident they are not postage-stamps at all, though often sold as such. Of the issue of 1861 of Austrian Italy there are only two values, 5 and 10 *soldi*, perforated fourteen; the 2, 3, and 15 *s.*, perforated twelve, pretended to have been discovered lately, are impostors.

Berlin Express.—There is a set of roughly-executed labels of various colours with this inscription. The Prussian Government has never issued anything of this kind, and it allows no private establishment to issue stamps; these should be looked at, therefore, only to be rejected.

Bolivia.—The values 15 *c.*, 20 *c.*, and 1 *peso.*

Breslau Express.—These profess to be locals for the Prussian town of Breslau. They are entirely fictitious, and are only designed to take in young and unsuspecting collectors.

CAPRERA.—No authentic stamps were ever issued for this island.

CONFEDERATE STATES.—The blockade stamps, pretended to have been used to prepay letters on board the vessels that ran the blockade of the Confederate ports during the Civil War in America. The "Richmond Postage," Nashville, 5 *cents*, lilac, 10*c*., green.

ICELAND.—There never was a genuine stamp for this island.

JERUSALEM.—No accredited stamp for this city was ever current.

KISSENGEN AND SCHWEINFURT.—Pretending to frank letters between the two towns.

LEITMERITZ.—The production of some speculator named Ed. A. Hofer.

MEKKA.—No genuine stamp for this city was ever issued.

MORESNET.—The set of labels for a Republic of this name, asserted to be the smallest State in Europe. They made their appearance on the 1st of April, 1867, and were merely the jocular invention of some witty engraver making merry on All Fools' Day.

PEKIN.—All pretended stamps for this city are impostors.

REPUBLIC OF IRELAND.—This is a green rectangular stamp, with REPUBLIC OF IRELAND inscribed on left and right sides, POSTAGE above, and 24 CENTS below; within this rectangle is an oval garter containing the motto LIBERTAS ET NATALE SOLUM, encircling a harp. The Fenian attempt to free Ireland from its allegiance to England having failed, and no Irish Republic having been established, this impostor was premature in coming into existence.

ROMAGNA.—The 6 *bajocci*. It only existed in the reprinter's imagination.

SANDWICH ISLANDS.—The 13 *cents* figures on blue paper.

SPAIN.—The 12 *cuartos*, same type as issue of 1857.

ST. THOMAS AND PORTO RICO.—A set with CLARA ROTHE on a label under a ship.

TAHITI.—No such stamps ever in use.

UTAH.—This professes to have been issued by Brigham Young for circulation in his Mormon State. The Mormons have never been favoured with the use of any such stamp.

WENDEN.—Ever since 1864, two oblong stamps, green and pink, and two rectangular, rose with green centre, all four inscribed WENDENSCHEN KREISES, have been considered a genuine issue for Livonia, in Russia. Even forgeries of them made their appearance, and the oblong pink was often difficult to obtain. It is now believed that they were the fabrication of a St. Petersburg dealer.

F, PHOTOGRAPHS.

Even the art of photography is called in to assist in imitating stamps. Photographs are easily detected when they profess to represent stamps of any other colour than black; but even when they simulate those that were originally black, their glazy appearance and brownish tinge betray them. Among the Brazil slanting figures, the Oldenburg ½ *groschen* of 1861, the Connell Essay, and the English V.R., may be mentioned as being photographed.

G, REVENUE STAMPS.

Receipt stamps of all sorts, and stamps belonging to the revenue of different countries, often find their way into the albums of collectors, in consequence of their being mistaken for, or purchased as, postage-stamps. Cases have been known in which revenue stamps have passed through the post and been postmarked, and there can be no objection to preserving such specimens as curiosities; but fiscal stamps in general have certainly no right to a place in a postage-stamp album. They are, as a rule, very elegantly designed. Among those often thought to be postal may be mentioned the revenue labels of the following countries:

CALIFORNIA, bearing value, and the inscription, *California State Revenue.*

CANADA, very similar in design to the present postal issue.

CAPE OF GOOD HOPE, with *The Stamp Act*, 1864, inscribed on them.

INDIA, part of inscription being, *Government of India.*

ITALY, large rectangular stamps, with inscription, *Marca da Bollo.*

IRELAND, inscribed, *Ireland Petty Sessions*, used on summonses.

JAMAICA, lilac, with value, *Three half-pence.*

MAGDALENA.—It was pretended for some time that this was a postage-stamp, issued more than a year ago, but only lately discovered. Magdalena is a part of New Granada, or, as it is now called, United States of New Columbia. The inscription on the fiscal stamp is, *Estados Unidos de Columbia,* 20 *centavos. Estado Soberano dei Magdalena*, 1867.

NEW SOUTH WALES, with *Stamp Duty* as part of inscription.

PERU, with large figures of value.

PORTUGAL, long stamps, with *Imposto do Sello*, part of inscription.

PRUSSIA, with the word *Stempelmarke* at the bottom.

SWITZERLAND.—Those with bear on shield, inscribed *Kanton Bern;* those of various colours and values, inscribed *Graduirter Stempel;* and those with *Geneve Estample* on the right-hand side.

UNITED STATES.—These are very numerous, of all sizes, values, and colours.

VENETIA.—Those sold as Venetian Declaration Stamps.

WURTEMBURG, with value in a white square in a circle occupying the upper part of the stamp.

Besides these revenue labels, the stamps impressed on newspapers are considered by many unfit to be occupants of a postage-stamp album, because they cover both the tax and postage.

H, CHANGELINGS.

This is the name given to those stamps whose colours have been changed by chemical or other means. Among those to be avoided are the following:

BADEN.—9 *kr.*, with figure in centre, *white* paper instead of pink.

BERGEDORF.—The ½ *schilling*, blue, of the second issue is made *lilac*, to represent the rare ½ *sch.* first issue, both being from the same die. By closely examining the back of this changeling, it will be seen that the colour is not even over the paper, but spotted and in patches.

CANADA.—The 12½ *cents*, packet postage, *blue* instead of green.

FRENCH REPUBLIC.—The 1 *franc, carmine*, is washed in saffron to imitate the very rare 1 *f.*, *vermilion.*

NEW ZEALAND.—The unperforated twopenny, *green* instead of blue.

UNITED STATES.—10 *cents* of the old issue, *blue* instead of green.

VICTORIA.—The sixpenny Queen on throne, *black* instead of blue.

WURTEMBURG.—First issue with figure in centre, 6 *kreuzer*, *blue* instead of green, and 9 *kr.*, *white* instead of pink.

HINTS AND SUGGESTIONS.

It is said that postage-stamp collecting first commenced at a boys' school on the Continent somewhere about fourteen years ago. At that time, and for several years after, stamps could only be occasionally obtained in small numbers by exchanging or asking friends to exert themselves to procure them.

Perhaps some very ardent collector might once in a way write to the postmaster of a town in some foreign country, or commission some friend in that country to obtain its stamps for him; still, buying stamps was almost unknown, and under any circumstances additions to an album were few and far between. After awhile the number of collectors increased to such an extent that it became evident it would be a very profitable trade to sell and exchange stamps. Consequently there is now every facility for making a good collection in a comparatively short time, for in addition to there being more with whom to exchange, there are numbers of dealers from whom the stamps of almost every country may be purchased. With greater advantages, however, we must not be surprised that there are some drawbacks. In the early days of philately there were few opportunities of getting stamps, but when they were obtained, there was no doubt about their being anything but what they professed to be. Such a thing as a forgery or counterfeit was not even dreamt of, much less known.

But at the present time, although the means of increasing a collection are very numerous, yet whether we exchange, or receive as presents, or buy, the idea uppermost in our minds must always be, are what we obtain genuine? Deception in every fascinating form, and counterfeit in every conceivable phase, waylay our footsteps. The young collector must not expect always to escape the meshes of roguery, but he should not be disheartened at a few mistakes at first. A careful reading of the cautions given above, and a continual reference to them, will prevent many a disappointment, and foil the attempt of many a forger.

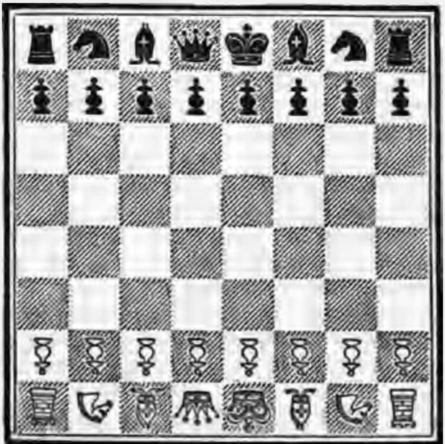
There is always great rivalry between collectors with respect to the excellence of their collections. Emulation is very praiseworthy, if exercised in the right direction. Boys, however, too often think that *numbers* is the test of the superiority of a collection, and encouraging this idea too much, they are not particular about what they accept, provided they can add to the number of their stamps. To estimate a collection by the amount of stamps it contains is very erroneous. Its value depends not on the quantity, but on the *quality* of the contents. It is unwise to prefer several *common* stamps to a few *good* ones. An album containing a quantity of inferior specimens would not be worth nearly so much as one with a smaller number, but those well selected and in good condition. After being satisfied of the genuineness of stamps, and their legitimate claim to a place in the album, the next strict rule to be observed is to accept none that are not as perfect specimens as can be obtained. It is necessary, therefore, to consider what constitutes this perfection. No stamps should be clipped, all should have wide margins, and in the case of perforated stamps, these only should be selected in which the perforation is perfect, and does not intrude on any part of the design. Many specimens are quite spoilt from being clipped, and this system was formerly so common that it is now often difficult to obtain with a margin an old Indian 4 *a.*, and many old envelopes. Envelopes, if not collected entire, should be cut square, with plenty of margin, never clipped round. Brightness of colour and fineness of impression should be looked for, and of postmarked stamps those should be preferred on which the obliteration is as slight as can be had, and does not deface any important part of the design. If the stamps in an album are well selected and genuine, and are remarkable for cleanness, clear impressions, bright and decided colours, completeness of watermark, perforation and margin, and if they are arranged neatly and orderly, and mounted according to the hinge plan, so as to admit of easy removal and inspection, everything that is desirable in a collection is attained.

GAMES OF SKILL.

Games of Skill.

CHESS.

Black.



White.

ORDER OF THE MEN ON THE BOARD.

INTRODUCTORY.

Chess is one of the most ancient of known games of skill. Mr. Drummond, a writer on the game of draughts, asserts that draughts is the "elder sister of chess," which he properly describes as "the thinking game;" but, however that may be, there is indisputable evidence that chess was known in the most remote periods. Various theories are advanced as to its origin. One account states that the wife of Ravan, King of Ceylon, devised it in order to amuse her royal spouse with an image of war while his metropolis was closely besieged by Rama. There are at least a dozen claimants for the honour of the invention, but all the accounts of the origin of "the thinking game" are attended with more or less uncertainty.

We will now proceed to give the necessary directions for playing the game.

The game is played on a board divided into sixty-four squares, coloured alternately black and white. It is the same as that used at draughts. Eight pieces of different denominations and powers, and eight pawns, are allotted to each competitor. As a necessary distinction, each set is coloured in a different way, one commonly being white, the other red or black. The pieces are named as follows:

King. Queen. Bishop. Knight. Rook. Pawn.

Every player, therefore, is provided with one king, one queen, two bishops, two knights, and two rooks, besides the eight pawns. They are placed, at the beginning of each game, in the order shown at the head of this article.

In placing the board, care must be taken that a white corner square be at the right hand of each player. It should also be observed that the queen must be placed upon a square of her own colour.

The Pieces: their Powers and Mode of Action.

The king can move in any direction—forward, backward, sideways, or diagonally, provided always, of course, that he does not move into check. The king possesses one great prerogative—that of *never being taken;* but, by way of counterbalancing the advantage of this exemption, he is restrained from exposing himself to *check*. He can move only one square at a time, except when he *cast'es*, which he may do once during each game. He may then move two squares. He cannot *castle* when in *check*, nor after he has once moved, nor with a rook that has been moved, nor if any of the squares over which he has to move be commanded by an adverse piece.

The queen can move either horizontally or diagonally. She combines the powers of the bishop and the rock. She can, at one move, pass along the whole length of the board, or, if moving diagonally, from corner to corner. Although she can move and take in the same manner as a bishop or as a rook, she must make the whole of one move in one direction, and cannot combine *in one move* the powers of these two pieces: in other words, she cannot move round a corner at one step.

The rook (sometimes called the castle) may pass along the entire length of the board at one move. It may move backwards, or forwards, or sideways—but always horizontally, never diagonally.

The bishop can move only in a diagonal direction, but can go any number of squares, from one to eight, or as far as the space be open. The bishop can never change the colour of his square. Thus, the white king's bishop being on a white square at the beginning, remains so throughout the game. This is a necessary consequence of his move being purely diagonal.

The knight has a power of moving which is quite peculiar, and rather difficult to explain. He moves two squares at once in a direction partly diagonal and partly straight. He changes the colour of his square at every move. The knight is the only piece that possesses what is styled the "vaulting motion." He is not precluded from going to a square between which and his own other pieces intervene. Thus, instead of moving your king's pawn two, as your first move, you might, if good play permitted it, move out either of your knights right over the row of pawns in front. This power is possessed by the knight alone, all the other pieces being obliged to wait until there is an opening in front of them before they can emerge.

The pawn moves in a straight line towards the adverse party. It cannot move out of its file except in capturing one of the opposing pawns or pieces, when it steps one square in a diagonal or slanting direction, and occupies the square of the captured piece. It can only be moved one square at a time, excepting in the first move, when the player has the option of advancing it two squares. The pawn is the only piece which cannot retreat, and which does not take in the direction in which it moves. For full explanations relative to "queening the pawn," and taking a pawn *en passant*, see instructions on those points.

ABBREVIATIONS.

The abbreviations which are invariably used in chess publications are the following: K. for king, Q. for queen, B. for bishop, Kt. for knight, R. for rook, P. for pawn, Sq. for square, and Ch. for check. The pieces on one side of the board are distinguished from those on the other in the following manner: Those on the same side as the king are named after him, as K.'s B. (king's bishop), K.'s Kt. (king's knight), K.'s R. (king's rook); while those on the same side as the queen are named Q.'s B. (queen's bishop), Q.'s Kt. (queen's knight), Q.'s R. (queen's rook). The pawns are distinguished in like manner. The pawn occupying the square in front of the K.'s B. is called K.'s B.'s P.; that in front of the K.'s Kt. is called K.'s Kt.'s P.; that in front of the Q.'s R. the Q.'s R.'s P., &c.

CHESS NOTATION.

It is very necessary that the beginner should thoroughly understand the system of notation which is invariably used throughout England, for without it he could never make any use of book games.

The following diagram fully explains it. It will be seen that the moves are reckoned both for black and white.

Black.

Q.R.sq.	Q.Kt.sq	Q.B.sq.	Q.sq.	K.sq.	K.B.sq.	K.Kt.sq	K.R.sq.
Q.R.8.	Q.Kt.8.	Q.B.8.	Q.8.	K.8.	K.B.8.	K.Kt.8.	K.R.8.
Q.R.2.	Q.Kt.2.	Q.B.2.	Q.2.	K.2.	K.B.2.	K.Kt.2.	K.R.2.
Q.R.7.	Q.Kt.7.	Q.B.7.	Q.7.	K.7.	K.B.7.	K.Kt.7.	K.R.7.
Q.R.3.	Q.Kt.3.	Q.B.3.	Q.3.	K.3.	K.B.3.	K.Kt.3.	K.R.3.
Q.R.6.	Q.Kt.6.	Q.B.6.	Q.6.	K.6.	K.B.6.	K.Kt.6.	K.R.6.
Q.R.4.	Q.Kt.4.	Q.B.4.	Q.4.	K.4.	K.B.4.	K.Kt.4.	K.R.4.
Q.R.5.	Q.Kt.5.	Q.B.5.	Q.5.	K.5.	K.B.5.	K.Kt.5.	K.R.5.
Q.R.5.	Q.Kt.5.	Q.B.5.	Q.5.	K.5.	K.B.5.	K.Kt.5.	K.R.5.
Q.R.4.	Q.Kt.4.	Q.B.4.	Q.4.	K.4.	K.B.4.	K.Kt.4.	K.R.4.
Q.R.6.	Q.Kt.6.	Q.B.6.	Q.6.	K.6.	K.B.6.	K.Kt.6.	K.R.6.
Q.R.3.	Q.Kt.3.	Q.B.3.	Q.3.	K.3.	K.B.3.	K.Kt.3.	K.R.3.
Q.R.7.	Q.Kt.7.	Q.B.7.	Q.7.	K.7.	K.B.7.	K.Kt.7.	K.R.7.
Q.R.2.	Q.Kt.2.	Q.B.2.	Q.2.	K.2.	K.B.2.	K.Kt.2.	K.R.2.
Q.R.8.	Q.Kt.8.	Q.B.8.	Q.8.	K.8.	K.B.8.	K.Kt.8.	K.R.8.
Q.R.sq.	Q.Kt.sq	Q.B.sq.	Q.sq.	K.sq.	K.B.sq.	K.Kt.sq	K.R.sq.

White.

CHESS NOTATION FROM EACH END OF THE BOARD.

Suppose the white queen's bishop moves one square, it is then said to stand on its second, which is the black queen's bishop's seventh. The white king's eighth is the black king's first, and *vice versâ* all through the pieces.

Technical Terms used in the Game.

The Move.—Whichever player opens the game by making the first move is said to have "the move."

Check.—When your king is attacked by any piece, he is said to be "in check," and it is your opponent's duty to give you warning of such an event by crying "Check," when he makes the move. You must then put your king out of check by moving him, by taking the checking piece, or by interposing one of your own men between the checking piece and your king, thus "covering" check, as it is termed.

Checkmate is the term used when the king is in inextricable check, *i.e.*, when none of the above means avail to place him beyond the range of the attacking pieces. When a checkmate is obtained, the game is at an end, that being the sole object.

Discovered Check is when the player moves a pawn or piece from before another piece, thereby opening or "discovering" check: *e.g.*, the black rook may be on a line with the opposing king, the only intervening piece being a black pawn. The removal of this pawn "discovers check."

Double Check is when check is discovered as above, the king being also attacked by the piece moved.

Perpetual Check is when the king of one of the players can be checked almost at every move, and when he has little else to do but move out of check. When the game has reached this stage, the weaker player may demand that checkmate shall be given in a certain number of moves, in default of which it may be declared a drawn game. (See Rule 8.)

Drawn Game.—A drawn game may arise from several causes:

1. As above.
2. Stalemate. (See "Stalemate.")
3. Equal play. "Between very good players," remarks Phillidor, "it sometimes happens that the equipoise in force and position is constantly sustained in the opening, in the intermediate stages, and in the last result; when either all the exchangeable pieces have been mutually taken, or the remaining forces are equal—as a queen against a queen, a rook against a rook, with no advantage in position, or the pawns are mutually blocked up."
4. Absence of mating power, *i.e.*, when neither player possesses the force requisite to obtain a checkmate. (See "Mating Power.")
5. Unskilful use of a sufficiently strong force. If one player is superior in force to his adversary, and possesses the requisite mating power, the game may still be drawn by the unskilful use of that superiority. If he cannot effect a checkmate in fifty moves it may be declared a drawn game.

Stalemate describes that state of the game when one of the players has nothing left but his king, which is so placed that, although not in check, he cannot move without going into check.

Castling is a double operation, accomplished by moving the king and one of the rooks at the same time. When the removal of the bishop and the knight on the one side, or of the bishop, knight, and queen on the other, has cleared the intervening squares, the king may *castle* with either of his rooks. If it should be done on the king's side of the board, the king is to be placed on the knight's square, and the rook on the bishop's; if in the queen's section, the king must be moved to the bishop's square, and the rook to the queen's. In other words, the king, in either case, must move two squares, and the rook be placed on the opposite side of him to that on which he stood before.

En Prise.—A piece is said to be *en prise* when under attack.

En Passant (*in passing*).—If your adversary has advanced one of his pawns to the fifth square, and you move one of your pawns in either of the adjoining files two squares, he is entitled to take your pawn, *en passant*, as though you had only moved it one square. This peculiar mode of capture can only be effected by pawns.

Ranks and Files.—The lines of squares running from left to right are known as *ranks*, and those perpendicular to them, running from one player to the other, are called *files.*

Passed and Isolated Pawns—A pawn is said to be "passed" when it is so far advanced that no pawn of the adversary's can oppose it. An isolated pawn is one that stands alone and unsupported.

Double Pawn.—Two pawns on the same file.

"*J'adoube*" (signifying *I adjust* or *I arrange*) is the expression generally used when a player touches a piece to arrange it without the intention of making a move. Perhaps it is not absolutely necessary that he should say "*J'adoube*," but he must at any rate use an equivalent expression.

To Interpose.—This term explains itself. If your king or one of your pieces is attacked, and you move another of your pieces between the attacking piece and the piece attacked, either for the purpose of covering check, or as a means of protection, or with any other object, you are said to "interpose."

Winning the Exchange.—You are said to "win the exchange" when you gain a rook for a bishop, a bishop for a knight, or, in short, whenever you gain a superior piece by giving an inferior.

Queening a Pawn.—You are said to "queen a pawn" when you advance it to the eighth square on the file. You may then claim a queen or any other piece in exchange for it. Formerly the rule was, that you might substitute for it any piece you had previously lost, but according to the modern game three or more rooks, or bishops, or knights may be obtained in this way.

Gambit.—This term, which is derived from the Italian, describes an opening in which a pawn is purposely sacrificed at an early stage of the game, in order subsequently to gain an advantage. Several gambits are distinguished by the names of their inventors, such as the Cochrane gambit, the Muzio gambit, the Salvio gambit, &c.; there are also the bishop's gambit, the queen's gambit, &c., &c.

Mating Power.—The force requisite to bring about a checkmate: a king and queen against king and two bishops, king and two knights, king and bishop and knight, or against king and rook, can effect checkmate. King and two bishops can mate against king and bishop, or king and knight. King with two bishops and knight can mate against king and rook. King with rook and bishop can mate against rook and king. King can always draw against king and bishop, or king and knight. King and rook against either a king and bishop, or king and knight, makes a drawn game, &c.

Laws of the Game.

The following laws are in force in all the principal clubs in this country:

1. If a player touch one of his men, unless for the purpose of adjusting it,

when he must say "*J'adoube*" (see Law 4), or it being his turn to move, he must move the piece he has so touched.

[Walker gives the following remark on this law: "When you touch a piece with the *bonâ fide* intention of playing it, the saying *J'adoube* will not exonerate you from completing the move. A chess-player's meaning cannot be misunderstood on the point; and were it otherwise, you might hold a man in your hand for five minutes, and then saying '*J'adoube,*' replace it, and move elsewhere."]

2. If the men are not placed properly at the beginning of the game, and this is discovered before four moves have been made on each side, the game must be recommenced. If the mistake should not be found out till after four moves have been made, the game must be proceeded with.
3. Where the players are even, they must draw lots for the first move, after which they take the first move alternately. When a player gives odds, he has the option of making the first move, and the choice of men in every game.

[In giving odds, should it be agreed upon to give a pawn, it is customary to take the K. B. P. If a piece is to be given, it may be taken from either the king's or queen's side.]

4. If a player should accidentally or otherwise move or touch one of his men without saying "*J'adoube,*" his adversary may compel him to move either the man he has touched or his king, provided the latter is not in check.
5. When a player gives check, and fails to give notice by crying "Check," his adversary need not, unless he think proper, place his king out of check, nor cover.

[If it is discovered that the king is in check, and has been so for several moves past, the players must move the men back to the point at which they stood when check was given. If they cannot agree as to when check was first given, the player who is in check must retract his last move, and defend his king.]

6. The player who effects checkmate wins the game.
7. Stalemate constitutes a drawn game.
8. So long as you retain your hold of a piece you may move it where you will.
9. Should you move one of your adversary's men instead of your own, he may compel you to take the piece you have touched, should it be *en prise*, or to replace it and move your king; provided, of course, that you can do so without placing him in check.
10. Should you capture a man with one that cannot legally take it, your adversary may compel you either to take such piece (should it be *en prise*) with one that *can* legally take it, or to move the piece touched; provided that by so doing you do not discover check, in which case you may be directed to move your king.
11. Should you move out of your turn, your adversary may compel you either to retract the move, or leave the piece where you placed it, as he may think most advantageous.
12. If you touch the king and rook, intending to castle, and have quitted hold of the one piece, you must complete the act of castling. If you retain your hold of both, your adversary may compel you to move either of them.

13. The game must be declared to be drawn should you fail to give checkmate in fifty moves, when you have

King and queen against king.	King and pawn against king.
King and rook ,,	King and two pawns ,,
King and two bishops ,,	King and minor piece ,,
King, bishop, and kt. ,,	

14. Drawn games of every description count for nothing.
15. Neither player may leave a game unfinished, nor leave the room without the permission of his adversary.
16. Lookers-on are not permitted to speak, nor in any way express their approbation or disapprobation while a game is pending.
17. In case a dispute should arise on any point not provided for by the laws, a third party must be appealed to, and his decision shall be final.

Hints for Commencing the Game.

To open the game well, some of the pawns should be played out first. The royal pawns, particularly, should be advanced to their fourth square: it is not often safe to advance them farther. The bishop's pawns should also be played out early in the game; but it is not always well to advance the rook's and knight's pawns too hastily, as these afford an excellent protection to your king in case you should castle. Phillidor describes pawn-playing as "the soul of chess." When they are not too far advanced, and are so placed as to be mutually supporting, they present a strong barrier to the advance of your adversary, and prevent him from taking up a commanding position. If you play your pieces out too early, and advance them too far, your adversary may oblige you to bring them back again by advancing his pawns upon them, and you thus lose time.

Do not commence your attack until you are well prepared. A weak attack often results in disaster. If your attack is likely to prove successful, do not be diverted from it by any bait which your adversary may purposely put in your way. Pause, lest you fall into a snare.

Beware of giving check uselessly—*i.e.*, unless you have in view the obtaining of some advantage. A useless check is a move lost, which may, particularly between good players, decide the game.

It is generally injudicious to make an exchange when your position is good, or when, by so doing, you bring one of your adversary's pieces into good play. Never make an exchange without considering the consequences. When your game is crowded and ill arranged and your position inferior, it is advantageous to exchange. Sometimes also, when you are much superior in force, it is worth your while to make an equal exchange.

The operation of castling often relieves a crowded game. A lost opportunity of castling, or castling at the wrong time, is a disadvantage which may be turned to account by your adversary.

Never put your queen before your king in such a way that your adversary may bring forward a bishop or rook and attack her, and the king through her. In such a case, unless you can interpose another piece, you will inevitably lose your queen.

It is good play to "double" your rooks—*i.e.*, to make them mutually supporting. Don't bring your rooks into active play too soon. They can generally operate most effectively at a distance, and they are therefore of most value towards the end of a game, when the board is comparatively clear.

From time to time take a review of the game. Although an incurably tedious p ayer is a general nuisance, it is mere folly to play without "knowing the reason why." To take an occasional review of the game gets you into a systematic habit. When near the close, take notice of the position of your adversary's pawns, and if you find that you can queen before him, make all haste to do so; if not, attack his pawns so as to prevent him from queening. If your adversary possesses a decided advantage, look out for a means of drawing the game.

Do not stick to one opening, but learn as many as you can.

Always be willing to accept odds of a better player, so that the game may be interesting to him. If you should lose, it is natural that you should feel inwardly chagrined, but do not let your disappointment be perceived. "Keep your temper" is a golden rule. Do not throw up the game before you are quite sure it is lost. On the other hand, you should not too hastily jump to the conclusion that you have won it.

It is necessary that you should occasionally study some of the best book games, but without actual practice proficiency can seldom be attained.

Endeavour to understand the reasons which lead to your adversary's moves, and take measures accordingly.

"OPENINGS" OF GAMES.—The principal openings are the king's gambit, the queen's gambit, the king's knight's opening, the king's bishop's opening, &c. From these spring the various gambits, known as the Evans, the Muzio, the Cunningham, the Allgaier, the Cochrane, the Giuoco piano, &c., most of them deriving their names from the inventors. All these gambits have a variety of subdivisions, and openings not founded on any of them are termed irregular openings. We shall, after defining each of the most celebrated of these openings, give illustrations of them.

The King's Gambit.—In this gambit, the first player advances his K. B. P two squares at his second move.

The Queen's Gambit is when the first player, at his second move, advances his Q. B. P. two squares.

King's Bishop's Gambit is so styled because the first player brings out the K. B. at his second move.

King's Knight's Gambit.—In this much-used opening the first player brings out his K. Kt. at his second move.

The Evans Gambit, so styled from its inventor, Captain W. D. Evans, R.N., is when the player advances Q. Kt. P. two at his fourth move, and sacrifices it, with the object of recovering at least its equivalent, at the same time obtaining a decided lead.

Besides the above, there are the queen's pawn-two-opening, the queen's bishop's pawn's opening, the Lopez gambit, the kings's pawn-one-opening, the queen's counter-gambit, the king's rook's pawn's gambit, the Allgaier gambit, the Muzio gambit, the Cochrane gambit, the Cunningham gambit, the bishop's gambit, the Damian's gambit, the Greco counter-gambit, &c., &c.

In an article of such limited scope as the present, it would be impossible to treat at any length upon every one of these openings. We shall therefore content ourselves with making a selection which will be at once interesting and suitable for beginners. In every case we have preferred to give those variations which are considered the *best* and *most legitimate*, believing that the study and practice of such positions will be more advantageous to the learner than giving, as some writers do, inferior play and positions, and then afterwards giving the correct ones.

The King's Gambit.—

White.	Black.
1. K. P. 2.	1. K. P. 2.
2. K. B. P. 2.	2. P. takes P.
3. K. Kt. to B. 3.	3. K. Kt. P. 2.
4. K. B. to Q. B. 4.	

There has been much difference of opinion as to the move which black should now make. Some writers prefer advancing K. Kt. P., whilst Walker and a whole host of authorities think it better to place the K. B. at Kt. second; "Although," says Walker, "playing the pawn is productive of more brilliant situations." He advises both moves for practice.

King's Bishop's Opening.—This opening is considered by the great chess master, Phillidor, as the very finest opening for the first player, as it brings out the bishop at the second move, and immediately attacks black's K. B. P., his weakest point. From this opening spring some of the finest and most difficult combinations known. It commences thus:

White.	Black.
1. K. P. to K. 4.	1. P. to K. 4.
2. K. B. to Q. B. 4.	2. K. B. to Q. B. 4 (best)
3. P. to Q. B. 3.	3. Q. to K. 2 (good).
4. K. Kt. to B. 3.	

Some prefer to play the Kt. to K. 2, but in our opinion this is not so good as to B. 3, because in the former case black could take K. B. P. with his bishop (check); and if white K. takes bishop, black queen gives check at her B. 4, and white loses bishop.

White.	Black.
	4. K. Kt. to B. 3.
5. Q. to K. 2.	5. P. to Q. 3.
6. P. to Q. 3.	6. P. to Q. B. 3.

If black plays his Q. B., pinning Kt., white will advance R. P., which will cause black either to retire bishop (which will be losing time) or force an exchange, which will open the game to white's queen. Therefore it will be better for black to play P. to Q. B. 3, as we have given it, which will leave the game pretty equal up to this point. If black, at his third move, replies as follows—which is an inferior move—then the game proceeds thus:

White.	Black.
	3. K. Kt. to B. 3.
4. P. to Q. 4.	4. P. takes P.
5. P. to K. 5.	5. Kt. to K. 5.
6. Q. to K. 2.	6. Kt. to Kt. 4.
7. P. to K. B. 4.	7. Kt. to K. 3.
8. P. to K. B. 5.	
If black now play	8. Kt. to K. B.,

white has the best of the game, and ought to win; but if black play Kt. to Kt. 4, white will play Q. to K. R. 5, and then P. to K. R. 4. If white at his third move should play Q. to K. 2, attacking K. B. P. and threatening ch. with Q. and capture of bishop, and if black advance Q. P. one, it may then become the Ruy Lopez gambit by white playing as his fourth move P. to K. B. 4. If the gambit referred to be not properly met, it leads to strong positions of attack. It is better for the second player to refuse the pawn offered.

King's Knight's Opening.—This is a sound opening, and has been largely treated upon by many writers. Some fine situations spring from it. At the second move, white directly attacks K. P. with K. Kt. We will give the opening, and a few brief remarks thereon, together with a game arising from it:

White.	Black.
1. P. to K. 4.	1. P. to K. 4.
2. K. Kt. to B. 3.	

For black, in reply to this, to move P. to K. B. 3, would only show weak play, and would enable white to win in a few moves, or at any rate to obtain a rook and a pawn in exchange for a knight. Black's best answer is the following:

	2. Q. Kt. to B. 3.

Black thus defends his pawn, and has the advantage of a counter-attack.

King's Knight's Gambit.—This is a variation of the king's gambit, brought about by white at his fourth move advancing the K. R. P. before bringing out his K. B. This variation brings out some fine play, but is not so strong for the first player as the king's gambit proper. The Allgaier gambit springs from this opening.

White.	Black.
1. P. to K. 4.	1. P. to K. 4.
2. P. to K. B. 4.	2. P. takes P.
3. K. Kt. to B. 3.	3. P. to K. Kt. 4.
4. P. to K. R. 4.	4. P to K. Kt. 5 (best).
5. K. Kt. to K. 5.	

By white's last move the game merges into the Allgaier. Black's best move now is

	5. P. to K. R. 4.
6. K. B. to Q. B. 4.	6. R. to K. 2.

This move of black's is considered better than K. Kt. to R. 3.

7. P. to Q. 4.	7. P to Q. 3.
8. Kt. to Q. 3.	8. K. B. P. advances.

If white now plays K. Kt. P., black has the best of the game by keeping the gambit pawn. If white attacks queen with bishop, black will give check with pawn, and have the stronger game. Most authorities consider this opening weak for the first player.

The Allgaier Gambit.—This opening, the invention of a noted German from whom it takes its name, arises out of the king's knight's gambit, as detailed in the preceding paragraph. It is not a safe opening, although, if successful, it will prove a strong one. When properly met, the siege is soon raised, and the second player will stand in the better position. It is, however, a fine opening, and requires cautious play on both sides. It is as follows:

White.	Black.
1. P. to K. 4.	1. P. to K. 4.
2. P. to K. B. 4.	2. P. takes P.
3. K. Kt. to B. 3.	3. P. to K. Kt. 4.
4. P. to K. R. 4.	4. P. to K. Kt. 5.
5. K. Kt. to Kt. 5.	

White's fifth move constitutes the Allgaier gambit, white intending to sacrifice the knight if attacked by the pawns. Black may reply in several ways, but in our opinion his best move is the following:

	5. P. to K. R. 3.

Black by this move wins the knight.

6. Kt. takes K. B. P.	6. K. takes Kt.
7. Q. takes P.	7. K. Kt. to B. 3.
8. Q. takes B. P.	

The last move is much better than giving check with the bishop, which would only have the effect of involving white's game. Walker says, "No better move can be played at this crisis." It will be good practice for the student to continue the above opening, and exercise his ingenuity by finishing the game.

The Muzio Gambit.—This is another variation of the king's gambit, and is produced by white offering to sacrifice knight in order to gain a strong attacking position. It is the invention of Signor Muzio, an Italian player of some eminence. Walker says this may be classed as the most brilliant and critical opening known, and recommends the student to play it at every opportunity; he also throws out the warning that an incorrect move may irrecoverably lose the game. The defence is most difficult to discover in actual play.

White.	Black.
1. P. to K. 4.	1. P. to K. 4.
2. P. to K. B. 4.	2. P. takes P.
3. K. Kt. to B. 3.	3. P. to K. Kt. 4.
4. K. B. to Q. B. 4.	4. K. Kt. P. advances.
5. Castles.	

This move constitutes the gambit; for, instead of white withdrawing his Kt., or moving it to Q. 4, he allows it to remain and be taken. It now rests with black whether he will accept the gambit. Walker says he cannot do better.

	5. P. takes Kt.
6. Q. takes P.	6. Q. to K. B. 3 (best).

This last move is Sarratt's defence, which is clearly shown to be the best.

7. K. P. advances.	7. Q. takes K. P.

This is black's best move, for if he did not take P., white at once obtains the advantage by playing P. to Q. 2, defending K. P. If black play Q. to Kt. 3 (ch.), white moves K. to R. sq., and ought to win.

The Scotch Gambit, or *Queen's Pawn Two Opening.*—This gambit has a fine, dashing attack, and one of its advantages is, that in case it should miscarry, the disaster is comparatively slight. "It is," as Walker says, "one of the most attacking yet safe methods of commencing the game which can possibly be adopted." Again, "It is alike fertile in resource and safe in results."

White.	Black.
1. P. to K. 4.	1. P. to K. 4.
2. K. Kt. to B. 3.	2. Q. Kt. to B. 3.
3. P. to Q. 4.	

The third move of white gives it the name of the Queen's Pawn Two Opening. White plays the pawn for the purpose of opening the game, especially for his bishops. Black may now take the pawn either with his P. or Kt. We will suppose him to do the former, which we consider best:

3. P. takes P.

4. K. B. to Q. B. 4.

Some players now give black's fourth move as B to Q. Kt. 5 (ch.); but this is a decidedly bad move, and with an indifferent player would lose the game. Black's best move is that introduced by Macdonnell, and described by Walker as a sound defence. We give it below:

4. Q. to K. B. 3.

White may now castle, or play P. to Q. B. 3; either of which is better than Kt. or B. to K. Kt. 5.

How to Finish the Game.

Having now considered the "Hints for Commencing the Game," and studied most of the principal openings, we must say a few words with regard to finishing the game. It is often very difficult to checkmate when you have a king, bishop, and knight against a king. Although possessing the requisite mating power, good players have often failed to accomplish the mate within the stipulated fifty moves. The only way in which it can be done is by driving the adverse king to a corner commanded by your bishop. The better to convey our meaning, we give an illustration. Suppose the men to be placed thus:

White K. at K. B. 6.
" K. B. at K. B. 5.
" Kt. at K. Kt. 5.
Black K. at K. R. sq.

Then, in eighteen moves, white may effect checkmate:

White.	Black.
1. Kt. to K. B. 7 (ch.).	1. K. to Kt. sq.
2. B. to K. 4.	2. K. to K. B. sq.
3. B. to K. R. 7.	3. K. to K. sq.
4. Kt. to K. 5.	4. K. to K. B. sq.
5. Kt. to Q. 2.	5. K. to K. sq.
6. K. to K. sq.	6. K. to Q. sq.
7. K. to Q. 6.	7. K. to K. sq.
8. B. to K. Kt. 6 (ch.).	8. K. to Q. sq.
9. Kt. to Q. B. 5.	9. K. to Q. B. sq.
10. B. to B. 7.	10. K. to Q. sq.
11. Kt. to Q. Kt. 7 (ch.).	11. K. to Q. B. sq.
12. K. to Q. B. 6.	12. K. to Q. Kt. sq.
13. K. to Q. Kt. 6.	13. K. to Q. B. sq.
14. B. to K. 6 (ch.).	14. K. to Q. Kt. sq.
15. Kt. to Q. B. 5.	15. K. to Q. R. sq.
16. B. to Q. 7.	16. K. to Q. Kt. sq.
17. Kt. to Q. R. 6 (ch.).	17. K. to Q. R. sq.
18. B. to Q. B. 6, checkm.	

As will be observed from the above example, one of the important objects is never to let the king escape into the middle of the board.

In our chapter on checkmate we should not omit to give the "Fool's Mate" and the "Scholar's Mate."

The former shows that it is possible to effect mate in as few as two moves. It is easy to understand why it should be named the "fool's mate;" but why a checkmate which may be effected in four moves should be termed "scholar's mate" is probably less capable of explanation.

Fool's Mate.—

White.	Black.
1. K. Kt. P. 2 sq.	1. K. P. 2.
2. K. B. P. 1 sq.	2. Queen mates

Scholar's Mate.—

White.	Black.
1. K. P. 2.	1. K. P. 2.
2. K. B. to Q. B. 4.	2. K. B. to Q. B. 4.
3. Q. to K. R. 5.	3. Q. P. 1.
4. Q. takes K. B. P., giving "scholar's mate."	

King and Queen against King.—Several examples of this checkmate might be given, but the one below will probably be sufficient. The principal point upon which the learner need be warned is against allowing his adversary to effect stalemate. Suppose the pieces to be placed thus:

White king at K. sq.
" queen at Q. B. sq.
Black king at Q. 3.

The game may then proceed as follows:

White.	Black.
1. Q. to K. Kt. 5.	1. K. to K. 4.
2. K. to K. 2.	2. K. to Q. 3.
3. K. to K. 3.	3. K. to K. 3.
4. K. to K. 4.	4. K. to Q. 3.
5. Q. to K. Kt. 6.	5.
6. K. advances.	6.
7. Q. mates.	

King and Queen against King and Rook.—Suppose the men to be placed thus:

White king at K. B. 3.
" queen at K. sq.
Black king at K. R. 7.
" rook, at K. Kt. 7,

supposing white to have the first move, the game may be completed in three moves:

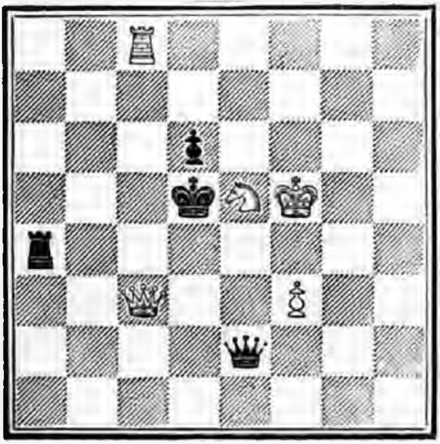
White.	Black.
1. Q. to K. 5 (ch.).	1. K. to R. 8
2. Q. to Q. R. (ch.).	2. K. moves.
3. Q. to K. sq., and wins.	

Problems.

The following problems are selected from various sources, and are given because they are just sufficiently difficult to exercise the ingenuity of the learner. At the same time, we would caution him against too close a study of problems until he is well up in the game, for, if followed up, it will only tend to weary and tire him, and the result may be that he will throw up the game with dislike.

PROBLEM No. 1.

Black.

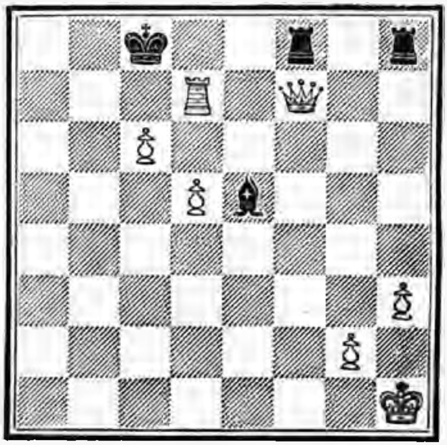


White.

White to move, and mate in two moves.

PROBLEM No. 2.

Black.

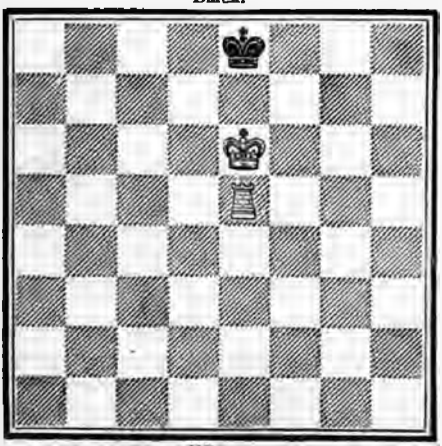


White.

White to move, and mate in two moves.

PROBLEM No. 3.

Black.

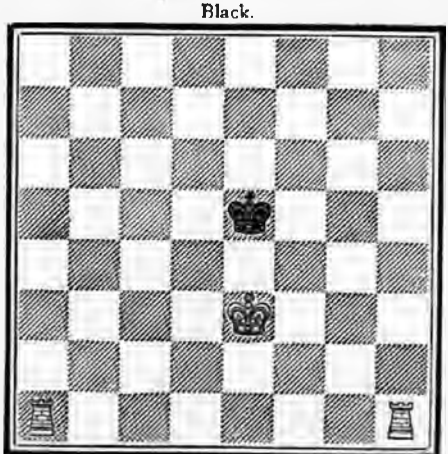


White.

White to move, and mate in three moves.

PROBLEM No. 4.

Black.

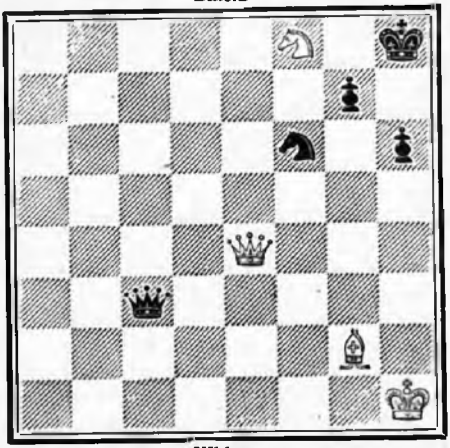


White.

White to move, and mate in three moves.

PROBLEM No. 5.

Black.

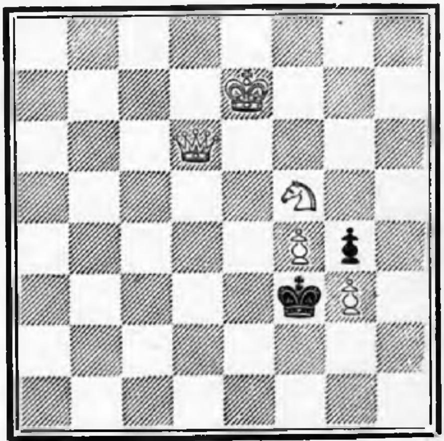


White.

White to move, and mate in three moves.

PROBLEM No. 6.

Black.

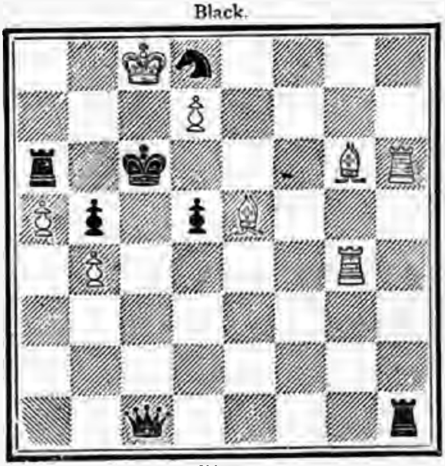


White.

White to move, and mate in three moves.

PROBLEM No. 7.

Black.

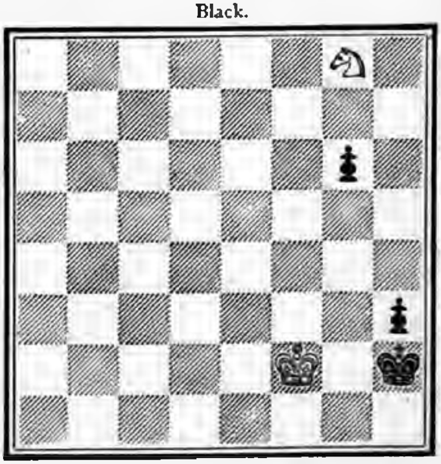


White.

White to move, and mate in three moves.

PROBLEM No. 8.

Black.

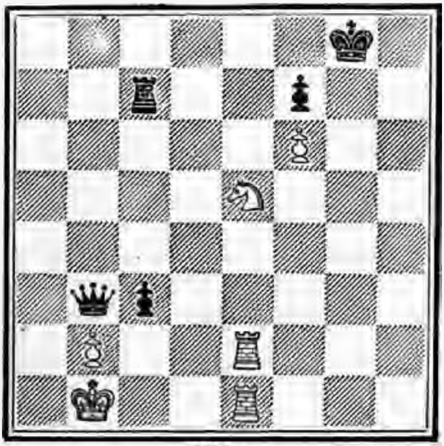


White.

White to move, and mate in four moves.

PROBLEM No. 9.

Black.

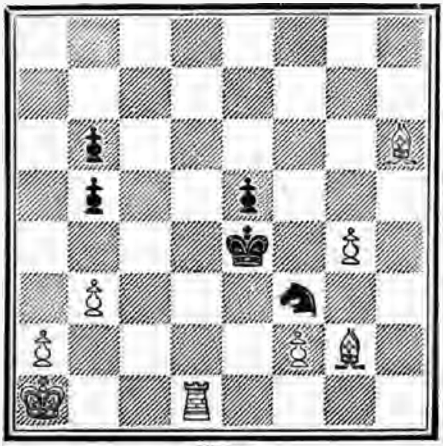


White.

White to move, and mate in four moves.

PROBLEM No. 10.
(The Indian Problem.)

Black.



White.

White to move, and mate in four moves.

Solutions of the Problems.

Problem 1.

White.	Black.
1. Q. to B. 4 (ch.).	1. P. takes Q.
2. R. to Q. 8, mate.	

Problem 3.

White.	Black.
1. R. to K. sq.	1. K. to B. sq.
2. R. to K. Kt. sq.	2. K. to K. sq.
3. R. to Kt. 8, mate.	

Problem 5.

White.	Black.
1. Q. to K. R. 7.	1. Q. Kt. takes Q.
2. Kt. to Kt. 6 (ch.).	2. K. to Kt. sq.
3. B. to Q. 5, mate.	

Problem 7.

White.	Black.
1. B. to Q. B. 2 (dis. ch.).	1. R. takes R.
2. R. to Q. B. 4 (ch.).	2. P. takes R.
3. B. mates.	

Problem 9.

White.	Black.
1. R. to K. Kt. 2 (ch.).	1. K. to B. sq.
2. Kt. to Q. 7 (ch.).	2. R. takes Kt.
3. R. to K. 8 (ch.).	3. K. takes R.
4. R. to Kt. 8, mate.	

Problem 2.

White.	Black.
1. R. to Q. 8 (ch.).	1. K. takes R.
2 Q. to Q. 7, mate.	

Problem 4.

White.	Black.
1. K. R. to R. 6.	1. K. to K. B. 4.
2. Q. R. to K. Kt. sq.	2. K. to K. 4.
3. R. to Kt. 5, mate.	

There are two other solutions to this problem.

Problem 6.

White.	Black.
1. Q. to Q. 2.	1. K. moves.
2. Q. to Q. sq.	2. K. takes Kt.
3. Q. mates.	

Problem 8.

White.	Black.
1. Kt. to K. B. 6.	1. P. advances.
2. Kt. to K. 4 (ch.).	2. K. to R. 8.
3. K. to B. sq.	3. R. P. 1.
4. Kt. to B. 2, mate.	

Problem 10.
(The Indian Problem.)

White.	Black.
1. B. to Q. B. sq.	1. P. moves.
2. R. to Q. 2.	2. P. moves.
3. K. moves.	3. K. moves.
4. R. to Q. 4 (dis. checkm.)	

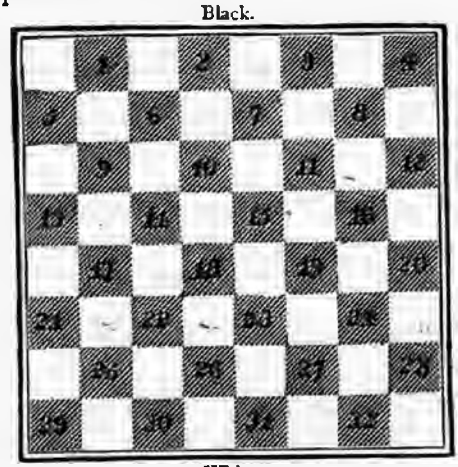
THE GAME OF DRAUGHTS.

Draughts is a game that is very often underrated, because it is supposed that there is little or no play in it, and thus when a person is asked if he play draughts, his reply is not unusually, "No, it is such a stupid game; there's no play in it."

Whenever this remark is made to us, we challenge the person to a series of games, when, having beaten him some half-dozen in succession, we prove that there must be some play in the game, or such a result would be improbable.

When playing chess, there are so many pieces, each having a different moving power and a relative value, that one oversight, caused probably by a momentary relaxation of memory, loses a game, whereas in draughts such a result is less probable, and the attention can be more completely devoted to some plot, through which the opponent does not see. As a rule, a good draught-player is a more acute person on every-day subjects than is a good chess-player, and thus we strongly recommend draughts as a game likely to call into action very useful qualities.

Black.



White.

Draughts is played on the same board as is chess, the men, however, being placed entirely on squares of one colour.

There are twelve men on each side, arranged on the squares from 1 to 12 and from 21 and 32.

The two squares marked 1 and 5, and 32 and 28, are called the *double corners*, and these must always be on the right hand of the player, whilst the left-hand lowest square, 4 and 29, must always be on the left-hand side.

Having arranged the men, the first move is arranged between the players by lot.

The men move one square at a time; thus, the man on 22 can move either to 18 or 17; the man on 23 can move either to 19 or 18. The men can only move forwards, not backwards, until they have succeeded in reaching the bottom row of the adversary's squares, when they are *crowned* by having a second man placed above them. They are then termed *kings*, and can move either forwards or backwards as desirable.

A man may *take* an opponent's man by leaping over him and taking up the vacant square beyond him, the piece taken being removed from the board.

A man may take two or three men at one move, provided he can leap over each in succession. To understand this, place a white man at 18, 11, and 25, and a black man at 29, all other pieces being removed from the board. The black man can move and take the three white men, as he can leap to 22, 15, and 8, thus taking the men on squares 18, 11, and 25. A king can take both backwards and forwards any number of men, as long as a square is open. Thus, place a white man on 25, 26, 27, 19, 10, 9, and 17. A black king at 29 could take all these men at once, for he could leap from 29 to 22, taking 25 man; to 31, taking 26; to 24, taking 27; to 15, taking 19; to 6, taking 10; to 13, taking 9; and to 22, taking 17, and taking all these in one move.

If a man take other men, and in the taking reach the bottom row, he cannot go on taking, as a king, until the adversary has moved.

Example.—Place a white man at 24, 7, 16, and 8, a black man at 28. The black man takes 24 by leaping to 19, takes 16 by leaping to 12, takes 8 by leaping to 3, and is there crowned; but cannot leap to 10, thus taking the man at 7, until the adversary has moved.

The game is won when all the adversary's men are either taken or blockaded so that they cannot move, and it is drawn when two kings or less remain able to move, in spite of the adversary.

LAWS.—The following are the established laws of the game, which should be learnt by every person who is desirous of becoming a draught-player.

RULES OF THE GAME OF DRAUGHTS.

The chief laws for regulating the game of draughts are as follows:

1. Each player takes the first move alternately, whether the last game be won or drawn.
2. Any action which prevents the adversary from having a full view of the men is not allowed.
3. The player who touches a man must play him.
4. In case of standing the huff, which means omitting to take a man when an opportunity for so doing occurred, the other party may either take the man, or insist upon his man, which has been so omitted by his adversary, being taken.
5. If either party, when it is his turn to move, hesitate above three minutes, the other may call upon him to play; and if, after that, he delay above five minutes longer, then he loses the game.
6. In the losing game, the player can insist upon his adversary taking all the men in case opportunities should present themselves for their being so taken.
7. To prevent unnecessary delay, if one colour have no pieces but two kings on the board, and the other no piece but one king, the latter can call upon the former to win the game in twenty moves; if he does not finish it within that number of moves, the game to be relinquished as drawn.

8. If there are three kings to two on the board, the subsequent moves are not to exceed forty.

ADVICE.—The men should be kept as much as possible in a wedge form towards the centre of the board. Avoid moving a man on the side square, for when there he is deprived of half his power, being able to take in one direction only.

Consider well *before* you touch a man, for a man once touched must be moved.

Avoid the cowardly practice of moving a man, and then, when you discover by your adversary's move that you have committed an error, taking your move back. Stand the consequences though the game be lost, and next time you will be more careful. A game, even if won after replacing a man, is unsatisfactory, and not to be counted a victory, and often leads to disputes. The rules are made to avoid *all* argument and dispute, and the more closely, therefore, you obey these, the more harmonious will be your games.

Do not talk during a game, or whistle, or fidget by drumming with the fingers, or in any way act so as to annoy or worry an adversary. A game of draughts, though only a game, may be made a training process for much more important matters. A careless, thoughtless, or worrying draught-player will, undoubtedly, be the same character in worldly matters.

Never allow the loss of a game to cause you to lose your temper, for such a proceeding shows you to be more self-sufficient than intellectual. If beaten, it proves your adversary to be more experienced or quicker sighted than yourself, and you should, therefore, use all your faculties to discover how he beats you.

As a rule, seek to play with a better player than yourself rather than with a worse, which is merely saying, "endeavour to improve your own game rather than to instruct a worse player."

When you lose a game, avoid all disparaging remarks, such as, "Oh, I should have won that if so-and-so had not occurred," &c. Your adversary who defeats you will think more highly of you if you say nothing, or merely acknowledge his greater skill.

If you find a person who defeats you easily, remember how much thought and time he must have devoted to the subject in order to obtain this advantage, and bear in mind that it is only by a similar process that you can gain like results.

GAMES.

Draughts is a game in which one is particularly called upon to estimate the skill and style of play of one's adversary. One person may very easily be drawn into a trap, where another more cautious could not be thus defeated. Again, a too cautious player may be defeated by a dashing move, whereas another opponent would win the game in consequence. We will now give one or two examples of games, calling attention to the points in each. The men are supposed to be arranged as before mentioned—white's men from 21 to 32, black's from 1 to 12; black moves first.

Black.	White.
11 to 15.	22 to 18.
15 to 22 (takes).	25 to 18 (takes).
8 to 11.	29 to 25.

Now, at this point of the game, if white were a very young or incautious player, he might be easily tempted into a false move by black moving 11 to 16, for white, seeing a supposed advantage in position, might move 24 to 20. Let us suppose these moves to have been made, and black wins at once, for, moving 3 to 8, he compels white to take 20 to 11, and then with the man at 8 takes 11, 18, and 25, and procures a king at 29, thus gaining a majority of two men, an advantage equivalent to the game, for by exchanging man for man on every occasion, he would soon reduce the odds to 4 to 2, or 2 to 0.

If however, black play a more cautious game, he should move 4 to 8.

White again might lose the game if he moved either 24 or 23 to 19, for black would respond by 10 to 15, when white must move from 19 to 10, black from 6 to 29, taking these men as before.

Black's best move is, perhaps, 25 to 22.

At this period of the game exchanges of men usually take place, the object being an advantage of position, as follows:

Black.	White.
9 to 14.	18 to 9.
5 to 14.	24 to 20.
6 to 9.	22 to 18.
1 to 5.	28 to 24.

Up to the present time no great advantage is gained on either side, the game being, perhaps, slightly in favour of black, who may cause a separation in white's men by the following:

	Black.	White.
	9 to 13.	18 to 9.
	5 to 14.	
White may reply by—		23 to 18;
Then,	14 to 23.	27 to 18.

Now, unless black moves 2 to 6, or 10 to 15, white could procure a king as follows: Suppose black had moved 12 to 16, then white 18 to 14,

Black.	White.
10 to 17,	21 to 14,

and whatever black now does, white must procure a king. It is under such conditions as this that the acute player often wins a game; for we shall find that the eagerness for gaining this king may cause white to be in a difficult position. Carrying on the game under this supposition, we have

Black.	White.
16 to 19.	24 to 15.
11 to 18.	13 to 9.
8 to 11.	9 to 5.
18 to 22.	26 to 17.
13 to 22.	5 to 1 (king).
2 to 6.	1 to 10.
7 to 14.	32 to 28.
14 to 17.	28 to 24.
3 to 8.*	31 to 27.
8 to 12.	27 to 23.

* This move of black's will very likely lose him a man, or at least allow his adversary to make a king rapidly.

Black must now lose a man, and therefore the game, as follows:

Black.	White.
22 to 26, or 17 to 21.	23 to 18.
26 to 31, or 22 to 25.	19 to 15, and white wins.

The Double Corners.—When there is one king against two, the rule is that the game is drawn unless it be won in at least twenty moves. If the player does not know how to block up in the double corners, this may easily be a drawn game. We will now show the moves for blocking in the double corners, giving the case that will require the greatest number of moves.

Black's kings at 1 and 5; white's at 10.

Black.	White.
5 to 9.	10 to 15.
9 to 14.	15 to 19.
14 to 18.	19 to 24.
18 to 23.	24 to 28 (reaches double
1 to 6.	28 to 32. corner).
6 to 10.	32 to 28.
10 to 15.	28 to 32.
15 to 19.	32 to 28.
23 to 27.	28 to 32.
19 to 23.	32 to 28.
27 to 32.	28 to 24.
23 to 18.	24 to 19.
32 to 28.	19 to 16.
18 to 15.	16 to 20.
15 to 11, and wins in fifteen moves.	

Had black moved from 15 to 19 at last, white could have gone to 24, and the game would have been prolonged. There is no position on the board where two kings cannot defeat one in fifteen moves.

It is usual with two experienced players to pronounce the game drawn when there are two kings only on each side, one of which is enabled to reach the double corners. There are, however, two or three chances of catching an incautious player.

The following example will serve to illustrate cases. White's positions are king at 28 and at 30; black at 24 and 19. Black moves.

Black.	White.
24 to 27.	28 to 32.
19 to 23.	30 to 26.
23 to 30.	32 to 23.
30 to 25.	23 to 26.
25 to 30.	26 to 22, and wins.

Another case may be tried with caution, and which is as follows, two kings each: black at 15 and 23; white at 16 and 25. White moves.

White.	Black.
25 to 22.	23 to 18.
16 to 11.	18 to 25.
11 to 18, and wins next move by blocking.	

These are not positions likely to entrap very good players, but succeed very often with average hands.

The game in these instances resulted in the winner having what is called "the move." To ascertain whether you have the move of any one of your adversary's men, examine the situation of each. If your opponent has a black square at a right angle under his man, you have the move, and *vice versâ.*

Draughts is in reality a deeply interesting game, and one that is very rarely appreciated.

The Losing Game of Draughts.

The losing game of draughts is rarely understood, and therefore rarely appreciated. We believe that there is even more foresight required in the losing than in the winning game of draughts, for it is equally as necessary to see several moves on ahead, and the game may be almost instantly lost by a thoughtless move.

To win at the losing game we must compel our adversary to take all our men, and the novice usually commences by losing as many men as possible. This proceeding is an error: the player has the advantage who has the most men on the table, as will be instanced by one or two examples.

Suppose white to have a king on each of the four squares, 1, 2, 3, 4; black, one on 31. First, we will suppose that white commences thus:

White.	Black.
4 to 8.	31 to 27.
3 to 7.	27 to 23.
2 to 6.	23 to 18.
1 to 5.	

Black must now retreat, for if he moves to 14 or 15 the game is lost, as he may be compelled to take each of his opponent's men in succession. Thus, suppose he move to 14:

White.	Black.
5 to 9.	14 to 5.
6 to 9.	5 to 14.
7 to 10.	14 to 7.
8 to 11, and wins.	

Thus black's move must be a retreat in answer to white's 1 to 5. Then

Black.	White.
18 to 22.	5 to 9.
22 to 26.	9 to 14.
26 to 31.	14 to 18.
31 to 27.	

At this point, if white advanced from 18 to 23 to be taken, he would lose the game unless very careful, as the lost man would have the move against him. His best move, therefore, would be 18 to 15. If black move to 24, he loses. Black had better move to 32, and white 6 to 10.

Black.	White.
32 to 28.	8 to 11.
28 to 32.	15 to 19.
32 to 28.	19 to 24.
28 to 19.	10 to 15.
19 to 3.	11 to 7, and wins.

We will now point out the best "traps" for the losing game.

Suppose white's men to be placed from 21 to 32. If then we can secure one of the adversary's men at 21, we are almost certain to lose all our men first, and thus to win the game, for by keeping this man blocked until required, he can be made use of at the right time. Let us take an example, white moving first.

White.		Black.	
22 to 18.		9 to 14.	
18 to 9.		5 to 14	(very bad play
21 to 17.		14 to 21.	this: ought to
24 to 20.		11 to 16.	have been 6 to
20 to 11.		7 to 16.	13).
23 to 18	(not a good move, but will	10 to 15.	
18 to 11.	serve to illustrate the	8 to 15.	
28 to 24.	advantage of man at 21).	1 5 to .	
24 to 15.		6 to 10.	
15 to 6.		1 to 10.	
26 to 22.		4 to 8.	
27 to 23.		16 to 19.	
23 to 16.		12 to 19.	
22 to 18.		10 to 15.	
18 to 4.		3 to 8.	
4 to 11.		2 to 7.	
11 to 2.			

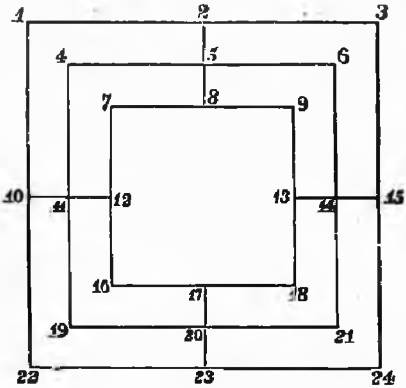
White now has six men on the board, whilst black has only two; but white can reduce this number at any time by moving 30 to 26. Black can only move 19 to 24 or to 23. Suppose he move it to 23, then it will be better for white to reduce black to one as follows:

White.	Black.
31 to 27.	23 to 26.
30 to 23.	21 to 30.
29 to 25.	30 to 21.
32 to 28.	21 to 17.
28 to 24.	17 to 14.

If black move to 18, 10, or 9, he loses at once, so 14 to 17 is the best move. If white move 27 to 23 he loses the game, for black would move 17 to 22, from which white could not escape. Hence the game would be best played by

White.	Black.
2 to 6.	17 to 21.
6 to 10.	21 to 25.
10 to 14.	25 to 30.
14 to 17.	

The game might now be prolonged, but still to win the losing game with the four against one is almost a certainty, as it can only be lost by an oversight.



NINE MEN'S MORRIS, OR MORELLES.

This game, also known by the name of the "Shepherd's Game," is a peculiar rustic amusement, and flourishes in many parts of England, where it is played on hill-sides and glades, on the rustic "public" table, on the door-step, on the slate on the way from school, and on the highly-finished board from London in the squire's drawing-room.

The published rules of the game are very imperfect, and do not by any means give an idea of the art of the game, or of its variations. There seem also to be different ideas as to the formation of the board to be used, at least among those who know the shepherd's game only from books. To avoid the confusion which necessarily arises from different rules being used, we will explain how the foresters and countrymen in Hampshire and Wiltshire play the game, and their principle we believe to contain in it the original law and best board.

Shakspeare, in "A Midsummer Night's Dream," speaking of the overflowing of rivers caused by fogs and rains, says:

> "The folds stand empty in the drowned field,
> The crows are fatted with the murrain flock;
> The nine men's morris is filled up with mud."

The countrymen then, as now, evidently played the game out of doors. Their board was cut out of the turf, and thus, when heavy rains set in, it was, as Shakspeare asserts, "filled up with mud."

Until we ourselves became devotees to morris, we wondered to see the excitement over a game played on three squares with nine dark pebbles against nine bits of chalk, the performers little ruddy foresters, who knew better how to trail a deer to its lair, or to spot a badger, than how to make pothooks and hangers. At length we were initiated into the laws of the game, and having thought over it for some time and practised "right hand against the left," we became so skilled as to be a "caution," and few foresters would have ventured to risk a "pint" on the result of a combat with us.

So easily is a board made, either on a slate, piece of cardboard or wood; so easily can men be enlisted, either by means of pebbles, bits of chalk, paper, wooden chips, &c., that the game need not wait long because no board has been brought, or men have been lost; but whenever there is half an hour to spare and nothing else to do, a game of morris will fill up the gap. Now, therefore, we will commence our description.

The Board.

Draw three squares, one within the other. The inside square ought to have its sides about 3 or 4 in. in length, or as much larger as suits. The next square ought to have at least an inch space all round, and the same distance between its sides and the outside square. Four lines joining each square, as shown in the diagram below, complete the board.

In some boards we have seen lines along the angles of the squares, as if 3, 6, 9, &c., were joined; but this is not the board now used by the experienced rural player, and we, therefore, do not recommend its adoption.

Each player is provided with nine men, which may be anything—draughtmen, or the leaves of a tree, or bits of paper, or pieces of chalk—as long as there is so marked a difference between each player's army of men that the one can be easily distinguished from the other. We have seen the game played on the turf, the men on one side being peeled sticks (very small), on the other sticks with the bark on, each player pegging his men into the ground. The board and men being ready, the game may commence.

The Game.

Each player places alternately a man on any one of the intersections marked from 1 to 24. The first move or placing to be arranged between the players. The great object in placing is to get three men in a line, the three men belonging to one player.

Three men are said to be in line when they are on three stations, such as 7, 8, 9, or 13, 14, 15, or 1, 10, 22, &c.; but not at the angles, as at 18, 21, 24.

If either player succeed in placing three men in line, he may *pound* one of his adversary's men, that is, he may remove one from the board. In this pounding, one of three men *in line* cannot be pounded, provided there are other men to pound; but if the men on the board are all in lines of threes, then one of these only can be pounded. We will first place our men on the board, explaining the reasons as we proceed, and then advance with the game, which may fairly be divided into three portions, each of which calls for a different style of ingenuity. We will suppose the players' men to be black and white, and that black commences placing his men.

PLACING.

Black.	White.
9.	11.
13.	18.
14.	15.
8.	7.
5.	2.
6.	4.
21 (line, and pounds 11).	16.
12.	17 (pounds 12).
12.	24.

White has by far the best of this game, as will be evident to the reader when he becomes acquainted with the next portion of the game, which is termed the *moving*.

MOVING, OR NO. 2 PORTION.

The moving consists in moving alternately a man from intersection to intersection, or, as our board is numbered, from number to number. Thus, a man at 11 might move to 10, 19, 4, or 12, provided there were no men on those stations. A man at 6 could move only to 5 or 14. Thus a man can move only along the lines from number to number. The first placing having been accomplished, the playing commences, each move being alternate. We will, for the sake of illustration, continue the game above, in which we said white had the best of the game. White's last place was at 24, and black, therefore, moves first. Black can only move one man, viz., 21, all the others being blocked. The moves, therefore, will be

Black.	White.
21 to 20.	2 to 3 (pounds 20).

Now comes the question, *why* should white pound 20 in preference to any other man? The reason was, because, unless either 6, 14, or 20 had been pounded, a line would have been made, 7 pounded, and black's game opened. Then it must be considered which is it best to pound, 6, 14, or 20? and we find that if 20 be pounded black can move only 14 to 21, when white can reply by 15 to 14, thus preventing black from lining, and being ready to line by returning again 14 to 15.

Trifling as seemed this matter about which to pound, the game mainly depended on the selection, as we will show, first by carrying on this game, then starting from white's first move and pounding another man.

We would remind the reader that one game worked out in this manner will teach him most of the art of the game.

Starting, then, after white's first move, in which he pounds 20, we have

14 to 21.	15 to 14.
21 to 20.	3 to 2.

This is good play on the part of white, as he can make his line at 3, 15, 24, in spite of black, whenever he chooses, and by his last move he imprisons black's man at 5, and compels him to move 20: thus white can improve his position considerably. Black 20 to 21. White now has the option of "drawing" the game by moving 17 to 20, and thus blocking up black; but a safer move, though it opens black's man at 5, is 2 to 3; then

Black.	White.
5 to 21.	4 to 5.
21 to 20.	14 to 15 (pounds 20).
13 to 14.	17 to 20.
9 to 13.	24 to 23.
14 to 21.	18 to 17 (line and pounds 21).
8 to 9.	23 to 24 (line and pounds 12).
6 to 14.	24 to 23 (line and pounds 13),

thus reducing black to three men, when a new phase of the game comes into practice, of which we will treat presently; now, however, we will show the result of pounding another man instead of 20 at white's first move. Replacing the men according to the third example of placing, we will recommence the moves thus:

21 to 20.	2 to 3 (pounds 14).
13 to 14.	4 to 11 (not to break line).
5 to 2.	11 to 19.

Black.	White.
20 to 21 (pounds 7).	19 to 20.
6 to 5 (pounds 20).	24 to 23 (must break line now).
5 to 6 (pounds 23).	

And so on, reducing *white* to three men.

HOPPING.

We will now pass on to the third and last part of the game, which is as amusing and interesting as any.

When either party is reduced to three men, instead of being obliged to move his men from station to adjoining station, he can "hop" to any part of the board instead of "moving." Thus a man at 1 might hop over to 24, or to 19, or to 13, or anywhere, provided a man is not on the station. In order to illustrate this hopping, let us place white's men at 3, 6, 8, 9, 11, 17, and 18, thus giving him seven men to three of black, whose men we will place at 7, 12, and 15, and let white move first.

White.	Black.
6 to 14.	7 to 13.
17 to 20.	15 to 7.

This last move of black's is a good one, as it will enable him to hop to 16, make a line, and pound one of white's men.

White.	Black.
3 to 15.	13 to 16 (and pounds 14).

When black is reduced to two men he loses the game; and this would have occurred had he pounded any man except 14, as white could have completed a line next move, as will be evident on looking at the board. Then the game may be continued as follows:

White.	Black.
15 to 14.	16 to 13.
20 to 21.	13 to 16 (pounds 9).
8 to 9.	7 to 13.
11 to 19.	13 to 7 (pounds 9).
18 to 17.	7 to 20.

We now come to a very difficult part of the game, for when white is reduced to three men, *he* can hop, and thus may complete a line at once, as will be evident were white to move 14 to 6, and black 20 to 7, pounding *any* man; for white could then either complete line in one or two moves, in spite of black, as follows: Suppose white to move 14 to 6, and black 20 to 7, pounding 21. Black then hops from 6 to 20, and must, next hop, complete line at either 21 or 23. Thus black must try a different game, and must work for move and position.

White.	Black.
14 to 6.	12 to 18.
21 to 14.	16 to 21.
17 to 16.	18 to 17.
6 to 5.	

Black dare not yet complete his line by hopping to 23 from 21, for if he pounded one of white's men, white could immediately complete line in two moves, either by hopping to 6, 12, or 11, and if both play well the game ought to be drawn. Supposing, however, we allow white to place his men badly, we will show how he may be made to suffer.

Black.	White.
9.	7.
21.	12.

If black did not place his next man at 16, of course white would do so with his man, and make a line, thus:

Black.	White.
16.	11.

Again, black must place a man at 10, and white has now the worst of the placing, as will soon be evident: no matter where he goes, black must obtain a line in a very few placings, or a very good position. Thus again:

Black.	White.
10.	18.
14.	6 (compulsory or block lines).
19.	20. "
15.	13. "
24.	3.
23.	22.

The placing is here completed, and white played cautiously. Thus, although black's game is a trifle the best, still it is tolerably even. We will now take an example in which white shall not play well, and we will show where his false moves occur, and their result, black commencing as before:

Black.	White.
18.	22.
7.	10.
1.	11.

This last move of white was a bad one, for black can not only defend himself against the threatened line by placing a man at 12, but can at once compel his adversary to place a man at 16, after which he obtains a line in two placings. Let us place the men.

Black.	White.
12.	16.
9 (making a line certain).	8.
13 (line, and pounds 16).	16.

White's man on 16 being removed, he must place another there to avoid the line.

15 (a very good place).	14.
3 (must make another line).	24.
2 (pounds 24).	24.

Here is a second placing completed, during which white lost two men, and now has to fight black with seven against nine—rather heavy odds. We will take one more example of this early part of the game before proceeding.

White.	Black.
14 to 15.	21 to 14.
15 to 24.	14 to 4.
12 to 11.	17 to 12.
11 to 10.	12 to 17.

White.	Black.
5 to 8.	4 to 23 (pounds 10.)
19 to 9.	23 to 7.
24 to 13.	18 to 17.
8 to 16.	7 to 20.
13 to 23.	17 to 21.
9 to 19.	20 to 13.
23 to 9.	18 to 14 (and wins).

White might have won this game immediately after black pounded 10.

Before giving examples of games from beginning to end, we will offer a few hints on the best play.

1. Avoid crowding all your men together on two squares.

2. Place first on the corners, if you are first player, and endeavour to form a cross with three men, as a line follows this.

3. Block your adversary's men as much as possible, whilst your own are free to move.

4. Do not devote all your attention to merely obtaining a line during the placing, for a cautious antagonist will prevent this, and whilst you are intent on this one point, will so arrange his men that when the moves commence he will easily defeat you.

5. When possible, arrange to make two lines in successive moves, or three lines, not merely one at a time; obtain also what is called an "open and shut," which is as follows: Men on 9, 13, 18, 20, and 23. Then 18 can move to 17 and complete line; back again to 18 and again complete line, and so on. Again: men at 9, 13, 18, 6, and 21. The man at 13 moves to 14, back to 13, again to 14, completing line each time.

6. Avoid moving one of three men when an adversary's man may block your station, but when you have a choice move another. Example: Black men at 13, 14, 15; one of white's at 3, another at 18, the other men on the other side of the board. Move 14 rather than 13 or 15, as you could recomplete line with 14, whilst 3 to 15, or 18 to 13, would prevent you if you had moved 13 or 15.

7. Before reducing your adversary to three men, and thus allowing him to hop, endeavour to arrange two or three means by which you can complete lines in successive moves.

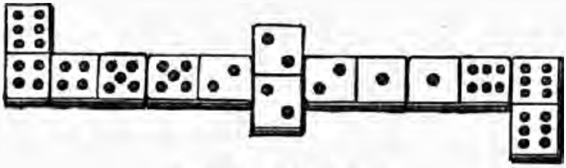
Example: Black's men, eight in number, at 2, 11, 13, 15, 16, 19, 21, 24; white's men, four in number, at 3, 9, 12, 22.

Black's first move.	White.
24 to 23.	22 to 10.

If black completed line either at 14 or 20, white, being thereby reduced to three, could hop either to 20 or 14, whichever was vacant, and so prevent the second line being formed. If, however, black move 2 to 5, white cannot then prevent him from completing line, either at 4, 14, or 20, even though he can hop. Thus suppose

Black.	White.
2 to 5.	12 to 7.
23 to 20 (pounds 9).	3 to 14 or 4.
5 to 4, or 21 to 14, and wins.	

If black had moved 21 to 14, instead of 23 to 20, he would have limited his power of making a line to one instead of two points. Of course 23 to 20 wins the game, as after this white's sixth man is pounded, and he is reduced to two.



DOMINOES.

Introductory.

The game of dominoes is frequently looked upon as a trivial amusement, but those who are well acquainted with it agree that it affords room for much curious calculation. It is by no means a mere game of chance. Let any ordinary player enter the lists against an old and experienced hand, and he will soon discover that it requires something besides good weapons to come off victorious in this as in most other contests. In fact, it is as much a game of skill as any of the card games. A moderately good player can generally tell what his adversary has in his hand, by his style of play; and by calculating two or three moves in advance, he may either block the game or leave it open, just as he finds it will suit his purpose.

The ordinary game—technically termed "double sixes"—is played with twenty-eight dominoes. In some parts of England—chiefly in the North—they use "double nines" and "double twelves." But it signifies little how many dominoes are used, the rules and principles of the game, as here laid down, will, in most cases, equally apply.

How to Commence the Game.

In the English game it is usual to play a rubber of three games; but this, of course, is subject to arrangement.

After the dominoes have been well shuffled, each player draws one, and he who draws the domino containing the smallest number of pips wins "the down;" in plainer English, he wins the privilege of playing first. Sometimes a different method of deciding who shall have "the down" is adopted. One of the players draws a domino, and without showing it, asks if it is odd or even. If the adversary guesses right he wins "the down;" if, on the contrary, he guesses wrong, he loses it. The latter method is the more common of the two. A third method is in use on the Continent. The person holding the highest double has the "*pose*" or "down," and he commences by playing that domino. If there should be no doubles, then the person holding the highest domino has the *pose*. However, it is quite immaterial which of these plans is adopted. The dominoes having been shuffled, each player takes six or seven, as may be agreed upon.

If it is found that one of the players has drawn more than the number agreed upon, his adversary withdraws the extra number, and puts them back on the heap, keeping the face downwards, of course. Each player then takes up his dominoes, and the first player commences by putting down one of his dominoes, after which his adversary joins one to it, containing on one of its sections the same number of pips as are marked upon adjoining of the domino first played. They thus play alternately till the game may become so "blocked" that one of the players cannot "go." His adversary will then continue to play as long as there is an end open. If he should succeed in getting rid of all his men he wins the game; but if the game should be blocked at both ends before either player has played out, they compare the aggregate number of pips on all the dominoes in each hand, and whoever has the smallest number wins the game.

GENERAL MAXIMS.

1. Endeavour to play so as to keep both ends open, so that you may be sure of being able to "go" next time.

2. Play out your heavy dominoes first, because if the game becomes blocked, you will then have fewer pips to count.

3. Contrive to play so that the numbers at both ends shall be those of which you hold the most. By this means you may often block your adversary till you are played out.

4. If you have made both ends alike, and your adversary plays, follow him at that end, as the chances are that he cannot go at the other, which you may keep open for yourself until you are unable to play at his end.

5. It is sometimes an advantage to hold heavy dominoes, as they not unfrequently enable you to obtain what is called a good "follow;" and if your adversary should hold none but low dominoes, he would not be able to go, thus enabling you to play five or six times consecutively, or even to play out.

6. When you have sole command over both ends you are generally in a position to "block" the game or not, as you think most expedient for your own game. In such a case, you must be guided by the number of dominoes you hold compared with those in your adversary's hands; and another element for your consideration would be whether yours are light or heavy. If they are light, and fewer in number than your adversary's, of course your best policy is to close the game at once and count. But in this you must learn to calculate from your adversary's style of play whether his hand is light or heavy.

7. At the commencement of the game it is better to have a variety in hand.

8. If you hold a "double," with two of the same number, it is better to play the double before either of the others. Sometimes you will be obliged to play one, in which case you must endeavour to force the double.

9. If you hold a double, and one other of the same number, play both consecutively; but if you are unable to do that, endeavour at any rate to let the double go first.

10. In playing against "the down," endeavour to deceive your opponent by playing a domino or two at each end indifferently. This is better than playing to his last domino, as it leads him to believe you cannot go at that end, while at the same time you may be simply keeping both ends open.

11. If your adversary has possession of one end, make the other of a number of which you hold several, with a view of forcing him to play at his end, and shutting it against the dominoes he was keeping it for.

12. If you hold several doubles, wait till your adversary makes the number for them in preference to making them for yourself; otherwise, a good player will see what you are aiming at, and will block the double. But if you hold a double with several duplicates, and can bring that number at both ends, do so.

13. If your adversary cannot go at one end, and you hold the double of that end, it is better that you should play at the other as long as you can. When you are blocked at that end, you may then play your double, and your adversary will then in most cases be obliged to open the other end for you.

14. It is generally considered that a light hand, yet with no number missing, is the best for ordinary play. The following, for example, would be a very fine hand: $\frac{6}{3}$, $\frac{5}{4}$, $\frac{2}{1}$, $\frac{1}{0}$, $\frac{3}{0}$, $\frac{0}{0}$. An example of a bad hand would be: $\frac{6}{6}$, $\frac{5}{5}$, $\frac{6}{2}$, $\frac{2}{2}$, $\frac{2}{1}$, $\frac{1}{1}$; but the worst possible hand would be the following: $\frac{6}{6}$, $\frac{5}{5}$, $\frac{4}{4}$, $\frac{3}{3}$, $\frac{2}{2}$, $\frac{1}{1}$. The latter, however, would seldom occur in actual play.

15. It does not necessarily follow that because a hand is heavy it must therefore lose. Provided it is equally varied, it has an equal chance of success with a light hand. The disadvantage of a heavy hand is shown when the game becomes blocked, and has to be decided by counting.

16. In leading "the down" from a hand consisting of a high double and several light dominoes, lead the double, and afterwards endeavour to obtain command of both ends. Suppose, for example, you hold the following hand: $\frac{5}{5}$, $\frac{2}{2}$, $\frac{3}{2}$, $\frac{2}{4}$, $\frac{1}{0}$, $\frac{5}{0}$; it would be better to play the $\frac{5}{5}$, as your other double can be forced by the aid of the $\frac{2}{4}$ and $\frac{2}{3}$.

17. It will at all times be found a difficult thing, in an equal game and between equal players, for the second player to win.

18. Endeavour to bring both ends as often as you can to a number of which you have several duplicates, for by that means you may block your adversary.

19. In blocking the game, you must be cautious that you do not block it to yourself, and leave it open to your adversary.

20. During the game look over the dominoes which have been played, so that you may calculate what numbers are likely to be soon run out, and what numbers your opponent is likely to be short of.

21. Do not push the game to a block if you hold a heavy hand, but play out your heaviest first, and keep both ends open.

22. Use your judgment freely. It is not always the best policy to adhere too strictly to the rules laid down in books. In fact, a wily player will oftentimes find it expedient to play a speculative, eccentric game, apparently quite at variance with the ordinary "laws."

23. Keep perfectly quiet, attentively watch your opponent's moves, and prevent him, if you can, from obtaining an insight into your play.

24. Last (though not least), don't lose your temper.

ALL FIVES.

This game stands next in popularity to the preceding one. The same number of dominoes are taken, or as many as may be agreed upon, and in many points it is similar. The object of the game is to contrive so to play that the aggregate number of pips on the dominoes at both ends shall number 5, 10, 15, or 20. If they number 5, the player who makes the point counts one; if 10, two; if 15, three; if 20, four.

In order to make our meaning clearer, we give an illustration. Suppose that at one end there is $\frac{0}{0}$, and at the other a five. The next player then plays $\frac{5}{5}$ to the single five, and scores two, because the aggregate number of pips on the dominoes at both ends is ten. If the opponent should follow up by playing the $\frac{0}{5}$ to the $\frac{0}{0}$, he of course scores three.

To give another illustration. Suppose at one end is $\frac{6}{6}$, and the next player places at the other end $\frac{4}{4}$, he scores four for making twenty.

If the game becomes blocked, he who holds the least number of pips counts one.

The custom as to what number shall be "up" is different in different parts of the country. In some places it is ten; in others, fifteen; in others again, twenty. The number ought to be agreed upon at the commencement of the game. In our opinion it adds to the interest of the game to select the lower numbers.

Sometimes the game is so played that he who makes five counts five; ten is made to count ten, and so on; but in that case not fewer than 50 and not more than 100 points should constitute the game.

As we have shown, the material point in which this game differs from the previous one is that you count the fives, from which circumstance it derives its name.

The next best thing to making fives yourself is to prevent your adversary from doing so; and when you do give him the opportunity of making a point it should only be in order that you may make two or three points yourself.

When your adversary fails to avail himself of a good chance, you may presume that he does not hold such and such dominoes, and from that and like indications, which you must carefully store up in your memory, you will be able to form a tolerably accurate estimate of his hand. You should never omit to turn these indications to good account.

There is only one domino in the whole pack which can be led without the next player being able to make a point from it—namely $\frac{2}{3}$. Always lead that if possible.

If you must play one of two dominoes, either of which you fear your adversary will turn to his account, of course you must play that by which you think you will be likely to lose the least.

It is good practice occasionally to take a survey of the game as far as it has gone, not only in order to refresh your memory as to what has been played, but also that you may form an opinion, if possible, of what your opponent's "little game" is. If there are good grounds for coming to the conclusion that he holds heavy numbers while you hold light ones, block up the game as speedily as you can, and proceed to count. To understand your opponent's hand is a most important matter, and we do not think we have insisted on it too much. Good players will tell you that they have won many games by watching closely the opponent's moves, and drawing therefrom inferences respecting the dominoes he holds in hand. We need not add, the greatest caution must be used in forming these inferences.

The Drawing Game.

The same number of dominoes are used, and the lead is drawn for in the same manner in this as in the previously described games.

The difference is that when a player cannot go, he must draw a domino from a pack. If he cannot then go, he must draw another, and so on until he is able to continue the game.

He who plays out first, or in case the game becomes blocked, he who holds the smallest number of pips, wins.

The French have a different way of playing this game. The player who holds the highest double, or in the event of there being no double, the highest domino, has the *pose* or lead. The second player, should he be unable to go, may draw all the remaining dominoes except two, which must remain untaken. If he leave more than two, the first player, should he require them in order to continue the game, may appropriate the surplus, still leaving two on the table.

If a player cannot go, it is compulsory that he draw till he gets hold of a domino that will enable him to continue the game.

Each player may take the *pose* alternately, or the winner in the first instance may retain it, as agreed upon.

The French method of counting is also different. When a player has played out, he counts the pips in his opponent's hand, and scores them to his own account. In case the game should become blocked, the player holding the fewest pips scores the number of pips in his adversary's hand to his own account, each pip counting one. A game consists of from 20 to 100 points, according to agreement.

With respect to the English method of playing this game, the general instructions and maxims given on the other games apply equally to this. But a few words must be added with regard to the French play. He who has the highest double is compelled to play first, and cannot draw any more dominoes until it is his turn to play again, but his opponent may draw all but two, which two must retain untaken during that game. But the second player should not draw more than half the dominoes, unless really compelled by the badness of his hand, as by this means it will leave a chance of his opponent having as many to draw. A good player at times might be justified in taking all but two, for by the calculation and judgment obtained by having them, he might be enabled to play them all before his opponent could play his five or six dominoes, as the case may be. Should the second player hold a good hand, comprising dominoes of every denomination, he should not draw until compelled. If he should happen to draw high doubles, he ought to continue to draw until he holds several of that number.

It is not always the player holding the greatest number who gets out first, because as he has some of almost every denomination, his adversary will keep playing to him, and the odds are that he (the adversary) will be able to play out first. Still, in many games, the one holding the largest number of dominoes possesses this advantage, that he has the power to keep both ends open to himself but closed to his opponent, and he may thus run out.

In order to be able to play out first with the largest number (supposing that only two dominoes remain untaken), you should by all means, and in the first place, endeavour to ascertain what those two are. You may arrive at this in two ways. Suppose you hold so many of a particular number that with those already played they make six out of the seven of that denomination, you must by all means keep playing them.

As an illustration, we will suppose you hold in your hand four threes, and that two other threes have already been played. Now, if you play your threes, and he, not being able to play to them, becomes blocked, it is quite clear that one of the dominoes on the table is a three. Then, if those you hold in your hand are—$\frac{3}{2}$, $\frac{4}{3}$, $\frac{3}{6}$, and $\frac{3}{3}$, and you find among the dominoes played $\frac{3}{0}$ and $\frac{3}{1}$, it is, of course, quite safe to conclude that the domino which is left is the $\frac{3}{5}$.

The second plan is this. If during the course of the game you have given your opponent opportunities of playing a certain double which you do not yourself hold, you may be certain that is one of the left dominoes.

A little experiment, in order to test the nature of your adversary's hand, so as, however, not materially to injure your own, would often be found more expedient than groping all the while, as it were, in the dark.

By carefully looking over your own hand, you may judge pretty correctly as to whether your adversary's is light or heavy.

It is only by taking into account all these and other nice points that a player can possibly be successful.

Having formed an idea of your opponent's hand, you should make it an object to "run out," or play so that he may be blocked, or that he may be obliged to leave both ends open for you to play out.

Having given some instructions to the player who holds the larger number of dominoes, we must now proceed to give a few hints to the lesser hand.

If, holding the lesser hand, you can contrive to play a few moves at first without being blocked, you ought to be pretty sure of winning; because, by that time, your hand will have become so disproportionately small, that your opponent will have some difficulty in preventing you from playing out without blocking himself. This, therefore, must be one of your main objects.

If the game goes pretty equal, bring out your strong suits. Wherever you are short of a particular suit, if you find that many of that number have already been played, you need not fear that your adversary will be able to block you in regard to it, for you will, of course, infer that they are as scarce in his hand as in your own. Endeavour to bring these rules to bear, reserving to your discretion as to whether you should in anywise depart from them, or use such modifications as the contingencies of the moment require.

The Matadore Game.

This is a foreign game, and each player takes only three dominoes. You can only play when your domino, added to the one previously played, would make seven. Those dominoes which themselves make that number are termed "matadores," and may be played at any time, regardless of the numbers played to. The double blank is also a matadore. The matadores, therefore, are four in number, viz., $\frac{6}{1}$, $\frac{5}{2}$, $\frac{4}{3}$, $\frac{0}{0}$.

The highest domino leads, and if the next player cannot go, he must draw from the heap until he can. He must cease, however, to draw when there are only two dominoes left. He who plays out first wins, and if the game is blocked, he who holds the least number of pips counts those held by his opponent, and scores them to his own game. The number of points constituting the game is subject to agreement: it varies from 20 to 100.

MAXIMS FOR PLAYING THE MATADORE GAME.

This game differs widely from any of the other varieties of dominoes. The element of chance is more largely introduced. The player who happens to obtain more matadores than the other is almost certain of winning, provided the parties be pretty evenly balanced in skill and experience.

The blanks are very valuable at this game—the double blank being the most valuable of all the matadores. It is impossible to make a seven against a blank, so that if you hold blanks you may easily block the game and count.

When you have the worst of the game, and indeed at other times as well, guard against your adversary's blanks, and prevent him from making them; which you may do by playing only those dominoes which fit with the blanks already down.

Never play a blank at the *pose* unless you have a matadore or a corresponding blank.

Keep back your double blank till your opponent makes it blanks all; you can then force him to play a matadore, or compel him to draw till he obtains one. It is better to have a mixed hand.

DOMINO POOL.

This game is played either by partners or by separate players. If played singly by three or four players, each must draw a domino, and he who draws the highest number of pips but one sits on the left of him who draws the highest, the next highest to the left of the second, and so on. If the game is played by partners, the two lowest are partners and the two highest. The partners must sit opposite to each other. The players must draw afresh at each game, and the stake to be played for, called "the pool," must be placed on the table.

Each player takes five dominoes, and he who holds the highest leads. When one player cannot go, the next in turn plays, and so on. The maxims given in reference to the English game apply equally to this.

The game is scored in the following manner: When one player has played out, the one keeping the score counts the number of pips on each player's remaining dominoes, and puts down the number under each of their names or initials respectively. The same is done if a player cannot go. When the number of any one player reaches 40, 50, or 100, or any limit previously agreed upon, he is out of the game; but he comes in again by what is called "starring." In other words, he must pay over again the amount he originally put into the pool. The method of "starring" is the same as at billiards, from which the game is taken. He who "stars" recommences at the number which the player holds who is in the worst position. Suppose, for example, there were three players—one at 20, one at 40, and the other at 60, 100 being up, the player who "stars" must recommence at 60. He can only "star" once, and that must be at the time he is out. Each player has the option of "starring," except the last two, who must divide the pool, or they may agree to play it out. Still, unless an agreement to play out is made beforehand, the last two must divide.

INSTRUCTIONS FOR PLAYING DOMINO POOL.

When this game is played by separate players, and one becomes greatly ahead, the other three can combine, so as to render his chance of winning uncertain. The necessity of this combination is clear. If he is allowed to win, the competition for that game is over; but if, by combining, the other players can keep him back a little, they obtain for themselves a better chance of success. The player who is ahead will also do his best to throw obstacles in the way of the player in the next best position, as he becomes a dangerous competitor. The two in the worst position will in like manner combine against the two ahead. The necessity for this combination does not arise till the game is somewhat advanced, as at the beginning all the players are on a level; and the relative position of the others is of no moment till the game becomes advanced. It is of very little use for *one* player to attempt to stop the progress of another who is too far ahead, unless the others combine with him. If, through ignorance or anything else, they continue to play for their own hands, you must do likewise. Although, if you attempted by yourself to stop the player who was ahead of you, you might succeed, that success might be purchased at the risk of your own chance in the game. As in this game you have only five dominoes out of twenty, your power of influencing the game is very much diminished, and there is not quite so much scope for the exercise of your judgment as in other single games where you hold six dominoes out of twelve. Your opponents are sure to hold some of the remaining numbers in which you are strong; so that the injury you can in other games inflict by having a preponderance of a particular number will be greatly diminished here. Therefore it is scarcely worth your while endeavouring to retard your opponent's game when you have three of a number, unless some of that number have already been played; because if you keep those numbers until you are called upon to play to them, you would do infinitely more towards crippling their game than if you were to lead from them. On the other hand, should you hold *more* than three of a particular number, do not wait for this chance, but lead it on the first opportunity. If you find that you and one of the other players hold nearly all of a particular number, combine with him, in order to exhaust the hands of the other two. In doing this, you are of course only studying your own interest. It is better to adopt this plan when you have reasons to believe you are already on the safe side. If you hold one or two doubles, with duplicates of either, retain the latter until you first get rid of the doubles; but if you hold three or four duplicates along with a double, play the duplicates at once, as you will be able by your own hand to force the double at any time. If you are short in any particular number, get rid of your heavy dominoes as quickly as possible. In playing off you may lead with a light domino, if you hold one or more of the number; but if not, you must lead a higher domino, in order to diminish the number of pips in your hand. If you hold a heavy hand with high doubles, or a hand which admits of little or no variety, or without any particular preponderance, you must play a safe game, and sustain as little loss as you possibly can under the circumstances. Endeavour to balance the inferiority of your hand by drawing the other players along with you.

When there are only three players left, and one is greatly ahead, while another has starred, it should be the object of the third player to prolong the game as much as possible, as he still has a chance to star.

When two players are in advance, the two behind must avoid embarrassing each other in their combinations against the other two. It is better for them to use their joint efforts against one at a time, as the attack, if concentrated in that way, would be stronger and more effectual. Should one of the advanced players get embarrassed, endeavour to embarrass him still more, for you may be sure his competitor will not assist him.

It will be perfectly understood, however, that in playing with partners, the object of each partner will be to play as much as possible into his partner's hands and to cripple his opponents. If it is your lead and you have a good hand, you must try and win with it, regardless of your partner's position. So, on the other hand, if it is your partner's down, and you have a bad hand, you must be content to sacrifice your own chance in order to increase his. In the partner's game it is generally good play to lead from a strong suit, for as this is a generally understood rule, your partner will accept the hint, and will not fail to "return your lead," or, in other words, to play into your hands as much as possible. If you hold some doubles, with others of the same number, you may—contrary to the single game—play the latter first if it suits your hand, as your partner will be sure to assist in getting out your doubles.

We might continue these directions and hints *ad infinitum*, but experience, after all, is the best teacher; and—recommending the learner to practise assiduously and play carefully—we dismiss this portion of our subject.

The Whist Game.

This game resembles in some points the game of cards from which it takes its name. It is played by four persons—two partners on each side. The partners, as usual, sit opposite to each other. The whole of the dominoes are taken—seven by each player.

It is best to lead from your strongest suit. By this and such other indications you will enable your partner to form an opinion as to your hand, by which he will be guided very much in his play, and as the game proceeds each must tax his recollection as to who played such and such a domino, and how the game stood at that particular time, so as to form a judgment as to the motive of such play, &c. The general instructions given in previous chapters will apply in great measure to this game, particularly those given in reference to the Pool Game.

The Four Game.

In this game, which is played by four persons, each player takes seven dominoes; and he who plays out first, or, if the game becomes blocked, holds the least number of pips, wins the hand, and draws a certain stake from the other three.

Very little in the way of instruction is required in this game. If you have the *pose*, you should play out as far as possible, and then endeavour to block the game.

Endeavour to keep your hand even, so as to be ready at any number, or (and in this you must be guided by the nature of your hand) play to keep your strongest suit in hand until those of the same suit held by other players are out. By this means you may oftentimes be able to play out or shut the game, as you find most expedient.

Sebastopol Game.

This game is played by four players, each taking seven dominoes. The player holding the double six plays it, and takes the lead. Each player must play a six to it. He who cannot loses the turn. The dominoes are played in the form of a cross the first round, after which the players alternately play at either of the four ends. He who has the last domino, or in the event of more than one player being left with dominoes when the game is shut, he who holds the greatest number of pips, pays a certain amount to the winners.

Endeavour to get rid of your heavy dominoes, and put obstacles in the way of your adversaries running out.

Tiddle-a-wink Game.

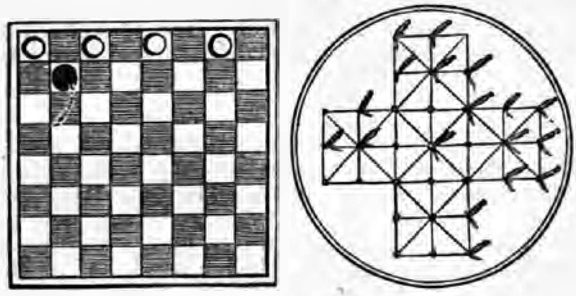
This is a very amusing game, and suitable for a round party.

If six or more play, each takes three dominoes. The $\frac{6}{6}$ is then called for, as in the French game, and the person holding it leads with it. If it is not out, the next highest double is called forth, and so on downwards until a start is made.

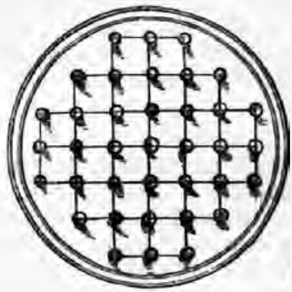
In this game, he who plays a double, either at the lead or at any other part of the game, is entitled to play again if he can—thus obtaining two turns instead of one. The game then proceeds in the ordinary way, and he who plays out first cries "Tiddle-a-wink!" having won. In the event of the game being blocked, he who holds the lowest number of pips wins.

FOX AND GEESE.

In this amusing game the four geese are placed in a row upon the board, and the fox may station himself wherever he likes, the fact of placing himself being counted as a move. The geese can only move forward on the diagonal as in draughts; but the fox may move backwards or forwards, like the king in draughts. The object of the geese is to pen up the fox, so that he cannot move, while the object of the fox is to break through the line of the geese, so as to reach either of the squares which the geese occupied.



FOX AND GEESE—TWO MODES OF PLAYING.



SOLITAIRE.

There is only one drawback to the game: if the geese be played properly, they *must* win. The best play of the geese is to keep themselves as much as possible in a line across the board, and of the fox to manœuvre so as to prevent the line from being formed.

Another mode of playing this very variable game is by means of a board pierced with holes arranged in a certain order. The fox is represented by a red peg, and the geese by white pegs. The object of the geese is to pen up the fox; but if the fox can place himself next to a goose behind which is an open hole, he may hop over and take the goose, as is done in draughts. If the geese can pen the fox, they win; and if the fox can take a certain number of the geese, he wins.

SOLITAIRE.

This rather popular game is, after all, nothing but a modification of draughts, the chief difference being that the men can move in any direction. The men being placed, one is removed, so as to expose a vacant hole, into which any man can jump by passing over the head of the man next the hole. The man thus jumped over is removed from the board, and the object of the game is to leave only one man on the board. Skilful players will begin by removing any man that may be pointed out, and will not only take all the men, but finish by placing the last man in the hole from which the first was removed.

Conjuring, Puzzles, Riddles, Acrostics, &c.

PARLOUR MAGIC.

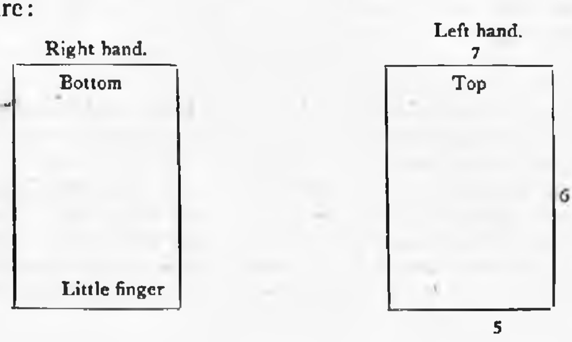
A few preliminary hints are necessary in order to enable an amateur to perform the tricks he attempts with effect and success.

A conjuror should always be able to "palm" well. That is done by holding a coin in the fingers, and by a quick movement passing it into the middle or palm of the hand, and, by contracting the muscles on each side of the hand, to retain it there, making the hand appear open and as though nothing were in it. After a little practice this will become comparatively easy, but it will require the exercise of great perseverance in order to become perfect. The pains, however, will be well bestowed, as this is one of the principal means by which prestidigitators deceive their audiences.

Making the Pass.

In many of the tricks with cards it is necessary to "make the pass," as it is termed, which is a very neat and simple movement. The operator shows a card, which he wishes his audience to believe he can change by simply using the mysterious words, "Presto, begone!" While, however, he is saying these words, he gives a sharp blow on the pack he holds in his hand, and at the same time slips the card under the pack and takes off the top one, or *vice versâ*. Practice, in this as in other matters, will impart great dexterity to the operator; and as the hand can be trained to move more quickly than the eye can see, he will be able to go through the movement without it being perceived by his audience.

The following mode of "making the pass" should be well studied: Hold the pack of cards in your right hand so that the palm of your hand may be under the cards; place the thumb of that hand on one side of the pack, and the first, second, and third fingers on the other side, and your little finger between those cards that are to be brought to the top and the rest of the pack. Then place your left hand over the card in such a manner that the thumb may be at 5, the forefinger at 6, and the other fingers at 7, as in the accompanying figure:



The hands and the two portions of the pack being thus disposed, you draw off the lower cards confined by the little finger and the other parts of the right hand, and place them with an imperceptibly quick motion on top of the pack.

But before you attempt any of the tricks that depend upon "making the pass," you must have great practice, and be able to perform it so dexterously and expeditiously that the eye cannot detect the movement of the hand, or you may, instead of deceiving others, expose yourself.

Forcing a Card.

In card tricks it is frequently necessary to "force a card," by which you compel a person to take such a card as you think fit, while he imagines he is taking one at haphazard. The following is, perhaps, the best method of performing this trick:

Ascertain quietly, or whilst you are amusing yourself with the cards, what the card is which you are to force; but either keep it in sight, or place the little finger of your left hand, in which you have the cards, upon it. Next, desire a person to select a card from the pack, for which purpose you must open them quickly from left to right, spreading the cards backwards and forwards so as to perplex him in making his choice, and when you see him about to take one, open the pack until you come to the one you intend him to take, and just at the moment his fingers are touching the pack let its corner project invitingly a little forward in front of the others. This will seem so fair that in nine cases out of ten he will take the one so offered, unless he is himself aware of the secret of forcing. Having by this method forced your card, you request him to examine it, and then give him the pack to shuffle, which he may do as often as he likes, for you are of course always aware what card he has taken. A perfect acquaintance with the art of forcing is indispensably necessary before you attempt any of the more difficult card tricks.

The "Long Card."

Another stratagem connected with the performance of many of the following tricks is what is termed the "long card," that is, a card a trifle longer or wider than the rest of the pack, so as not to be perceptible to the eye of the spectator, but easily distinguished by the touch of the operator. Good operators sometimes have both cards in the pack. Any bookbinder will shave the edges of your pack so as to leave you a long and a wide card.

Having laid down what we may be allowed to term the "leading principles" which rule the art of card conjuring, we now propose to explain the various tricks which may be performed with a pack of ordinary playing cards. They depend to some extent for success on manual dexterity, a knowledge of the science of numbers, and some simple apparatus, easily procured or made by an ingenious youth. For instance, all the court cards may be made to come together by relying upon the doctrine of chances. Thus: take the pack, separate all the kings, queens, and knaves, and place them all together in any part of the pack you choose. There are five hundred chances to one that a stranger cannot in twelve cuts disturb the order in which they are placed. This trick is easy, and when successfully carried out is amusing. It may be made more so by placing one-half of the above number of cards at the bottom of the pack and the other half at the top. Of a very similar character is the famous trick of

Guessing a Card thought of.

To do this well you must attend to the following directions: Spread out the cards in your right hand in such a manner that, in showing them to the audience, not a single card is wholly exposed to view, with the exception of the king of spades, the upper part of which should be clearly seen without any obstruction either from the fingers or from the other cards. When you have thus spread them out, designedly in fact, but apparently at random, show them to one of the spectators, requesting him to think of a card, and at the same time take care to move the hand a little, so as to describe a segment of a circle, in order that the audience may catch sight of the king of spades without noticing that the other cards are all partially concealed. Then shuffle the cards, but in doing so you must not lose sight of the king of spades, which you will then lay on the table face downwards. You may then tell the person who has thought of a card that the one in his mind is on the table, and request him to name it. Should he name the king of spades, which he would be most likely to do, you will of course turn it up and show it to the company, who, if they are not acquainted with the trick, will be very much astonished. If, however, he should name some other card—say the queen of clubs—you must tell him that his memory is defective, and that that card could not have been the card he at first thought of. Whilst telling him this, which you must do at as great length as you can in order to gain time, shuffle the cards rapidly and apparently without any particular purpose until your eye catches the card he has just named (the queen of clubs). Put it on the top of the pack, and, still appearing to be engrossed with other thoughts, go through the first false shuffle to make believe that you have no particular card in view. When you have done shuffling, take care to leave the queen of clubs on the top of the pack; then take the pack in your left hand and the king of spades in your right, and while dexterously exchanging the queen of clubs for the king of spades, say, "What must I do, gentlemen, that my trick should not be a failure? what card should I have in my right hand?" They will not fail to call out the queen of clubs, upon which you will turn it up, and they will see that you have been successful.

This trick, when well executed, always has a good effect, whether the spectator thinks of the card you intended him to think of, or, from a desire to complicate matters, of some other. It requires considerable presence of mind, however, and the power of concealing from your audience what your real object is.

Another method of making the spectator think of any particular card is the following: Pass several cards under the eye of the person selected, turning them over so rapidly that he sees the colours confusedly, without being able to distinguish their number or value. For this purpose take the pack in your left hand, and pass the upper part into your right, displaying the front of the cards to the audience, and consequently seeing only the backs yourself. Pass one over the other so rapidly that he will not be able to distinguish any one of them, until you come to the card which you desire to force—presuming, of course, that you have made yourself acquainted with its position. The card you select ought to be a bright-looking and easily distinguishable one, such as the king of hearts or the queen of clubs. Contrive to have this card a little longer before your audience than the rest, but avoid all appearance of effort, and let everything be done naturally. During the interval watch the countenance of the spectator, in order that you may be sure he notices the card you display before him. Having thus assured yourself that he has fixed upon the card you selected, and that he is not acquainted with the trick, you then proceed as before. Should you come to the conclusion that he has fixed upon some other card, you will then have recourse to the "exchanged card" trick, as explained in the previous trick.

To tell a Card by Smelling it.

A very clever trick, and one which never fails to excite astonishment at an evening party, is to select all the court cards when blindfolded; but before commencing it, you must take one of the party into your confidence, and get him to assist you. When all is arranged, you may talk of the strong sense of smell and touch which blind people are said to possess, and state that you could, when blindfolded, distinguish the court cards from the rest, and profess your willingness to attempt it. The process is this: After you have satisfied the company that your eyes are tightly bound, take the pack in your hands, and holding up one of the cards in view of the whole company, feel the face of it with your fingers. If it is a court card, your confederate, who should be seated near to you, must tread on your toe. You then proclaim that it is a court card, and proceed to the next. Should you then turn up a common card your confederate takes no notice of it, and you inform the company accordingly; and so on until you have convinced the company that you really possess the extraordinary power to which you laid claim.

To tell all the Cards without Seeing them.

Another good parlour trick is to tell the names of all the cards when their backs are turned towards you. Perhaps this is one of the best illusions that can be performed with cards, as it not only brings the whole pack into use, but can never fail in the hands of an ordinarily intelligent operator. This trick, which is founded on the science of numbers, enables you to tell every card after they have been cut as often as your audience please, although you only see the backs of them. It is thus performed: A pack of cards are distributed face uppermost on a table, and you pick them up in the following order—6, 4, 1, 7, 5, king, 8, 10, 3, knave, 9, 2, queen. Go through this series until you have picked up the whole of the pack. It is not necessary that you should take up the whole of one suit before commencing another. In order that the above order may not be forgotten, the following words should be committed to memory:

6 4 1 7 5 *king*
The sixty-fourth regiment beats the seventy-fifth; up starts the king, with
8 10 3 *knave* 9 2 *queen*
eight thousand and three men and ninety-two women.

The cards being thus arranged, the cards must be handed to the company to cut. They may cut the cards as often as they like, but it must be understood that they do it whist fashion, that is, taking off a portion of the cards, and placing the lower division on what was formerly the upper one. You then take the pack in your hands, and, without letting your audience perceive, cast a glance at the bottom card. Having done this—which you may do without any apparent effort—you have the key of the whole trick. You then deal out the cards, in the ordinary way, in thirteen different sets, putting four cards to each set; in other words, you deal out the first cards singly and separately, and then place the fourteenth card above the first set, the next upon the second set, and so on throughout, until you have exhausted the whole pack. You may be certain now that each one of these thirteen sets will contain four cards of the same denomination—thus, the four eights will be together, and so with the four queens, and every other denomination. The thirteenth, or last set, will be of the same denomination as the card at the bottom which you contrived to see, and as they will be placed exactly in the reverse order of that in which you first of all picked them up, you may without difficulty calculate of what denomination each of the sets consists. For example, suppose an 8 was the bottom card, you would find, after a little calculation, that after being dealt out in the manner above described, they would be placed in the following order: king, 5, 7, 1, 4, 6, queen, 2, 9, knave, 3, 10, 8; and repeating in your own mind the words which you have committed to memory, and reckoning the cards backwards, you would say—

8 10 3 *knave* 9 2 *queen* 6 4
"Eight thousand and three men, and ninety-two women; sixty-fourth
1 7 5 *king*
regiment beats the seventy-fifth; up starts the king with," &c., &c.

You observe the same rule whatever the bottom card may be.

To tell a Card thought of.

By a certain pre-arranged combination of cards, the conjuror is enabled—apparently to guess, but really to calculate—not only the card that is thought of by any member of the company, but to tell its position in the pack. You take the pack and present it to one of those present, desiring him to shuffle the cards well, and after he is done, if he chooses, to hand them over to some one else to shuffle them a second time. You then cause the pack to be cut by several persons, after which you select one out of the company whom you request to take the pack, think of a card, and fix in his memory not only the card he has thought of, but also its position in the pack, by counting 1, 2, 3, 4, and so on from the bottom of the pack, as far as, and including, the card thought of. You may offer to go into another room while this is being done, or remain with your eyes bandaged, assuring the company that, if they desire it, you will announce beforehand the number at which the card thought of will be found. Now, supposing the person selecting the card stops at No. 13 from the bottom, and that this thirteenth card is the queen of hearts, and supposing also that the number you have put down beforehand is 24, you will return to the room or remove your handkerchief, as the case may be, and without putting any question to the person who has thought of a card, you ask for the pack, and rest your nose upon it, as if you would find out the secret by smelling. Then, putting your hands behind your back or under the table, so that they cannot be seen, you take away from the bottom of the pack twenty-three cards—that is, one fewer than the number you marked down beforehand—and place them on the top, taking great care not to put one more or less, as inaccuracy in this respect would certainly cause the trick to fail. You then return the pack to the person who thought of the card, requesting him to count the cards from the top, beginning from the number of the card he thought of. For example, having selected the thirteenth card, he will commence counting 14, 15, 16, and so on. When he has called 23, stop him, telling him that the number you marked down was 24, and that the twenty-fourth card which he is about to take up is the queen of hearts, which he will find to be correct. In performing this trick it is necessary to observe that the number you name must be greater than the number which your opponent gives you, describing its position in the pack.

To Change a Card by Word of Command.

It at first sight seems singular that any one should be able even to appear to change a card by word of command; yet it can easily be done, and under different titles, and with slight variations, the trick is constantly performed in public. To do it, you must have two cards alike in the pack; say, for example, a duplicate of the king of spades. Place one next to the bottom card, which we will suppose to be the seven of hearts, and the other at the top; shuffle the cards without displacing these three, and then show one of the company that the bottom card is the seven of hearts. This card you dexterously slip aside with your finger, so that it may not be perceived, and taking the king of spades from the bottom, which the person supposes to be the seven of hearts, lay it on the table, telling him to cover it with his hand. Shuffle the cards again without displacing the first and last cards, and shifting the other king of spades from the top to the bottom, show it to another person. You then contrive to remove the king of spades in the same manner as before, and taking the bottom card, which will then be the seven of hearts, but which the company will still suppose to be the king of spades, you lay that also on the table, and tell the second person to cover it with his hand. You then command the cards to change places, and when the two parties take off their hands, they will see to their great astonishment that your commands are obeyed.

"Twin-card" Trick.

Another trick performed by means of "twin," or duplicate, cards, as in the previous case, is to show the same card apparently on the top and at the bottom of the pack. One of these duplicate cards may be easily obtained; in fact, the pattern card which accompanies every pack may be made available for that purpose. Let us suppose, then, for a moment that you have a duplicate of the queen of clubs. You place both of them at the bottom of the pack, and make believe to shuffle them, taking care, however, that these two keep their places. Then lay the pack upon the table, draw out the bottom card, show it, and place it on the top.

You then command the top card to pass to the bottom, and on the pack being turned up, the company will see with surprise that the card which they had just seen placed upon the top is now at the bottom.

Magic Tea-caddies.

This, like some of the tricks we have previously explained, requires suitable apparatus for its successful performance. Two cards, drawn by different persons, are put into separate tea-caddies and locked up, and the object of the operator is to appear to change the cards without touching them. This may be done without the aid of a confederate. The caddies are made with a copper flap, which has a hinge at the bottom, and opens against the front, where it catches under the bolt of the lock, so that when the lid is shut and locked, the flap will fall down upon the bottom. The operator places the two cards he intends to be chosen between the flap and the front, which may be handled without any suspicion; he then requests one of the persons to put the card he has selected into one of the caddies, taking care that he puts it into the caddy into which you placed the other card; the second person, of course, puts his card into the other caddy. The operator then desires them to lock the caddies, and in doing this the flap becomes unlocked, falls to the bottom, and covers the cards, and when opened, the caddies show apparently that the cards have been transposed.

The Vanishing Card.

Another good trick is thus performed: Divide the pack, placing one-half in the palm of the left hand, face downwards; and taking the remainder of the pack in the right hand, hold them between the thumb and three first fingers, taking care to place the cards upright, so that the edges of those in your right hand may rest upon the back of those in the left, thus forming a right angle with them. In this way the four fingers of the left hand touch the last of the upright cards in your right hand. It is necessary that the cards should be placed in this position, and that once being attained, the rest of the trick is easy. These preliminaries having been gone through, one of the company, at your request, examines the top card of the half-pack that rests in the palm of your left hand, and then replaces it. Having done this, you request him to look at it again, and to his astonishment it will have vanished, and another card will appear in its place. In order to accomplish this, having assumed the position already described, you must damp the tips of the four fingers that rest against the last card of the upright set in your right hand. When the person who has chosen a card replaces it, you must raise the upright cards in your right hand very quickly, and the card will then adhere to the damped fingers of your left hand. As you raise the upright cards, you must close your left hand skilfully, and you will thereby place the last of the upright cards—which, as we have explained, adheres to the fingers of your left hand—upon the top of the cards in the palm of your left hand, and when you request the person who first examined it to look at it again, he will observe that it has been changed. Rapidity and manual dexterity are required for the performance of this capital sleight-of-hand trick.

To Tell the Number of Cards by Weight.

The apparently marvellous gift of telling the number of cards by weight depends on the use of the long card. Take a portion of a pack of cards—say forty—and insert among them two long cards. Place the first—say fifteen from the top and the other twenty-six. Make a feint of shuffling the cards, and cut at the first long card; poise those you hold in your hand, and say, "There must be fifteen here;" then cut at the second long card and say, "There are but eleven here;" and poising the remainder, say, "And here are fourteen." The spectators, on counting them, will find that you have correctly estimated the numbers.

To Produce a Mouse from a Pack of Cards.

Cards are sometimes fastened together like snuff-boxes. If you possess such a pack, or can procure one, you may without difficulty perform this feat. The cards are fastened together at the edges, but the middles must be cut out, leaving a cavity in the pack resembling a box. A *whole* card is glued on to the top, and a number of loose ones are placed above it. They must be skilfully and carefully shuffled, so that your audience may be led to believe that it is an ordinary and perfect pack. The card at the bottom of what we may term the "box" must likewise be a whole card, but must be glued to the box on one side only, so that it will yield immediately to internal pressure. This bottom card serves as the door through which you convey the mouse into the middle of the pack. Being thus prepared, and holding the bottom tight with your hand, request one of the company to place his open hands together, telling him you intend to produce something very marvellous from the pack. Place the pack in his hands, and whilst you engage his attention in conversation, affect to want something out of your bag, and at the same moment take the pack by the middle, and throw it into the bag, and the mouse, which you had previously plaeed in the box, will remain in the hands of the person who held the cards.

To send a Card through a Table.

Request one of the company to draw a card from the pack, examine it, and then return it. Then make the pass—or, if you cannot make the pass, make use of the long card—and bring the card chosen to the top of the pack, and shuffle by means of any of the false shuffles before described, without losing sight of the card. After shuffling the pack several times, bring the card to the top again. Then place the pack on the table, about two inches from the edge near which you are sitting, and having previously slightly damped the back of your right hand, you strike the pack a sharp blow, and the card will adhere to it. You then put your right hand very rapidly underneath the table, and taking off with your left hand the card which has stuck to your right hand, you show it to your audience, who will at once recognize in it the card that was drawn at the commencement of the trick. You must be careful while performing this trick not to allow any of the spectators to get behind or at the side of the table, but keep them directly in front, otherwise the illusion would be discovered.

To Knock all the Cards from a Person's Hand except the chosen one.

With a little care a novice may easily learn this trick. It is not new, and is called by some the "Nerve Trick." Force a card, and request the person who has taken it to return it to the pack and shuffle the cards. Then look at the card yourself, and place the card chosen at the bottom of the pack. Cut them in two, and give him the half containing his card at the bottom, and request him to hold it just at the corner between his finger and thumb. After telling him to hold them tight, strike them sharply, and they will all fall to the ground except the bottom one, which is the card he has chosen. An improvement in this trick is to put the chosen card at the bottom of the pack and turn the face upwards, so that when you strike, the card remaining will stare the spectators in the face.

Another Clever Card Trick.

This trick, commonly called the "Turnover Feat," is easily performed, and yet is difficult of detection. Having forced a card, you contrive, after sundry shufflings, to convey it to the top of the pack. Make the rest of the cards perfectly even at the edges, but let the chosen card project a little over the others. Then, holding them between your finger and thumb, about two feet above the table, let them suddenly and quickly drop, and the projecting card in the course of its descent will be turned face uppermost by the force of the air, and exposed to the view of the whole company.

To tell the Name of a Card thought of.

One of the company must, at your request, draw seven or eight cards promiscuously from the pack, and select one from among them as the card he desires to think of. He then returns them to the pack, and you, either by shuffling or in any other way which will not be noticed, contrive to pass the whole of them to the bottom of the pack. You then take five or six cards off the top of the pack, and throw them on the table face upwards, asking if the card thought of is among them. Whilst the person is examining them, you secretly take one card from the bottom of the pack and place it on the top; and when he tells you that the card he thought of is not in the first parcel, throw him five or six more, including the card you have just taken from the bottom—the denomination and suit of which it is presumed you have taken the opportunity to ascertain—so that should he say that his card is in the second parcel, you will at once know which card is indicated, and in order to "bring it to light," you may make use either of the two foregoing tricks, or any other you think pr6per

To tell the Names of all the Cards by their Weights.

The pack having been cut and shuffled to the entire satisfaction of the audience, the operator commences by stating that he undertakes, by poising each card for a moment on his fingers, to tell not only the colour, but the suit and number of spots, and, if a court card, whether it be king, queen, or knave. For the accomplishment of this most amusing trick we recommend the following directions: You must have two packs of cards exactly alike. One of them we will suppose to have been in use during the evening for the performance of your tricks; but in addition to this you must have a second pack in your pocket, which you must take care to arrange in the order hereinafter described. Previous to commencing the trick you must take the opportunity of exchanging these two packs, and bringing into use the prepared pack. This must be done in such a manner that your audience will believe that the pack you introduce is the same as the one you have been using all the evening, which they know has been well shuffled. The order in which the pack must be arranged will be best ascertained by committing the following lines—the words in italics forming the key:

Eight kings threa-ten'd to save.
Eight, king, three, ten, two, seven,
Nine fair ladies for one sick knave.
Nine, five, queen, four, ace, six, knave.

These lines thoroughly committed to memory will be of material assistance. The alliterative resemblance will in every instance be a sufficient guide to the card indicated. The order in which the suits should otherwise be committed to memory,—viz., *hearts*, *spades*, *diamonds*, *clubs*. Having sorted your cards in accordance with the above directions, your pack is "prepared" and ready for use; and when you have successfully completed the exchange, you bring forward your prepared pack, and hand it round to be cut. The pack may be cut as often as the audience please, but always whist fashion,—*i.e.*, the lower half of the pack must be placed upon the upper at each cut. You now only want to know the top card, and you will then have a clue to the rest. You therefore take off the top card, and holding it between yourself and the light, you see what it is, saying at the same time, by way of apology, that this is the old way of performing the trick, but that it is now superseded. Having once ascertained what the first is, which, for example, we will suppose to be the king of diamonds, you then take the next card on your finger, and poise it for a moment, as if you were going through a process of mental calculation. This pause will give you time to repeat to yourself the two lines given, by which means you will know what card comes next. Thus:—" Eight kings threa-*ten'd to*," &c.; it will be seen that the three comes next.

The Queen's Dig for Diamonds.

Taking the pack in your hands, you separate from it the four kings, queens, knaves, and aces, and also four common cards of each suit. Then laying the four queens, face upwards, in a row on the table, you commence telling your story somewhat after this fashion:

"These four queens set out to seek for diamonds. [*Here you place any four cards of the diamond suit half over the queens.*] As they intend to dig for diamonds, they each take a spade. [*Here lay four common spades half over the diamonds.*] The kings, their husbands, aware of the risk they run, send a guard of honour to protect them. [*Place the four aces half over the spades.*] But fearing the guard of honour might neglect their duty, the kings resolve to set out themselves. [*Here lay the four kings half over the four aces.*] Now, there were four robbers, who, being apprized of the queens' intentions, determined to waylay and rob them as they returned with the diamonds in their possession. [*Lay the four knaves half over the four kings.*] Each of these four robbers armed himself with a club [*lay out four clubs half over the knaves*]; and as they do not know how the queens may be protected, it is necessary that each should carry a stout heart." [*Lay out four hearts half over the knaves.*]

You have now exhausted the whole of the cards with which you commenced the game, and have placed them in four columns. You take the cards in the first of these columns, and pack them together, beginning at your left hand, and keeping them in the order in which you laid them out. Having done this, you place them on the table, face downwards. You pack up the second column in like manner, lay them on the first, and so on with the other two.

The pack is then handed to the company, who cut them as often as they choose, provided always that they cut whist fashion. That done, you may give them what is termed a shuffle-cut; that is, you appear to shuffle them, but in reality only give them a quick succession of cuts, taking care that when you are done a card of the heart suit remains at the bottom.

You then begin to lay them out again as you did in the first instance, and it will be found that all the cards will come in their proper order.

Mysterious Disappearance of the Knave of Spades

Fixing your eye upon the stoutest-looking man in the room, you ask him if he can hold a card tightly. Of course he will answer in the affirmative; but if he should not, you will have no difficulty in finding some one who does. You then desire him to stand in the middle of the room, and holding up the pack of cards, you show him the bottom one, and request him to state what card it is. He will tell you that it is the knave of spades. You then tell him to hold the card tightly and look up at the ceiling. While he is looking up you ask him if he recollects his card; and if he answer, as he will be sure to do, the knave of spades, you will reply that he must have made a mistake, for if he look at the card he will find it to be the knave of hearts, which will be the case. Then handing him the pack, you tell him that if he will look over it, he will find his knave of spades somewhere in the middle of the pack.

This trick is extremely simple and easy of accomplishment. You procure an extra knave of spades, and cut it in half, keeping the upper part, and throwing away the lower. Before showing the bottom of the pack to the company, get the knave of hearts to the bottom, and lay over it, unperceived by the company, your half knave of spades; and under pretence of holding the pack very tight, put your thumb across the middle, so that the joining may not be seen, the legs of the two knaves being so similar that detection is impossible. You then give him the lower part of the knave of hearts to hold, and when he has drawn the card away hold your hands so that the faces of the cards will be turned towards the floor. As early as possible you take an opportunity of removing the half-knave.

SLEIGHT-OF-HAND TRICKS, &c.

Having completed our catalogue of card feats, we now proceed to give a short selection of other conjuring tricks.

A Cheap Way of being Generous.

You take a little common white or bees'-wax, and stick it on your thumb. Then, speaking to a bystander, you show him sixpence, and tell him you will put the same into his hand; press it down upon the palm of his hand with your waxed thumb, talking to him the while, and looking him in the face. Suddenly take away your thumb, and the coin will adhere to it; then close his hand, and he will be under the impression that he holds the sixpence, as the sensation caused by the pressing still remains. You may tell him he is at liberty to keep the sixpence; but on opening his hand to look at it he will find, to his astonishment, that it is gone.

The Famous Mountebank Trick.

In the days when merry-andrews and mountebanks met with a hearty welcome on every English village green, no conjuring trick was more popular than this; yet there are few that can be performed with less difficulty. You first of all procure a long strip of paper, or several smaller strips pasted together, two or three inches wide. Colour the edges red and blue, and roll up the paper like a roll of ribbon. Before doing so, however, securely paste a small piece of cotton at the end you begin to roll. Then, when the proper time has arrived, you take hold of this cotton, and begin to pull out a long roll which very much resembles "a barber's pole." In order to perform this trick with good effect, have before you some paper shavings, which may easily be procured at any bookbinder's, and commence to appear to eat them. The chewed paper can be removed each time a fresh hand-full is put into the mouth; and when the proper time and opportunity have arrived, put the roll into the mouth, and pull the bit of cotton, when a long roll comes out, as before described, to the astonishment of the audience.

A more elegant but similar feat is the following, which we will style

Bringing Coloured Ribbons from the Mouth.

Heap a quantity of finely-carded cotton wool upon a plate, which place before you. At the bottom of this lint, and concealed from the company, you should have several narrow strips of coloured ribbons, wound tightly into one roll, so as to occupy but little space. Now begin to appear to eat the lint by putting a hand-full in your mouth. The first hand-full can easily be removed and returned to the plate unobserved while the second is being "crammed in." In doing this, care should be taken not to use all the lint, but to leave sufficient to conceal the roll. At the last hand-full, take up the roll and push it into your mouth without any lint; then appear to have had enough, and look in a very distressed state, as if you were full to suffocation; then put your hands up to your mouth, get hold of the end of the ribbon, and draw, hand over hand, yards of ribbon as if from your stomach. The slower this is done, the better the effect. When one ribbon is off the roll your tongue will assist you in pushing another end ready for the hand. You will find you need not wet or damage the ribbons in the least. This is a trick which is frequently performed by one of the cleverest conjurors of the day.

Catching Money from the Air.

The following trick, which tells wonderfully well when skilfully performed, is a great favourite with one of our best-known conjurors. So far as we are aware, it has not before been published. Have in readiness any number of silver coins, say thirty-four; place all of them in the left hand, with the exception of four, which you must palm into the right hand. Then, obtaining a hat from the audience, you quietly put the left hand with the silver inside; and whilst playfully asking if it is a new hat, or with some such remark for the purpose of diverting attention, loose the silver, and at the same time take hold of the brim with the left hand, and hold it still so as not to shake the silver. Now address the audience, and inform them that you are going to "catch money from the air." Ask some person to name any number of coins up to ten, say eight. In the same way you go on asking various persons, and adding the numbers aloud till the total number named is nearly thirty; then looking round as though some one had spoken another number, and knowing that you have only thirty-four coins, you must appear to have heard the number called, which, with what has already been given, will make thirty-four: say the last number you added made twenty-eight, then, as though you had heard some one say six—and twenty-eight and six make thirty-four—"Thank you, I think we have sufficient." Then, with the four coins palmed in your right hand, make a catch at the air, when they will chink. Look at them, and pretend to throw them into the hat, but instead of doing so palm them again; but, in order to satisfy your audience that you really threw them into the hat, you must, when in the act of palming, hit the brim of the hat with the wrist of the right hand, which will make the coins in the hat chink as if they had just fallen from the right hand. Having repeated this process several times, say, "I suppose we have sufficient," empty them out on to a plate, and let one of the audience count them. It will be found that there are only thirty, but the number which you were to catch was thirty-four. You will therefore say, "Well, we are four short; I must catch just four, neither more nor less." Then, still having four coins palmed in your right hand, you catch again, and open your hands, saying to the audience, "Here they are."

How to Fire a Loaded Pistol at the Hand without hurting it.

This extraordinary illusion is performed with real powder, real bullets, and a real pistol; the instrument which effects the deception being the ramrod. This ramrod is made of polished iron, and on one end of it is very nicely fitted a tube, like a small telescope tube. When the tube is off the rod, there will, of course, appear a little projection. The other end of the rod must be made to resemble this exactly. The ramrod with the tube on being in your hand, you pass the pistol round to the audience to be examined, and request one of them to put in a little powder. Then take the pistol yourself, and put in a very small piece of wadding, and ram it down; and in doing so you will leave the tube of the ramrod inside the barrel of the pistol. To allay any suspicion that might arise in the minds of your audience, you hand the ramrod to them for their inspection. The ramrod being returned to you, you hand the pistol to some person in the audience, requesting him to insert a bullet, and to mark it in such a way that he would recognize it again. You then take the pistol back, and put in a little more wadding. In ramming it down, the rod slips into the tube, which now forms, as it were, an inner lining to the barrel, and into which the bullet has fallen; the tube fitting tight on to the rod is now withdrawn along with it from the pistol, and the bullet is easily got into the hand by pulling off the tube from the rod while seeking a plate to "catch the bullets;" and the marksman receiving order to fire, you let the bullet fall from your closed hand into the plate just as the pistol goes off.

Curious Watch Trick.

By means of this trick, if a person will tell you the hour at which he means to dine, you can tell him the hour at which he means to get up next morning. First ask a person to think of the hour he intends rising on the following morning. When he has done so, bid him place his finger on the hour, on the dial of your watch, at which he intends dining. Then—having requested him to remember the hour of which he first thought—you mentally add twelve to the hour upon which he has placed his finger, and request him to retrograde, counting the hours you mention, whatever that may be, but that he is to commence counting with the hour he thought of from the hour he points at. For example, suppose he thought of rising at eight, and places his finger on twelve as the hour at which he means to dine, you desire him to count back twenty-four hours; beginning at twelve he counts eight, that being the hour he thought of rising, eleven he calls nine, ten he calls ten (mentally, but not aloud), and so on until he has counted twenty-four, at which point he will stop, which will be eight, and he will probably be surprised to find it is the hour he thought of rising at.

The Magic Funnel.

This trick is capable of being varied in many ways. You place a small funnel inside a larger one, the two being united at the top. There will be an open space between these two figures, as shown on the accompanying figure at 1 and 1, and a small aperture at 2. The handle must be held in one hand, and the opening, 3, stopped by a finger of the other hand. The funnel is then filled so as to allow the liquid to flow over from the interior to the space marked 1, 1. The thumb is then placed upon the aperture 2, and the finger withdrawn from 3, when all the water in the open part of the funnel will run out; but the liquid in the outer compartment, 1, 1, will be retained by the pressure of the thumb on 2, the weight of the atmosphere below the aperture 3 not being counterbalanced by any corresponding pressure above.

Immediately the thumb is removed from 2, the air above forces out the water, and it will appear as if a fresh supply had been obtained by magic, to which, of course, allusion must be made by the operator.

The Flying Shilling.

This is a purely sleight-of-hand trick, but it does not require much practice to be able to do it well and cleverly. Take a shilling between the forefinger and thumb of the right hand; then, by a rapid twist of the fingers, twirl the coin by the same motion that you would use to spin a teetotum. At the same time rapidly close your hand, and the coin will disappear up your coat-sleeve. You may now open your hand, and, much to the astonishment of your audience, the coin will not be there. This capital trick may be varied in a hundred ways. One plan is to take three shillings, and concealing one in the palm of your left hand, place one of the others between the thumb and forefinger of the right hand, and the third between the thumb and forefinger of the left hand. Then give the coin in the right hand the twist already described, and closing both hands quickly, it will disappear up your sleeve, and the left hand, on being unclosed, will be found to contain two shillings. Thus you will make the surprised spectators believe that you conjured the coin from your right hand to the left.

Plumes for the Ladies.

The following very clever trick was a favourite with M. Houdin, and was performed by him at St. James's Theatre, where it drew forth a good deal of admiration. When known, however, it appears, like a great many other tricks, extremely simple and easy.

Procure two or three large plumes of feathers, or a lot tied together. Take off your coat, and hold one lot in each hand, so that the plumes will lie in a parallel line with the arms. Put your coat on again, and press the feathers into small compass. Ask some one to lend you a large silk handkerchief, throw it over one hand and part of the arm, and with the other quickly draw the feathers from that arm. The plumes, being released from their imprisonment, will spread out and resume their bulky appearance, and the onlookers will be completely baffled as to where they could have come from. Then repeat the process with the other arm.

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The Borrowed Shilling in the Worsted Ball.

This easily-performed trick should be in the *répertoire* of every amateur magician. A large ball of worsted is obtained, and a marked shilling having been borrowed from the audience, the worsted is unwound, and out falls the shilling which but a moment before was supposed to be in the hands of the operator. It is done in this way: Procure a few skeins of thick worsted; next, a piece of tin in the shape of a flat tube, large enough for the coin to pass through, and about four inches long. Then wind the worsted on one end of the tube to a good-sized ball, having a shilling of your own in your right hand. You may now show the trick. Place the worsted anywhere out of sight, borrow a marked shilling, and taking it in your left hand, you put the one in your right hand on the end table farthest from the company. While so doing, drop the marked shilling into the tube, pull the tube out, and wind a little more worsted on in order to conceal the hole. Then put the ball into a tumbler, and taking the shilling you left on the table, show it to the company (who will imagine it to be the borrowed shilling), and say, "Presto! fly! pass!" Give the end of the ball to one of the audience, and request him to unwind it, and on that being done the money will fall out.

The Ink and Fish Trick.

This trick, originally introduced by M. Houdin, has been performed by every wizard since. A large goblet is placed on the table, containing apparently several pints of ink. A small quantity of ink is taken out with a ladle, and being poured out into a plate, is handed round to the company to satisfy them that it really is ink. A handkerchief is then covered over the goblet, and upon being instantly withdrawn, reveals the glass now full of water, in which swim gold and silver fish. The trick is thus performed: A black silk lining is placed inside the goblet, and kept in its place by a wire ring. It thus forms a bag without a bottom, as it were, and when wet adheres close to the glass in which are the water and the fish. The next part of the deception is the ladle, which must be capable of containing as much ink as will induce the audience to believe that it was got from the goblet before them. The ink must be concealed in the handle of the ladle, so that when it is lying on the table it will not be perceived; but on being elevated, it must run into the ladle through a small aperture made for the purpose. The black silk is easily withdrawn by the thumb and finger at the time the handkercief is removed. It must be concealed within the folds of the handkerchief.

Silver changed to Gold—Flying Money.

Before commencing this trick you must provide yourself with two shillings and a sovereign, and one of the shillings must be concealed in the right hand. Lay the other shilling and the sovereign on the table, in full view of the audience. Now ask for two hankerchiefs, then take the sovereign up and pretend to roll it in one of the handkerchiefs; but instead of that, roll up the shilling which you had concealed in the right hand, and retain the sovereign. Then give the handkerchief to one of the company to hold. Now take the shilling off the table, and pretend to roll that up in the second handkerchief, but put up the sovereign instead. Give this handkerchief to a second person, and bid him "hold it tight," while you command the sovereign and the shilling to change places. On the handkerchiefs being opened the coins will appear to have obeyed your command.

The "Twenty Halfpence" Trick.

This trick may be performed with any number of either shillings, sovereigns, or half-crowns; but following the traditional rule, we will suppose that you borrow at random twenty halfpence from the company, and display them on a plate, having previously concealed five *other* halfpence in your left hand. You take the halfpence from the plate into the right hand, mix them with the concealed five, and then give them to one of the company to hold. You then ask the possessor to return five to you, which he will do, under the supposition that he only retains fifteen, while in reality he retains twenty. You must now have another halfpenny palmed in your right hand, so that when you give the five halfpence to another person to hold, you add one to the number, and in reality put six in his hands. You then ask him, as in the previous case, to return one to you, reminding him, as you receive it, that he has only four left. Then pretending to put the halfpenny you have just received into your left hand, you strike the left hand with your magic wand, and bid the coin you are supposed to be holding to fly into the closed hand of the person holding five, or, as he supposes, four halfpence. On unclosing his hand he will find it to contain five halfpence, and he will believe that you transferred one of them thither. Now, taking the five halfpence, you must dexterously pass them into the left hand, and bid them fly into the closed hand of the person holding the supposed fifteen; and he, in like manner, will be astonished to find, on unclosing his hand, that it contains twenty halfpence instead of, as he supposed, fifteen.

The Mysterious Bag.

Mr. Philippe, when appearing before his wonder-struck audiences, used to excite the most profound amazement by means of a mysterious bag, from which he produced nearly every conceivable thing, from a mouse-trap to a four-post bedstead; and its capacity was so prodigious, that it swallowed even more than it produced. A similar but less pretending is the one which we give under the title of "The Mysterious Bag." Make two bags, each about a foot long and six inches wide, of some dark material, and sew them together at the edge, so that one may be inside the other. Next make a number of pockets, each with a cover to it, which may be fastened down by a slight elastic band. Place these about two inches apart, between the two bags, sewing one side of the pocket to one bag, and the other side to the other. Make slits through both bags, about an inch long, just above the pockets, so that you can put your hand in the bags; and by inserting your thumb and finger through these slits you may obtain entrance to the pockets, and bring out of them whatever they contain. It is, of course, necessary that a variety of articles should be put in the pockets. Before commencing the trick you may turn the bag inside out any number of times, so that your audience may conclude that it is quite empty. You can then cause to appear or disappear any number of articles of a light nature, much to the amusement of your audience.

To make a Sixpence Disappear at Command.

This simple and well-known, but often amusing trick, enables the operator to cause a small coin to disappear after it has been wrapped up in a handkerchief. Borrow a sixpence or a small coin, or use one of your own, and secretly place a small piece of soft wax on one side of it; then spread a pocket-handkerchief on a table, and taking up a coin, show it to your audience, being very careful not to expose the side that has the wax on it. Having done this, place the coin in the centre of the handkerchief, so that the waxed side will adhere. Then bring the corner of the handkerchief over, and completely hide the coin from the view of the spectators. All this must be carefully done, or the company will perceive the wax on the back of the coin. You must now press very hard on the coin with your thumb, in order to make it adhere. When you have done this, fold over successively the other corners, repeating the operation a second time, and leaving the fourth corner open. Then take hold of the handkerchief with both hands at the opened part, and sliding your fingers along the edge of the same, it will become unfolded, and the coin adhering to the corner of the handkerchief will, of course, come into your right hand; then detach the coin, shake out the handkerchief, and to the great astonishment of the company the coin will have disappeared.

In order to convince your audience that the coin is still in the handkerchief after you have wrapped it up, you can drop it on the table, when it will sound.

To produce a Cannon-ball from a Hat.

This is a very old trick, though it still finds favour with most of the conjurors of the present day. You borrow a hat, and on taking it into your hands you ask a number of questions about it, or say it would be a pity for you to spoil so nice a hat, or make use of some such remark. This, however, is only a *ruse* for the purpose of diverting attention. Then, passing round to the back of your table—(where, by the way, you have arranged on pegs a large wooden "cannon-ball," or a cabbage, or a bundle of dolls, trinkets, &c., loosely tied together, so that they may be easily disengaged)—you wipe, in passing, one or other of these articles off the pegs, where they must be very slightly suspended, into the hat so rapidly as not to be observed.

Returning to the gentleman from whom you received the hat, you say to him—"You are aware, sir, that your hat was not empty when you gave it to me"—at the same time emptying the contents in front of the audience. Supposing you have, in the first instance, introduced the dolls and trinkets, you may repeat the trick by wiping the "cannon-ball" or one of the other articles into the hat, and again advancing towards the gentleman from whom you received it, say, "Here is your hat; thank you, sir." Then, just as you are about to give it to him, say, "Bless me, what have we here?" and turning the hat upside down, the large cannon-ball will fall out.

Evanescent Money.

"'T is here, and 't is gone!" This simple but effective trick is done in the following manner: Stick a small piece of white wax on the nail of your middle finger; lay a sixpence on the palm of your hand, and state to the company that you will make it vanish at the word of command, at the same time observing that many perform the feat by letting the sixpence fall into their sleeve, but to convince them that you have not recourse to any such deception, turn up the cuffs of your sleeves. Then close your hand, and by bringing the waxed nail in contact with the sixpence it will firmly adhere to it. Then blow upon your hand, and cry, "Begone!" and suddenly opening it and extending your palm, you show the sixpence has vanished. Care must be taken to remove the wax from the sixpence before you restore it to the owner.

The Winged Sixpence.

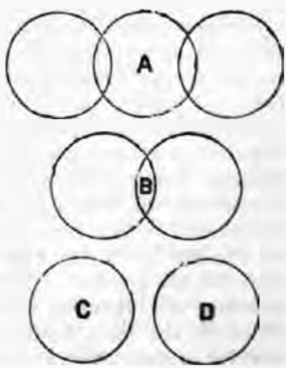
Take a sixpence with a hole on the edge, and attach it to a piece of white sewing-silk, at the end of which is a piece of elastic cord about twelve inches in length. Sew the cord to the lining of your left-hand coat-sleeve, but be careful that the end of the cord to which the coin is attached should not extend lower than within two inches of the end of the sleeve when the coat is on. Having done this, bring down the sixpence with the right hand, and place it between the thumb and under finger of the left hand, and showing it to the company, tell them that you will give it to any one present who will not let it slip away. You must then select one of your audience, to whom you proffer the sixpence, and just as he is about to receive it you must let it slip from between your fingers, and the contraction of the elastic cord will draw the coin up your sleeve, and its sudden disappearance will be likely to astonish the would-be recipient. This feat can be varied by pretending to wrap the coin in a piece of paper or a handkerchief. Great care should be taken not to let any part of the cord be seen, as that would be the means of discovering the trick.

The Aërial Coin.

The following will furnish the key to many of the stock tricks of professional conjurors. Having turned up the cuffs of your coat, begin by placing a half-penny on your elbow (your arm being bent by raising the hand towards the shoulder), and catching it in your hand—a feat of dexterity easily performed. Then say that you can catch even a smaller coin in a more difficult position. You must illustrate this by placing the sixpence half-way between the elbow and the wrist, and by suddenly bringing the hand down, the sixpence will fall securely into the cuff, unseen by any one, and it will seem to have disappeared altogether. Take a drinking glass or tumbler, and bidding the spectators to look upwards, inform them that the lost coin shall drop through the ceiling. By placing the glass at the side of your arm, and elevating your hand, the coin will fall from the cuff into the tumbler.

The Magic Rings.

This trick has been exhibited everywhere: who has not seen it?—yet what causes more wonder to the uninitiated? It is a regular stock trick with conjurors, and a very pretty trick for the amateur. You must have seven iron rings about a foot in diameter. Three of the rings must be firmly linked by the maker, also two others, and two left separate, as C D.



Hold these all up together, and they appear separate rings. Then throw the rings A, B, and C upon the floor, keeping D in the left hand, in which there is a joint, which must be concealed by the fingers or thumb; pick up C and link it to D, then B and A are linked on to D also. By a little practice many variations of a chain may be formed with rapidity, according to which ring of the set is linked on to D. You may in a careless manner give C and B to the audience to examine.

The Traversing Ring.

Provide yourself with a silk handkerchief and a small ring. With a needle-full of silk, doubled, sew the ring to the middle of the handkerchief, but let it be suspended by the silk within an inch or two of the bottom of the handkerchief. When the handkerchief is held up by the two corners, the ring must always hang on the side facing the conjuror. The handkerchief may now be crumpled up to "show all fair." Obtain a ring from one of the company, and retain it in the hand with which you receive it, but pretend to pass it to the other. Then pretend to wrap it up in the handkerchief, and taking hold of the other ring through the folds, request some one to hold it. Ask them if they can feel it, and as soon as they are satisfied that this is the identical ring which you borrowed, you put a plate on the table, and request the person holding the handkerchief to place both it and the ring on the plate. You then inform the company that you will cause the ring to pass through the plate and table into a little box, which you show round, and which you will place under the table. You can easily slip the ring in as you are doing so. Then partly unwrap the handkerchief, so that the ring will chink upon the plate, and with the words, "Quick! change! begone!" or some expressions of similar import, take the handkerchief by two corners, and put it in your pocket, saying, "It is now in the box." You then request some one to pick it up and take out the ring.

The Cooking Hat.

Have cakes or pudding previously made, and procure a jar, or doctor's gallipot, and a tin pot, made straight all the way up, with the bottom half-way down, so that both ends contain exactly the same quantity. The ready-made pancakes are previously put into the one end of this pot, which must be dexterously slipped into the hat. Then take some milk, flour, eggs, &c., and mix them up in the jar. Having done so, deliberately pour the mixture into the hat, taking care that the pot previously deposited there receives it. Put the jar down into the hat, press it on the tin pot, which exactly fits inside the jar, and brings away the pot containing the mixture, leaving the pancakes, which you pretend to fry over the candle, using the hat as a frying-pan. Then turn out the pudding or pancakes, show that the hat remains unsoiled, and restore it to its owner.

An Aviary in a Hat.

This excellent but well-known trick requires the assistance of a confederate. A hat is borrowed as before from one of the audience, and turned round and round to show there is nothing in it. It is then laid on the operator's table, behind a vase or some other bulky article; after which, as if a new idea had occurred to you, perform some other trick, during which the confederate removes the borrowed hat, substituting one previously prepared. This substituted hat is filled with small pigeons, placed in a bag with a whalebone or elastic mouth, which fits the inside of the hat. The bag containing the birds is covered with a piece of cloth, with a slit in the top. The operator, taking up the hat, puts his hands through the slit, and takes out the birds, one by one, till all are free. The hat is then placed on the table, for the ostensible purpose of cleaning it before handing it back, and the confederate again changes the hats, having in the interim fitted the borrowed hat with a bag similar to the other, and also filled with pigeons. This having been done, you call out to your confederate, and request him, so that all your audience may hear to "Take the gentleman's hat away, and clean it." He takes it up, and peeps into it, saying, "You have not let all the birds away," upon which, to the surprise and amusement of the spectators, you produce another lot of birds as before. In brushing the hat previous to restoring it to the owner, the bag may be adroitly removed.

A Bank-note concealed in a Candle.

Ask some one to lend you a bank-note, and to notice the number, &c. You then walk up to the screen behind which your confederate is concealed, pass the note to him, and take a wax or composite candle. Then, turning to the audience, you ask one of them—a boy would be preferred—to step up on the platform. At your request, he must cut the candle into four equal parts. You then take three of them, and say you will perform the trick by means of them, passing the fourth piece to the other end of the table, where your confederate has already rolled up the note in a very small compass, and thrust it into a hollow bit of candle, previously made ready. You take up this piece, and, concealing it in your hand, you walk up to the boy, and appear accidentally to knock one of the bits of candle out of his hand. and while you are stooping to pick it up off the floor, you change it for the bit which contains the note. You then place it on the table, and say to the audience, "Which piece shall I take—right or left?" If they select the one which contains the note, ask the boy to cut it carefully through the middle, and to mind that he does not cut the note. When he has made a slight incision, tell him to break it, when the note will be found in the middle. If the audience select the piece which does not contain the note, you throw it aside, and say the note will be found in the remaining piece. When this is done with tact, the audience will naturally believe that they have really had the privilege of choosing.

The Doll Trick.

The Doll Trick, although common in the streets of London and at every fair throughout the country, is without exception one of the best sleight-of-hand tricks that was ever performed, and must not be omitted here.

The conjuror produces a wooden painted doll, about 6 in. long; he then places it in a bag of very dark material, and tells his story. "The little traveller, ladies and gentlemen, you see before you, is a wonderful little man who has been all over the world; but as he has grown older he has become very nervous. One evening lately, at a small *cabaret* in the south of France, he was stating how nervous he was and how much he dreaded being robbed, when a Jew who sat in a corner of the room undertook to impart to him the means of making himself invisible at any moment, for a sum to be agreed upon. The bargain was struck, the money paid, and the Jew placed at his disposal a small skull-cap, which, as soon as it was placed upon his head, rendered him at once invisible; and I will now show you, ladies and gentlemen, the power possessed by this cap." The doll is then introduced into the bag, which has a small opening at the smaller end sufficiently large to admit of the doll's head passing through it. When the head has been shown, the lower part of the bag is turned over the doll and its body shown, "so that there can be no deception!" The conjuror then says (still showing the head above the top of the bag), "I will now show you the wonderful cap by which the old gentleman is at once rendered invisible;" and producing it from his pocket, he places it upon the head of the doll for a moment, and then removes it; the head then disappears in the bag, which is then turned inside out, and no trace of the doll can be perceived, though the bag be thrown on the floor, stamped upon, &c.

And now for the secret and the method of performing this really surprising though very simple trick. The head is removable and only fastened to the neck by a peg about $\frac{3}{4}$ in. long; the bag or dress is made full at the bottom, *i.e.*, about the size of a hat, and has an opening at the top just large enough to allow the doll's head to pass through it: at the lower edge of this bag must be made a small pocket, just large enough to contain *easily* the doll, and on the outside of the bag must be a red streak, by way of ornament, coming from the top directly down to the pocket, so that it may be seen exactly where the pocket is. This side of the bag must be held nearest to the performer.

In performing the trick the doll is introduced at the bottom of the bag, and passed upwards until the head is shown through the opening at the top; and when the performer says, "I will now show you the cap," he, holding the head of the doll in his left hand, quickly passes the body into his pocket where he has the cap, which he produces, leaving the body in its place. He then for a moment places the cap on the doll's head, and replaces it in his pocket; then placing his right hand in the bag, he slowly draws down the head, which he slips into the small pocket in the bag, and shows his hand open and empty. He then catches hold of the lower edge of the bag at the pocket, holding, of course, the head of the doll in his hand, and strikes the bag against the table, ground, &c., and says, "I told you the old gentleman would become invisible." He then says, "I will try to bring him back again;" and introducing his hand into the bag, he takes the head from the pocket and shows it through the opening at the top of the bag, and retaining it in his hand, he throws the bag on the floor and tramples upon it.

If well done, we consider this trick, though common, one of the best that is performed. It will be as well to have two dolls made exactly alike, one with the head fixed, to be handed round, and the other with the movable head to be used in the trick. We sometimes use a pocketless dress, and "palm" the head.

To pass a Shilling, or other small article, through a Table.

This trick, like the preceding one, is very amusing, and if well and what we may call *cleanly* done, is really very astonishing. The conjuror, seating himself at a table, borrows two articles of any kind sufficiently small to be concealed in the hands: these he places on the edge of the table before him, and says, "I take this one, as you see, in my right hand, and hold it at arm's length, and the other I take in my left hand—my hands never meet. I now place my left hand under the table and my right hand above it, and upon my giving the word 'Pass!' the shilling which you saw me take in my right hand will pass through the table to the ball of cotton in my left; which you see is the case."

This trick is very easy of accomplishment if but a little time and patience be bestowed upon it. The shilling, piece of India-rubber, or any other small article, must be placed on the edge of the table, and the fingers must be placed over it *exactly* the same way as if it were really desired to take it in the hand; but instead of doing so the fingers merely push it over the edge of the table, and, the knees of the performer being closed, it falls into his lap. It is then picked up with the left hand, and the right hand being brought sharply upon the upper surface of the table, the shilling appears to have passed through it.

The Cup and Halfpence.

This, too, if well performed, is a most astounding trick. Three-pennyworth of halfpence are shown, and a small cap or cup. The halfpence are thrown on the table, picked up again, arranged one on the other, and the cap placed over them. A hat is then introduced, and shown to be empty: this is then held in the left hand under the table, the cap removed with the right hand, the halfpence shown and re-covered. The conjuror then says "Pass!" when the halfpence are heard to fall in the hat; the cap on the table is raised, and they are gone, and in their place a small die or threepenny-piece appears. The halfpence are then taken in the left hand, held under the table, and commanded to pass; and on raising the cap they again appear beneath it.

This trick is very simple though ingenious, and the solution of it is as follows: The cap is of leather or any similar stiff material, and made to fit over three-pennyworth of halfpence *easily;* and the "trick" halfpence are six riveted together, the upper one being entire, but the other five being turned out, leaving nothing but their outer rims. Three-pennyworth of genuine halfpence are shown, as also the cap; and after showing the halfpence, while gathering them in the hand, "palm" them and place the "trick" halfpence (inside of which is the die) on the table, and cover them with the cap. Then taking the hat in the left hand, command the halfpence to pass, and at the word drop the genuine halfpence into the hat, at the same time raising the cap on the table, and by pinching the sides of it rather tightly the "trick" halfpence are raised with it, and the die or threepenny-piece appears; then covering the die or threepenny-piece with the cap and the "trick" halfpence concealed in it, show the genuine halfpence in the hat, and command them to return; and holding the genuine halfpence in the left hand, lift the cap, and the halfpence again appear. Then taking the cap in the right hand, adroitly drop the "trick" halfpence into it, and tender the cap for scrutiny.

The table-cloth should be a thick and soft one, to prevent the spectators from hearing the die fall as the "trick" halfpence are placed on the table.

The Shower of Sugarplums.

This is a capital *finale* to an evening's amusement, particularly with young children. A small bag, capable of holding about a pint, must be made of a piece of figured calico, of a conical shape, but open at the bottom or larger end, on each side of which must be inserted a flat thin piece of whalebone; at the upper or smaller end must be a small hook made of wire—a lady's hairpin will answer the purpose perfectly. The trick is performed in this way:

The bottom of the bag must be opened by pressing the opposite ends of the two pieces of whalebone, when, of course, they will bend and divide, and the bag must then be filled with sugarplums, care being taken to put the small *bonbons* at the top of the bag, and the large ones at the bottom next the whalebone, which will prevent the small ones from falling out. The bag when filled must on the first opportunity be suspended by its hook at the back of a chair having a stuffed back, so that it cannot be seen.

When the trick is to be performed, a large handkerchief must be shown, with a request that it may be examined. It is then laid over the back of the chair. A little girl must then be asked if she is afraid of being out in the rain, and on her answering in the negative she must be requested to kneel doll can be perceived, though the bag be thrown on the floor, stamped upon, &c.

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To remove an Egg from one Wine-glass to another without touching either the Egg or the Glasses.

Place two wine-glasses touching each other and in a direct line from you, and in the one nearer to you must be placed an egg with its smaller end downwards. Then blow with the mouth suddenly and sharply and strongly against the side of the egg, but in a downward direction, when the egg will be lifted up, and falling over, will lodge in the other glass.

The Egg in the Bag.

This, too, is a capital trick if quietly and neatly performed, and the more slowly the better.

A small bag is produced, rather larger than a sheet of note-paper, into which an egg (or rather the shell of one out of which the contents have been blown) is dropped. The corner of the bag must then be squeezed round it to show that it is there, and it may be felt by any one present. The corner of the open end of the bag is then held by the finger and thumb of the left hand, and the right placed in the bag, which is then held open end downwards, and the right hand withdrawn empty. The bag is then seized by the right hand, and struck violently against the table, and then crumpled up in the hands. It is then held with the mouth upwards, the right hand is again placed in the bag, and the egg unbroken produced.

The trick is performed in this way: The bag is made double on one side, thus forming a second bag, the mouth of which is at the bottom of the other. After the egg has been dropped in the bag and felt to be there, it is held in the right hand, while the bag is held bottom upwards, and then dropped in the second bag. The right hand is then withdrawn. When the edge of the bag is seized by the right hand, the egg must be also held in the same hand in the bag, and it is thus preserved from being broken when the bag is struck against the table, &c. The mouth of the bag being thus held upwards, the egg of course falls into the first bag, and is then taken out and shown.

To Fix a Penknife by its Point in the Ceiling, and afterwards place a Shilling so exactly under it that when dislodged by striking the Ceiling the Knife shall fall on the Shilling.

This is a most ingenious trick, and is done in this way: Mounting a table, stick the penknife by its point in the ceiling, but only sufficiently to support it. Then, after a deal of examination of its position, &c., place a piece of brown paper on the floor, on which put the shilling, and then say you will undertake to place the shilling so exactly under it that, when dislodged, the knife shall fall upon it. When wonder is excited, and it is declared to be impossible, call for a glass of water; then mounting on the table, dip the penknife in the water and withdraw the glass: a drop of water will soon fall on the paper, and on that very spot place the shilling. You then strike the ceiling with your fist, when the knife will fall, of course, on the shilling. The knife chosen for the purpose should be one having rather a heavy pointed handle, as the drop of water will then fall from the most central point.

To Produce a Cannon-ball from a Hat.

A ball must be turned out of any kind of soft light wood, and must have a hole bored in it large enough to admit the middle finger, and it should be painted black. The trick is performed in this way: On the front of the conjuring table, *i.e.*, the side next the spectators, should be placed a few layers of books, high enough to conceal from view the ball or any other apparatus with which it is intended to perform. On the side of the books next the performer the ball should be placed, with the hole in it towards him. The hat should be placed on the books on its side on the left-hand end of the table, with its crown next the spectators. When the trick is to be performed, the hat should be shown to be entirely empty, and then returned to its position on the books; then, having placed a hat-brush or silk handkerchief at the right hand of the table, say, "This trick cannot be performed unless the hat is perfectly smooth," and while leaning to the right to reach the brush or handkerchief, which diverts attention to *that* end of the table, the middle finger of the left hand must be placed in the hole in the ball, which is thus slipped into the hat, which must then be carefully brushed and held crown uppermost. The brush should then be put down, and the right thumb placed on the rim of the hat, with the fingers extended underneath so as to support the ball in the hat, and the left hand should then be placed in the same position, and the hat, with the ball in it, carried and placed upon another table. A small ball must then be produced, and a boy asked if he thinks he can hold it in his mouth, and told to try. The ball is then taken in the right hand, pretended to be thrown against the hat, "palmed," and concealed in the pocket. The boy should then be asked if he will again take the ball in his mouth, and while opening it the cannon-ball is suddenly taken from under the hat and placed in front of his face.

PUZZLES.

Puzzles are so numerous that to give the shortest possible description of every known puzzle would occupy an entire volume, and many of them are so complicated that to describe them fully would be impossible.

A few only have been selected, and those which have been well known for the last thirty or forty years have been intentionally omitted. As a brief key to most puzzles, it may be observed:

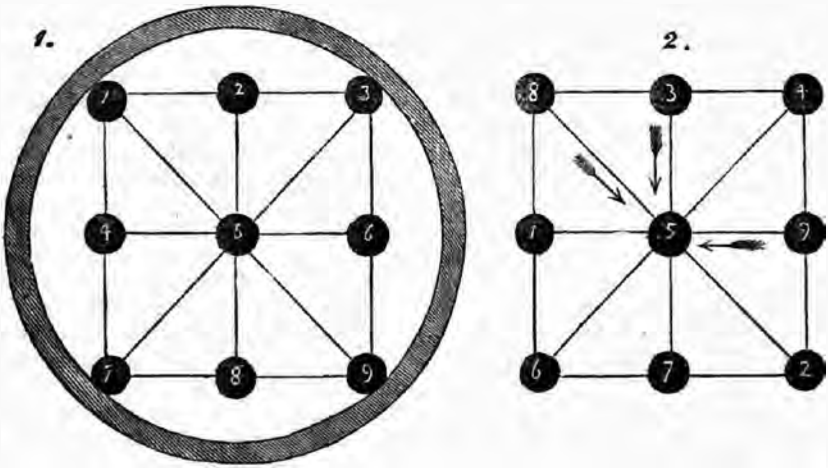
That, when a string is used, the key is generally to be found in a loop which can be drawn through a hole and slipped over a knot or a ball (see the balls and rings puzzle);

That, when a mechanical puzzle has a number of similar parts, such as a row of dots, pegs, or holes, one of them is tolerably sure to contain the key (see the cage and ball and the sceptre puzzles).

The Numerical Puzzle.

This will be found an excellent mental exercise. The puzzle consists in placing the balls, which are numbered from 1 to 9, in such positions that any line of the numbers, when added together, amount to the same.

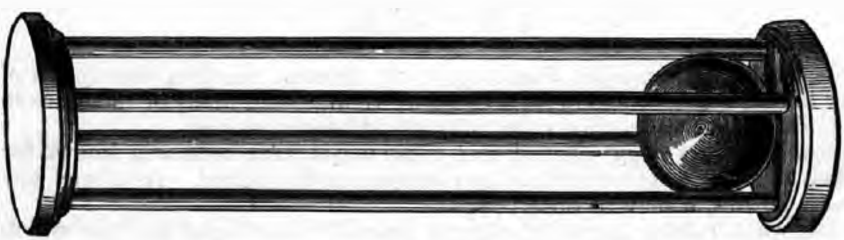
Fig. 1 shows the manner in which the board is constructed: it consists of a circular frame of wood, over the centre of which green cloth is stretched,



and on it lines in the form seen in the cut; at the angles are holes for the numbered balls to rest in. To change the position of these balls to the places in Fig. 2, it will be seen that the numbers are the same in all the lines if reckoned together.

The Cage and Ball.

This consists of four pillars fixed at either end into circular pieces of boxwood, which form the cage. The ball, which is kept imprisoned (as will be seen in the illustration), is not capable of being removed through the spaces



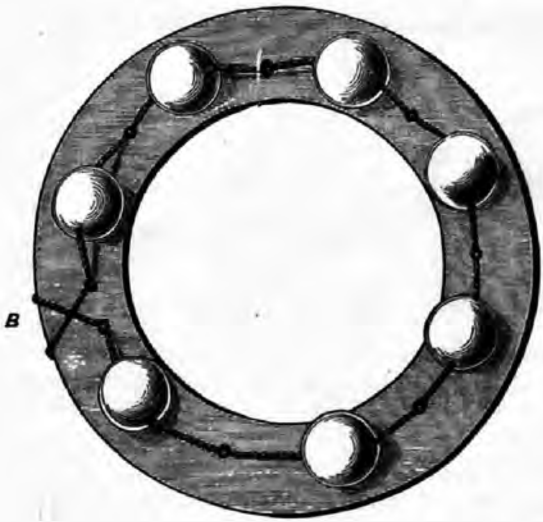
BALL IN CAGE.

between the pillars, it being too large. The puzzle is, therefore, to find out a means for the ball to escape. After trying in vain to move the pillars up or down, liberty seems impossible; but one of the pillars unscrews upon being twisted from left to right, when the cage is opened and the ball free.

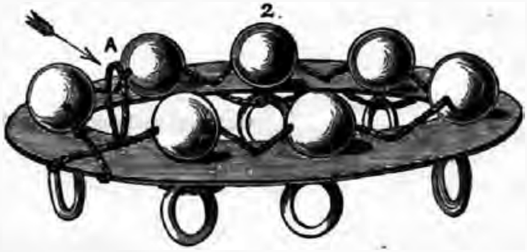
The Balls and Rings.

This is a very ingenious puzzle. It is a round frame of mahogany 2 in. wide and $\frac{1}{4}$ in. thick; in this at regular intervals are holes, between which are placed rings on one side and balls on the other, as shown in the cut. These are made fast with cord, which passes through each and then through the

1.



2.



holes in the frame; the ends of the cord are then tied in the form of a cross from one side of the frame to the other (B, Fig. 1).

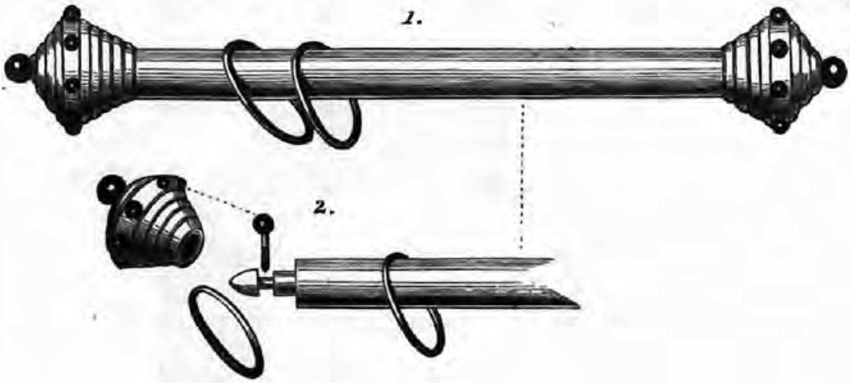
The puzzle is to remove the balls into the places of the rings without untieing the string—*i.e.*, from one side of the frame to the other.

It is done thus. In Fig. 2 at A the cord is pulled up tight, when it forms a loop through which the ball will pass, still remaining on its own string, and then over the edge of the frame, the rings being removed in the same way one by one into the vacant places, until the whole have changed position from one side of the frame to the other.

The Sceptre Puzzle.

This puzzle is of French origin, and consists of two rings on a rod, the ends of which prevent the rings from coming off. Fig. 1 shows the ends, which are ornamented with small black knobs.

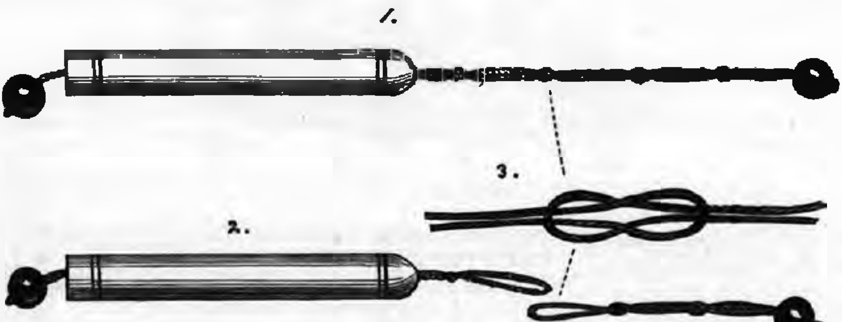
To release the rings is the puzzle, which is done thus: Upon testing the



fixture of all the black knobs, it will be found that one unscrews, the screw being of sufficient length to enter the groove in the end of the rod: unscrew it, and the end is detached (see Fig. 2), when the rings may be thus removed.

The Staff Puzzle.

This is formed of a staff made of box-wood, through the centre of which is a hole lengthways, and through this is passed a double cord; at the distance of $1\frac{1}{2}$ in. are knots, and at each end a button (Fig. 1). To free the staff from the buttons and cord is the puzzle.

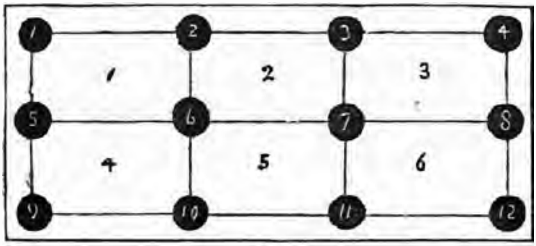


It is attainable thus (Fig. 2): The knot separated is a slip-knot—it is shown loose at Fig. 3. If the button is passed through the loop of the loosened knot it will free itself, and the other may be removed easily.

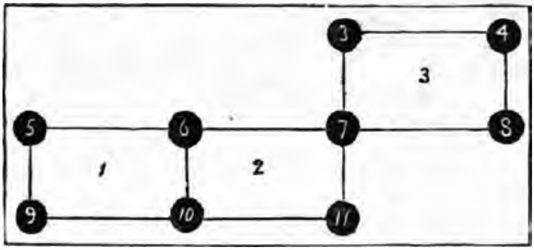
The Six-Square Puzzle.

Balls numbered from 1 to 12 are placed on a board to form the angles of six squares, as Fig. 1.

1.



2.



To remove three balls so that the remaining nine are at the angles of three perfect squares is the puzzle. Fig. 2 will show how it is done.

The Victoria Puzzle.

This puzzle is constructed of two pieces of wood of the same shape, with a wooden button between, as Fig. 1 will show. Through these is passed a cord,

1.

2.

Showing both Sides.

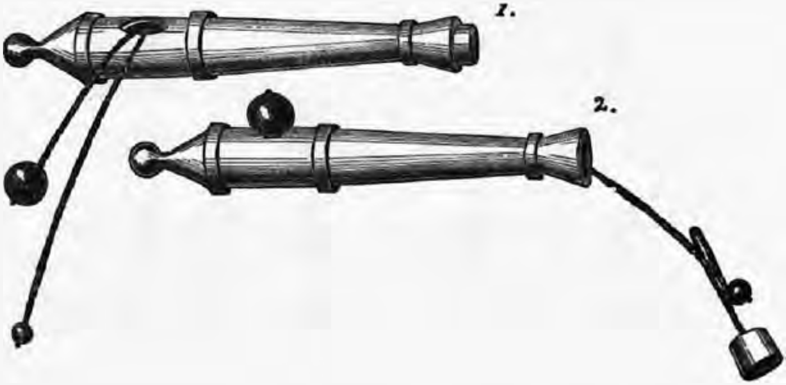
uniting the three in such a manner that it forms a most puzzling puzzle to get them free from the cord. We are indebted to Mr. Cremer, of Regent Street, who is the inventor, for the following description, as well as for the permission to engrave the whole of the illustrations of Puzzles.

Take one of the end pieces in the left hand, pull the loop up through the centre and pass it through the hole nearest the round piece of wood, then draw the remaining two pieces through the loop, pull the loop back again through the hole, and the cord will readily come off.

In playing this, care must be taken that the cord does not get twisted.

The Artillery Puzzle

is a box-wood cannon, with a small and large ball fixed by string at the breech internally. The puzzle is to remove these (Fig. 1). If the large ball is pulled, it will draw the smaller inside the cannon, and it cannot be extricated until the puzzle is played, which is done as follows:



A tightly-fitting plug at the mouth of the cannon (Fig. 2), when removed, draws out the cord by means of a loop fixed to it, which will slip over the small ball, and then, by taking hold of the ball at the breech, they can be freed from the cannon with ease.

QUESTIONS.

1. All pronounce me a wonderful piece of mechanism, and yet few have numbered up the strange medley of which I am composed. I have a large box, two lids, two caps and musical instruments, a number of weathercocks, and three established measures; some weapons of warfare, and a great many little articles that carpenters cannot do without. Then I always have about me a couple of esteemed fishes, and a great number of a smaller kind; two lofty trees and the fruit of an indigenous plant; a handsome stag and a vast number of smaller and less tame kind of game; two halls or places of worship; two students, or rather scholars, and half a score of Spanish gentlemen to attend upon me. I have also what is the terror of the slave, two domestic animals, and a number of negatives.

II.

Three feet have I, but ne'er attempt to go;
And many nails thereon, but not one toe.

III.

I shoot, but never kill a bird;
I fall—where, none can say.
Though fixed, I move; though seen by all,
I yet am far away.
Cut off my head.—when rightly used
And underfoot it's tied,
A class of men at once I'm made,
Who use me for a guide.
Transpose me now,—the word we have
Will partially explain
How Number One by Two is used,
To make their way more plain.
Once more: my first turned heels-o'er-head,
How sad a change is there!
From what we all so greatly love
To what we cannot bear.

IV.

My first is deep; my second skims the wave;
My third is heavy; and my whole was brave.

V.

In, my first, my second, sat; my third and fourth, I ate.

VI.

Cut off my head, and singular I seem;
Cut off my tail, and plural I appear;
Cut off both head and tail, and—wondrous to relate!—
Although my middle's left, there's nothing there.
What is my first? It is a sounding sea.
What is my last? It is a parent river.
And in their mingling depths I sportive play,
Parent of sweetest sounds, though mute for ever.

VII.

Cato and Chloe combined well together
Make a drink not amiss in very cold weather.

VIII.

My first's the joy of every cozy dame,
And in my second o'er to England came;
My whole of every household forms a part:
Thou art not Science, but thou teachest Art.

IX.

In my first for ever flow
Sounds of joy and sounds of woe;
In my second, newly made,
Thousands every year are laid;
In my whole we never jest,—
Prayers are made and sins confess'd.

X.

Come, let's look at it closely: 't is a very ugly word,
And one that makes us shudder whenever it is heard:
It may not be always wicked, but it must be always bad,
And speaks of sin and suffering enough to make us mad.
Folks tell us 't is a compound word, and that is very true;
And then they decompose it, which of course they 're free to do;
But why of twelve letters should they cut off the first three,
And leave the nine remaining as bad as they can be?
For though they seem to make it less, in fact they make it more,
And let the brute creation in, which was kept out before.
Let's try if we can't mend it,—it's possible we may,
If only we divide it in some new-fashioned way.
Suppose, instead of three and nine, we make it four and eight:
You 'll say 't will make a difference,—at least not very great;
But only see the consequence, that 's all that need be done
To change the mass of misery to unmitigated fun.
It clears off swords and pistols, proscriptions, bowie knives,
And all the horrid weapons by which men lose their lives.
It calls up Nature's voice, and, oh! how joyfully is heard
The native sound of merriment compressed into one word.
Yes! four and eight,—may that, my friends, be ever yours and mine
Though all the host of demons rejoice in three and nine.

XI.

My first is won and never lost;
  Reversed it 's now before ye;
My next reversed is red as blood
  In veins of Whig or Tory;
My whole 's so wondrous strange, that I
  Must candidly confess it,
Though you 're ingenious, it will be
  A wonder if you guess it.

XII.

There is a noun of plural number,
Foe to peace and tranquil slumber.
Now, any word you choose to take
By adding "s" you plural make,
But if you add an "s" to this
Strange is the metamorphosis:
Plural is plural now no more,
And sweet what bitter was before.

XIII.

My first in many a field is seen,
Of various hues, brown, white, and green:
Living, it may the eye delight,
But dead it is an ugly sight.
My next in Britain's ancient days
Roamed wildly through her forest ways;
A prisoner now, but kept and fed,

Kind hands supply its food and bed;
But, strange to say, when cold and dead,
We hang it up without its head.
My whole beside my first is seen,
With solemn pace and curious mien:
'T is shielded from its many foes
In armour (not of proof, it goes);
When winter comes, secure from harm,
Making its nest all soft and warm,
It sleeps away the cold dark hours,
And wakes again with April flowers.

XIV.

"'On, Stanley, on!'—were the last words of Marmion."

If I had been in Stanley's place
When Marmion urged him to the chase,
I there a thing should then descry
Would bring a tear to many an eye.

XV.

Can you tell me why a hypocrite's eye
Can better descry than you can, or I,
On how many toes a pussy-cat goes?

XVI.

The father of the Grecian Jove;
A little boy who's blind;
The foremost land in all the world;
The mother of mankind;
A poet whose love-sonnets are
Still very much admired:
The *initial* letters will declare
A blessing to the tired.

XVII.

Fire and sword. Fire and sword.

In the year 1792
F—R—A—N—C—E.

Liberty.

Laws.

~~Monarchy~~

Fire and Sword. Fire and Sword.

XVIII.

If your B m t put : if . putting :

XIX.

100 1 5 1 50. What all the world ought to be.

XX.

E A A A A A H H H H L L M Z B R S S

The above letters will form a name which occurs only twice in the Bible.

XXI.

A A A A A H H H N N P P T E Z

No name of nation or of place
I by these letters mean;
But if you do them rightly trace,
And put each letter in its place,
A name will still be seen.
To know what name these letters tell,
Take your Bible and read it well,
And when you've searched it through and round,
It only once will there be found.

XXII.

My whole is what must ever be
Of use to those who go to sea.
Cut off my head, and there behold
An animal just four years old;
Cut off my tail, and then I'll be
A fish—not taken from the sea.

RIDDLES.

1. If a church be on fire, why does the organ run the least possible chance of escape?
2. Why is a sailor the most learned person as to what occurs on the other side of the moon?
3. Why are persons born blind unfit to be carpenters?
4. What four letters would frighten a thief?
5. When is a sailor not a sailor?
6. Why is an old lady's cap the most economical article of human clothing?
7. Why does a man go into the law, remain in the law, and go out of the law?
8. When is a soldier not a soldier?
9. If a gentleman desired his daughter to take wine, the name of what country would he use?
10. What portion of the Mediterranean is the common chord of music like?
11. Black, white, and re(a)d all over?
12. What does a cat possess which no other animal has?
13. Why was Luther like a dyspeptic crow?
14. Who first introduced walking-sticks?
15. What is the difference between a baby and a pair of boots?
16. If a man met a crying pig, what animal would he call him?
17. What word becomes shorter by adding a syllable?
18. What is the difference between Charles Kean and Jonah?

19. What is the difference between the Mayor of Cork and a child's rocking-horse?
20. If a stupid fellow is going up for competitive examination, why should he study the letter P?
21. Why is I of all the vowels the most likely to get to heaven?
22. What is most like a cat's tail?
23. Which of the three following authors is the most industrious—Samuel Warren, Bulwer Lytton, or Charles Dickens?
24. With what two animals do you always go to bed?
25. Why is a naughty schoolboy like a penny postage-stamp?
26. What is the difference between Mario and a Cardinal?
27. Which of the animals took the most into the ark?
28. If the sea were to be drained, what would Neptune say?
29. Why does a lady not like a doctor to kiss her?
30. What is that which constantly changes its habit while it lives, is buried before it is dead, and whose tomb is valued wherever it is found?
31. You drink me, you eat me,—deny it who can!
 I am sometimes a woman, and sometimes a man.
32. Why is a naval outfitter a great bully?
33. Which two animals carried the least into the ark?
34. If you want a domestic servant, why should you choose a chimney-sweep?
35. Why need a man never starve in the Desert of Arabia?
36. When is it dangerous to walk by the river?
37. Why is a vine like a soldier?
38. Why is O the noisiest of all the vowels?
39. Why is a Member of Parliament like a shrimp?
40. When is a cockney nearest heaven?
41. When is a lover like a tailor?
42. Which is the most wonderful animal in the farm-yard?
43. What does a good-natured wife do?
44. Why is a barrister like a poker?
45. If you were obliged to swallow a man, whom would you prefer to swallow?
46. Why is a forged bank-note like a whisper?
47. Why do black sheep eat less than white?
48. Why must a magistrate be cold and chilly?
49. When is a traveller in the greatest hurry?
50. Which is the oldest tree?
51. Why is a barn-door hen sitting on a gate like a fourpenny-piece?
52. Why is a man searching for the Philosophers' Stone like Neptune?
53. Why is it dangerous to walk in the fields in spring?
54. Why is the National Anthem of the masculine gender?
55. What is the difference between a shabby fourpenny-piece and a half-crown?
56. What painter would be a favourite at sea?
57. What man is mentioned before Adam?
58. What is the difference between an old fowl and an ancient ferry-boat?
59. Take away half of thirteen, and yet eight will remain.
60. Why is the leaning tower of Pisa like Siberia?
61. What is most like a hen stealing?
62. When may a man be said to possess a vegetable timepiece?
63. What is worse than "raining cats and dogs"?
64. Why are Whigs and wigs alike?

65. What pleases in the air, what a horse does not like, and gives the name to a flower.
66. What was the difference between Douglas at Chevy Chase and Palmerston at Glasgow?
67. If an egg could speak, what preserve would it mention?
68. When is a fish like a bird?
69. What small bird does a Dorking fowl resemble when it steals my neighbour's barley?
70. The first is the cause of my second, and my whole must be kept.
71. Which is the cheapest way of buying a fiddle?
72. What wood makes the best piano?
73. What notes are of the most value, and how many tunes do they play?
74. When is butter like Irish children?
75. What went to Balaclava, stopped there, never went there, and came back again?
76. What is the colour of grass when covered with snow?
77. What did Princess Mary become when she married Prince Teck?
78. Why are little birds most unhappy in the morning?
79. A lady asked a gentleman his age: he replied, "What you do in everything."
80. Why was Robinson Crusoe not alone on the desert island?
81. What every one wants, what every one gives, what every one asks, and what very few take.
82. What is that which grows with its root upwards, which lives in winter, but dies in summer?
83. Why are babies like soldiers in a campaign?
84. What is the best weapon for a serious rifleman?
85. Why are university men like geese?
86. What is the riddle of riddles?
87. Why is it easier to be a clergyman than a physician?
88. Speak only two letters, and thus name the destiny of all earthly things.
89. What quadrupeds are admitted to balls, dinner parties, and operas?
90. What is better than presence of mind in a railway accident?
91. How many days belong to the year?
92. Why does a jester resemble a fowl?
93. What word is that which contains all the vowels, and in their order?
94. Why is a woman churning like a caterpillar?
95. If the poker, tongs, and shovel cost £3, what would the coals come to?
96. What is that which occurs twice in a moment, once in a minute, and not once in a thousand years?
97. What is that which is the constant possession of every human being, which cannot be bought, yet has been sold; it is invisible—never seen, but often felt?
98. What is that which will give a cold, cure a cold, and pay the doctor's bill?
99. What is that which has neither flesh nor bone, yet has four fingers and a thumb?
100. If the d——l were to lose his tail, why would he go to an inn?
101. Why is a farmer surprised at the letter G?
102. When is an alderman like a ghost?
103. What is that which no one wishes to have, yet no one wishes to lose?
104. Why is the letter G like the sun?
105. What tree is an officious gossip?

106. My first is a plaything; my second no one wishes to play with; and my whole plays with nobody.
107. Who first introduced salt provisions into the ark?
108. What is the difference between a bare head and a hair bed?
109. Who was the first whistler, and what did he whistle?
110. When is a man thinner than a lath?
111. Why are gymnastics like the tide at low water?
112. Why is the letter D like a wedding ring?
113. How did Jonah exhibit his feelings when he was swallowed by the whale?
114. When is money damp?
115. Why is a rakish Israelite like a witticism?
116. What sweetens the cup of life, yet, divested of its end, embitters the most grateful draught?
117. Why is a lovely young lady like a hinge?
118. When is a fellow's eye like a barrel?
119. Why is a fool like a needle?
120. What is invisible blue?
121. Which is of the most value, a £5 note or five sovereigns?
122. Why is a fiddle like a bad hotel?
123. Why is a bad wife better than a good one?
124. Why should ladies never learn French?
125. Which tree is the most suggestive of kissing?
126. What animal falls from the clouds?
127. When is a ship foolishly in love?
128. When is a ship dishonourably in love?
129. When is a ship honourably in love?
130. Why are washerwomen the most stupid people?
131. Why should a cabman never be a coward?
132. Why should an apothecary be the most sober of men?
133. What is the most difficult surgical operation?
134. Why are there no flirtations on board the P. and O. steamers?
135. What did the sunbeam say to the opening rose-bud?
136. Why is a person casting-up accounts like a venomous reptile?
137. Why is an empty cellar like a ship a sea?
138. What letter made Queen Bess mind her P's and Q's?
139. What is that from which if the whole be taken some will yet remain?
140. Why would it be useless going to an auction where Chang was?
141. Why are people who sit in free seats not likely to get any good from going to church?
142. Why should it affront an owl to mistake him for a pheasant?
143. Why must a manufacturer of steel pens be a very immoral character?
144. Why does Noah resemble an unfortunate rat-catcher?
145. Why is Gray's Inn supposed to be the oldest inn in London?
146. Why are deep sighs like long stockings?
147. When has a man four hands?
148. Why is it easy to break into an old man's house?
149. Why should you not go to London by the 12.50 train?
150. Why should the male sex avoid the letter A?
151. What is the best way of making a coat last?
152. Why does a day labourer never cease growing?
153. When does a man sneeze three times?

154. What relation is the door-mat to the scraper?
155. Why does a piebald pony never pay toll?
156. Why is a Pharisee a cheerful man?
157. When are you like a spider?
158. When does a hen peck the hardest?
159. Why is the best baker most in want of bread?
160. Why is the letter S like a sewing machine?
161. Why do ducks go under water?
162. Why is France never afraid of inundations?
163. What is the difference between a cow and a broken chair?
164. What three letters are of most use to a statesman?
165. When does a man look most like a cannon-ball?
166. Why is the letter A like a honeysuckle?
167. What flower most resembles a bull's mouth?
168. What does a stone become in the water?
169. Why is a spectator like a bee-hive?
170. When may we expect water to be expensive?
171. When is an umbrella not an umbrella?
172. Why is the letter N like a pig?
173. Why is a theatre the saddest of places?
174. When is cheese like Goliath the Philistine?
175. What lane do ladies most like walking in?
176. Why is a lean monarch a contemplative man?
177. What preserve was taken into the ark?
178. Why is a tournament like sleep?
179. Why is rheumatism like a glutton?
180. Why is the county of Buckingham like a drover's goad?
181. Why are sailors bad horsemen?
182. Why should a man never marry a woman named Ellen?
183. When is a soldier not half a soldier?
184. When was beef-tea first introduced into England?
185. Why is Cupid like poverty?
186. What people can never live long, nor wear greatcoats?
187. Why is a horse doctor like a water-rat?
188. When was B the first letter of the alphabet?
189. When does a man eat his furniture?
190. What letter does a deaf woman like best?
191. Why is an old woman like a well-driven nail?
192. Why is a pig's tail like a carving-knife?
193. When does a man belong to the vegetable kingdom?
194. Why are ladies like churches?
195. Why ought the children of a thief to be burnt?
196. When is love a deformity?
197. Why is a mouse like hay?
198. Why is a madman equal to two men?
199. Why are good resolutions like fainting ladies?
200. Why is a short person like an entertaining book?
201. What wonderful metamorphosis is a laundress subject to?
202. If cheese comes after meat, what comes after cheese?
203. What animal was in existence before the creation?
204. When were newspapers first mentioned?

205. Why must the inventor of beaver hats have been necessarily a talented man?
206. Why was the Fire King at Cremorne like Hermit on the 22nd of May?
207. Why were the Belgians not in good spirits when they came to Wimbledon?

ACROSTICS.

I.

"To arms!" he cried, the Hermit of the Rock;
"To arms!" the people answered in a breath:
Vainly might navies his bare isle enlock,
He 'scaped, exultant, to success—or death.
But ere he reached the city's strong redoubt
A deadlier engine was assigned his doom:
Science, not courage, put him to the rout,
And sent him, baffled, to a living tomb.

1. Once eloquent on mountain heights,
Now dying out, like Jacobites

2. Singly I'm a poor creature,
Collectively a great feature;
Scattered in volumes, fastened in frames,
Though I do little but iterate names.

3. Subscribe to Grove's new Syrian Expedition,
And from his diggers learn my full description.

4. All too high he pitched his flight,
Soaring where the ether springs;
We, like him, find stern daylight
Fatal to our waxen wings.

5. In England I'm a lump
Of wood, or brass, or clay;
In Yankeeland a man
With labourers in my pay.

6. Britain, envying Lisbon's vine,
Begged from Bacchus some such tree;
Growled the god, "There's barley-wine,
Drink it, and don't bother me!"

7. In the dusk like moth I show,
Down the streets in glittering row,
Cheerer of the wintry weather,
Feast and song about me gather.

8. We learn 't was good for kitchen duty,
But all aver it was no beauty;
Like homely wife, the best of cooks,
Who shames us by her parlour looks;
But as 't is vanished from the earth,
No matter what its looks were worth.

9. Whate'er our century may miss,
None can accuse its sons as *this;*
They fuss and fume on daily toil,
Each foremost scrambling for the spoil,
Till, worn out by the tug and tussle,
We wish they *were* this in the bustle.

II.

Men too oft confuse these twain,
And for the first the second squander;
A fatal loss they find that gain,
A loss for sage profound to ponder.

1. I preside at City dinners,
Not a single word I say;
Oh, how many fools and sinners
I 've seen in my day!

2. It flows and flows as it never would end,
With many a twisting and many a bend;
But the stream's longest course, and the life's longest sweep,
Must finish at last in the fathomless deep.

3. The buffalo in his prairie feeds on the herbage rank,
The mustang, sharply ridden, already nears his flank,
Out flies the curling leather, down falls the mighty brute,
The rider's knife is ready—one death-roar—all is mute!

4. In the workman's hand a tool,
On the lady's breast a flash,
In the pastime of the fool
Mad excitement, ruin's crash.

III.

The old man sits in his old arm-chair,
His old arms clasp its elbows old;
He will not move, nor change the air,
Nor bribe nor threat can loose his hold.
The rusty keys of broken doors
With miser grip he clutches fast:
The world outside him yells and roars,
But in that place he 'll die at last.

1. Exile is harsh to the free who range foreign lands at their will,
But exile in fetters must be a bitterness bitterer still.

2. Poor fellow! his throne was no joke, with Klepht, Albanian, and Turk;
Banditti all over his hills, the only industrious work;
The nations all offering advice, and now and then sprinklings of cash,
Then quarrelling how he should spend it. No wonder his kingdom went smash!

3. A thousand spring into life,
And perish like summer flies,
One in a thousand thousand
Fame doth immortalize.

4. In the South-east Isle blacks did adore him,
In the North-west Isle blacks fled before him;
Some folks revere him, patriot and hero,
Some folks denounce him viler than Nero.

IV.

"Ah, happy isle where summer reigns!"
We shivering 'neath our blankets cried:
"No fog her azure ether stains,
No frost-bite nips her gardens' pride"——
But while we praised her golden light,
And rhymed her merits o'er again,
The wild wind smote her in his might,
And foundered houses, ships, and men.

1. Oh, the trees of the desert, green to the wanderer's eye!
Oh, the fruits of the desert, sweet to the palate dry!
Every year to the desert cometh the caravan,
Laden on hunches of camels beareth all fruit that it can.

2. I was when the world was made,
Yet am I fresh as the morn;
Where I am not health must fade,
And the baby perish new-born.
My presence you cannot tell
By hearing, seeing, or smell;
My absence you surely find
By the lassitude left behind.

3. Fierce amid the gentle, 'mid the timid bold,
Curves and lines of beauty architects of old
Drew from his small person, as is often seen,
Genius giving glory to common things and mean.

4. Wiseacres in the mid ages
Quarrelled and puzzled their mind
How many stand-points for angels
On a pin's point they could find.
Wiseacres nowadays worry
Room for all people to seek
On the high crest of good fortune,
All on the uppermost peak:
No one will stand any lower,
Each must the other surpass:
Near them mediæval wiseacre
Was not, I think, such an ass!

5. Rough and dull in earthy nest,
Polished into lustre bright,
Man obeyeth its behest,
Its omnipotence of might.

6. On the mountain's gorge he stood,
Lavish of heroic blood,

That his country might not fall
Victim of a foreign thrall;
Battling on that mountain-side
He and his three hundred died.

7. The moral of fables, the pest of the tropics,
Where daily its mischiefs are wearisome topics;
It eats through your timbers, it eats through your boots,
It bites at your skin and spoils all your good looks.

V.

With stealthy creep her Anacondic coils
O'er the wide desert on her prey advance;
Amid his hills, rent by intestine broils,
Her victim feels the fascinating glance,
As every struggle of dissention draws
Him to the gullet of those greedy jaws.

1. Sindbad the Sailor mounted me,
And through the sky I bore him;
Aladdin's wife offended me,
In rage I nearly tore him.

2. Sunshine in a shady place,
Lions licked her virgin hand.

3. Trust me, 't was a useless case
To attempt it in the Strand.

4. Rome's famous general, bald before his years;
Pelissier's predecessor in Algiers,
But now degraded to such vulgar spheres,
You call his name,—a woolly head appears.

5. He built that window, broad and high,
Whence stepped a crownless king to die.

6. White Lady! White Lady! how oft as a child
I looked for thy shape by the waterfall wild,
And saw in the foam-sheet the waft of thy dress,
In the autumn-gold birch-spray the curl of thy tress,
And heard in the plash of the stream as it fell,
The murmuring cadence of sorcery's spell.

ANSWERS TO QUESTIONS.

I. Wonderful piece of mechanism—the human body:

A large box	The chest.
Two lids	Eyelids.
Two caps	Knee-caps.
Musical instruments	Drums (of ears).
Weathercocks	Vanes (veins).
Three established measures	Hand, foot, and nail.
Little articles that carpenters cannot dispense with	Nails.
Couple of esteemed fishes	Soles.
A great number of a smaller kind	Muscles (mussels).
Weapons of warfare	Arms.
Two lofty trees	Palms.
Fruit of an indigenous plant	Hips.
A handsome stag	Heart (hart).
Smaller kind of game	Hair (hare).
Two places of worship	Temples.
Two students	Pupils.
Half a score of Spanish gentlemen	Tendons.
The terror of the slave	Lashes.
Two domestic animals	Calves.
Number of negatives	Nose (noes).

II. A yard measure.
III. Star—tars—arts—rats.
IV. Well—ling—ton: Wellington.
V. In-sat-I-ate.
VI. Cod—od—Co—O—C—D: Cod-sounds.
VII. Chocolate.
VIII. Tea—chest (teachest).
IX. Ear—nest (earnest).
X. Manslaughter (man's laughter).
XI. Wonder.
XII. Cares—caress.
XIII. Hedge—hog (hedgehog).
XIV. On-I-on (onion).
XV. A hypocrite cheat can best count*erfeit*,
So 't is natural to suppose he can best
count *her toes*.
XVI. Socrates — Love — England — Eve — Petrarch.
XVII. In the year 1792 France was divided, liberty set aside, laws turned upside down, monarchy erased, and fire and sword in every quarter.
XVIII. If your grate be (great *b*) empty, put coal on (colon); if full, stop (full stop) putting coal on.
XIX. CIVIL.
XX. Mahershalal-hashbaz (Genesis viii. 1, 3).
XXI. See Genesis xli. 45.
XXII. Chart—hart—char.

ANSWERS TO RIDDLES.

1. Because the engine cannot play upon it.
2. Because he has been to see (sea).
3. Because they never *saw*.
4. O I C U (oh, I see you).
5. When he is aboard.
6. Because she never wears it out.
7. He goes into the law to get *on*; he remains in the law to get *oner*; he retires from the law to get *onest*.
8. When he is mustered.
9. Port-you-gal?
10. E G and C (Ægean Sea).
11. "Times" newspaper.
12. Kittens.
13. Because the Diet of Worms disagreed with him.
14. Eve, when she presented Adam with a little Cain.
15. One is what I was, the other what I wear.
16. Pork, you pine (porcupine).
17. Short.
18. Charles Kean was brought up at Eton, Jonah was eaten and brought up.
19. One is Mayor of Cork, and the other a horse of wood.
20. Because P makes ass Pass.
21. Because E is in hell and all the rest are in purgatory.
22. A kitten's tail.
23. Charles Dickens, because, though Samuel Warren wrote "Now and Then," Bulwer Lytton "Night and Morning," yet Charles Dickens wrote "All the Year Round."
24. Two calves.
25. Because you lick it and place it in the corner.
26. A Cardinal performs mass in red, Mario "Masaniello" (mass in yellow).
27. The elephant, for he carried his trunk.
28. I haven't a notion (an ocean).
29. Because she does not like a doctor's bill thrust in her face.
30. The silkworm.
31. A toast.
32. Because he gives cuffs right and left to many a blue-jacket.
33. The fox and the cock, for they carried a brush and comb between them.
34. Because he is sure to suit (soot) you.
35. Because of the sand which is (sandwiches) there.
36. When the bulrush is (bull rushes) out.
37. Because it is listed and trained, has ten drills, and shoots.
38. Because all the rest are in audible.
39. Because he has M.P. at the end of his name.
40. When he is on a lark.
41. When he presses his suit.
42. A pig, for it is killed first and cured afterwards.
43. Study "Self-help" and "Smiles."
44. Because he is often at the bar.
45. A little Dublin porter.
46. Because it is uttered, but not allowed (aloud).
47. Because there are fewer of them.
48. He is just-ice.
49. When he goes over to Rome, and leaves Thirty-nine Articles behind him.
50. The elder.
51. Because her head is on one side, and her tail on the other.

52. Because he is a-seeking (sea-king) what never was.
53. Because the hedges are shooting.
54. Because it is a hymn (him).
55. Two shillings and two pence.
56. Landseer.
57. Chap. the First.
58. One is a foul old wherry, and the other a "wery" old fowl.
59. XIII. ~~XIII.~~
60. Because it 's oblique (it 's so bleak).
61. A cock robbing (Cock Robin).
62. When he gets up at eight o' (a potato) clock.
63. Hailing omnibuses.
64. Because they both profess an attachment to the Crown.
65. Larkspur.
66. Douglas was stout and good; Palmerston had gout and stood.
67. Marmalade! (Ma me laid!)
68. When it takes a fly.
69. Cock Robin (robbing).
70. Sunday.
71. Buy two pennyworth of medicine and you get a vial in.
72. Broadwood.
73. Bank-notes, and they play for-tunes.
74. When it is made into little Pats.
75. A chronometer.
76. Invisible green.
77. Polly Teck.
78. Because their bills are all over (dew) due.
79. XL.
80. Because there was a heavy swell on the beach, and a sandy cove running up the shore.
81. Advice.
82. Icicle.
83. Because they are infantry in arms.
84. A converted Enfield.
85. Because they are fed on commons, are crammed and stuffed, and when plucked are regularly sold.
86. Life: because we must all give it up.
87. Because it is easier to preach than to practise.
88. DK.
89. Kids.
90. Absence of body.
91. 322; all the rest are Lent.
92. Each possesses a merry thought.
93. Facetiously.
94. Because she makes the butter fly.
95. Ashes.
96. The letter M.
97. The soul.
98. A draught (draft).
99. A glove.
100. Because bad spirits are re-tailed there.
101. Because it makes oats goats.
102. When he is a-gobbling.
103. A bald head.
104. Because it is the centre of light.
105. The medlar.
106. The rattlesnake.
107. Noah when he took Ham.
108. One flees for shelter and the other is a shelter for fleas.
109. The wind: he whistled "over the hills and far away."
110. When he is a-shaving.
111. Because they develop the muscles (mussels).
112. Because *we* cannot be *wed* without it.
113. He was down in the mouth and went to blubber.
114. When it is dew (due) in the morning and mist (missed) at night.
115. Because he is a Jew de spree *(Jeu d'esprit).*
116. Hope—hop.
117. Because she is something to adore (a door).
118. When it is bunged up.
119. Because he has an eye but no head.
120. A policeman when you want him.
121. A £5 note, because when you put it in your pocket you double it, and when you take it out you find it in creases.
122. Because it is a vile inn (violin).
123. Because bad is the best.
124. Because one tongue is enough for any woman.
125. Yew (you).
126. Reindeer (rain, dear).
127. When she is attached to a big buoy.
128. When she is anchoring (hankering) after a heavy swell.
129. When she is tender to a man-of-war.
130. Because they put out their tubs to catch soft water when it rains hard.
131. Because "none but the brave deserve the fair" (fare).
132. Because though any man may have a scruple, he makes three scruples to a dram.
133. To take the jaw out of a woman.
134. Because all the mails (males) are tied up in bags.
135. "You be blowed!"
136. Because he is an adder.
137. Because it is out of port.
138. R made her (Armada).
139. The word "wholesome."
140. Because he is sure to be the highest bidder.
141. Because they get good for nothing.
142. Because it is making game of him.
143. Because he makes his customers (steel) steal pens, and then persuades them that they do (write) right.
144. Because he did not see Ararat (e'er a rat) for forty days.
145. Because Nebuchadnezzar was a grazing (Gray's Inn) man.
146. Because they are "Heigh-hos!" (high hose).
147. When he doubles his fists.
148. Because his gait is broken and his locks are few.
149. Because it is ten to one if you catch it.
150. Because it makes men mean.
151. Making the waistcoat and trousers first.
152. Because he gets hire (higher) daily.
153. When he cannot help it.
154. A step farther (step-father).
155. Because his master pays it for him.
156. Because he is not sad, you see (Sadducee).
157. When you take a fly.
158. When she is in earnest (her nest).
159. Because he kneads (needs) the most.
160. Because it makes needles needless.
161. For divers reasons.
162. Because all the water is "*Teau.*"
163. One gives milk and the other gives whey (way).
164. A Y Z (a wise head).
165. When he looks round.
166. Because a B (bee) follows it.
167. A cowslip
168. Wet.

169. Because he is a *be*holder.
170. When we see rain, dear.
171. When it is "well wet" (w(v)elw(v)et).
172. Because it makes a sty nasty.
173. Because all the boxes are in tiers (tears).
174. When it is mitey (mighty).
175. *Mousseline de Laine.*
176. Because he is a thin king (thinking).
177. Preserved pairs (pears).
178. Because it is a (k)nightly occupation.
179. Because it attacks the joints.
180. Because it runs into Oxon and Herts.
181. Because they generally ride on the main.
182. Because he would ring his own Nell (knell).
183. When he is in quarters.
184. When Henry VIII. dissolved the Pope's bull
185. Because he drives people to the Union.
186. Dwarfs.
187. Because he is wet and hairy (veterinary).
188. In the days of no A (Noah).
189. When he has his pianoforte (piano for tea).
190. A, for it makes her hear.
191. Because she is infirm (in firm).
192. Because it is flourished over the ham.
193. When long experience has made him sage.
194. Because there is no living without them.
195. Because they 're pa steals (pastilles).
196. When it is all on one side.
197. Because the cat 'll (cattle) eat it.
198. Because he is one beside himself.
199. Because they ought to be promptly carried out.
200. Because he is often looked over.
201. She goes to bed a laundress and gets up fine linen.
202. A mouse.
203. The old shay hoss (Chaos).
204. When Cain took a "Bell's Life" (Abel's life).
205. Because he must have had a *fur tile* imagination.
206. Because he came in asbestos (as best hoss).
207. Because they came with a "tir" in their eye.

ANSWERS TO ACROSTICS.

I.

GARIBALDI—CHASSEPOT.

1.	G	aeli	C
2.	A	utograp	H
3.	R	am	A
4.	I	caru	S
5.	B	os	S
6.	A	l	E
7.	L	am	P
8.	D	od	O
9.	I	ndolen	T

II.

GOLD—GOOD.

1.	G	o	G
2.	O	rino	O
3.	L	ass	O
4.	D	iamon	D

III.

POPE—ROME.

1.	P	risone	R
2.	O	th	O
3.	P	oe	M
4.	E	yr	E

IV.

TORTOLA—TEMPEST.

1.	T	afila	T
2.	O	zon	E
3.	R	a	M
4.	T	o	P
5.	O	r	E
6.	L	eonida	S
7.	A	n	T

V.

RUSSIA—CABOOL.

1.	R	o	C
2.	U	n	A
3.	S	cru	B
4.	S	cipi	O
5.	I	nig	O
6.	A	vene	L

Ventriloquism and Polyphony.

WHAT IS VENTRILOQUISM.

Before we initiate the reader into the precise and minute instructions which he will have to study and practise ere he can become the possessor of the coveted art, it will be necessary to inform him what Ventriloquism* is, and in what it consists. In doing so, we shall endeavour to be as plain and clear as possible. Ventriloquism may be divided into two sections, or general heads, the first of which may be appropriately designated as "Polyphonism," and consists of the simple imitation of the voices of human creatures, of animals, of musical instruments, and sounds and noises of every description in which no illusion is intended, but where, on the contrary, the imitation is avowedly executed by the mimic, amongst which we may classify sawing, planing, door-creaking, sounds of musical instruments, and other similar imitations.

Secondly, we have ventriloquism proper, which consists in the imitation of such voices, sounds, and noises, not as originating in him, but in some other appropriate source at a given or varying distance, in any or even in several directions, either singly or together—a process exciting both wonder and amusement, and which may be accomplished by thousands who have hitherto viewed the ventriloquist as invested with a power wholly denied by nature to themselves. It is needless to observe, that when the imitations are effected without a movement of mouth, features, or body, the astonishment of the audience is considerably enhanced.

The terms Polyphony, Mimicry, or Imitation, are employed to designate results obtained in reference to the first division of the subject, where no illusion is intended; while the term Ventriloquism distinguishes those under the second division, where an illusion is palpably produced. The first is much more common than the latter; indeed, there is scarcely a public school which does not possess at least one boy capable of imitating the mewing of a cat, the barking of a dog, or the squeaking voice of an old woman. On the other hand, from a want of the knowledge of *how* to proceed, it is very seldom that even a blundering attempt at ventriloquism is heard, except from a public platform.

The art does not depend on a particular structure or organization, but may be acquired by almost any one ardently desirous of attaining it, and determined to persevere in repeated trials.

The judgments we form concerning the situation and distance of bodies, by means of the senses mutually assisting and correcting each other, seem to be

* Literally signifying belly-speaking, from *venter*, the belly, and *loquor*, I speak.

entirely founded on experience ; and we pass from the sign to the thing signified by it immediately, or at least without any intermediate steps perceptible to ourselves.

Hence it follows that if a man, though in the same room with another, can by any peculiar modifications of the organs of speech produce a sound which, in faintness, tone, body, and every other sensible quality, perfectly resembles a sound delivered from the roof of an opposite house, the ear will naturally, without examination, refer it to that situation and distance ; the sound which he hears being only a sign, which from infancy he has been accustomed, by experience, to associate with the idea of a person speaking from a house-top. A deception of this kind is practised with success on the organ and other musical instruments.

It is the business of the ventriloquist to amuse his admirers with tricks resembling the foregoing delusion ; and it will be readily granted that he has a subtle sense, highly corrected by experience, to manage, on which account the judgment must be cheated as well as the ear.

This can only be accomplished by making the pulses, constituting his words, strike the heads of his hearers not in the right lines that join their persons and his. He must, therefore, know how to disguise the true direction of his voice, because the artifice will give him an opportunity to substitute almost any echo he chooses in the place of it. But the superior part of the human body has been already proved to form an extensive seat of sound, from every point of which the pulses are repelled as if they diverged from a common centre. This is the reason why people, who speak in the usual way, cannot conceal the direction of their voices, which in reality *fly off towards all points at the same instant.* The ventriloquist, therefore, by some means or other, acquires the difficult habit of *contracting* the field of sound within the *compass of his lips*, which enables him to confine the real path of his voice to narrow limits. For he who is master of his art has nothing to do but to place his mouth obliquely to the company, and to dart his words out of his mouth—if the expression may be used—whence they will then strike the ears of the audience as that from an unexpected quarter. Nature seems to fix no bounds to this kind of deception, only care must be taken not to let the path of the direct pulses pass too near the head of the person who is played upon, lest the divergency of the pulses make him perceive the voice itself.

THE THEORY OF VENTRILOQUISM.

Many physiologists aver that ventriloquism is obtained by speaking during the inspiration of air. It is quite possible to articulate under these circumstances, and the plan may with advantage be occasionally adopted ; but our own practical experience and close observation of many public performers, and of not a few private friends who have attained distinctness and no small amount of facility in the art, convince us that the general current of utterance is, as in ordinary speech, during *expiration* of the breath. Some imagine that the means of procuring the required imitation are comprised in a thorough management of the echoes of sound. Unfortunately, however, for this theory, an echo only repeats what has been already brought into existence. Several eminent ventriloquists, including the late Mr. Mathews, have displayed the vocal illusion while walking in the streets. Baron Mengen describes as follows his mode of speaking when he desired the illusion to take the direction of a voice emanating from a doll: "*I press my tongue against the teeth, and thus circumscribe a cavity between my left cheek and teeth, in which the voice is produced by the air held in reserve in the pharynx.* The sounds thus receive a hollow and muffled tone, which causes them to appear to come from a distance." The Baron furthermore mentions that it is essential to have the breath well under control, and not to respire more than can be avoided.

A person having an ear acutely perceptive to the nice distinctions of sounds, may, by a little practice, imitate many sounds with accuracy. Those persons, however, who are highly endowed with the mental requisites, which consist of an intense desire to mimic, coupled with the ability to originate mimetic ideas, are able to imitate sounds at first hearing.

We next proceed to treat of those illusions, where the voice so perfectly counterfeits the reality intended, that it appears not to issue from the mimic, but from an appropriate source, in whatever direction and at whatever distance the source may be. We do not hear the distance which a sound has travelled from its source, but we judge the distance from our former experience, by comparing the loudness which we hear with the known distance and known loudness of similar sounds heard on former occasions. Common experience will prove that we oftener err in estimating the distance of uncommon than of familiar sounds. In apology for such an error, the ordinary language is, "It seemed too loud to come so far," or "It seemed too near to be so faint a sound," as the case may be,—both of which are apologies for an erroneous judgment, and not for faulty hearing. Near sounds are louder than distant ones. Now, by preserving the same *pitch*, *quality*, and *duration*, but with an *accurately graduated reductiou of loudness*, a series forming a *perspective* of sounds may be created, which, falling in succession on the ear, will suggest to the mind a constantly increasing distance of the sound's source. The estimate, then, which is formed of the distance which a sound has travelled before reaching the ear is a judgment of the mind formed by comparing a present perception (by hearing) with the remembrance of a former loudnes in connexion with its known distance. With regard to direction, it is observed, "The direction whence a sound comes seems to be judged of by the right or left ear receiving the stronger impression, which, however, can only take place when the sound's source is in a plane, or nearly so, with a line passing through both ears. It is familiarly known that a person in a house cannot by the noise of an approaching carriage judge with certainty whether it is coming from the right or left. He accurately judges it to be approaching, passing, or receding, as the case may be, by the gradations of loudness, but is unable to decide with certainty whether its approach or recession is from up or down the street. Enough has been stated to show that we do not *hear*, but that we judge *the direction a sound has travelled from its source on reaching the ear.*" The ventriloquist indicates, either directly or indirectly, the direction from which he wishes his audience to believe the sound is coming. Thus he directly indicates it by words, such as, "Are you up there?" "He is up the chimney," "He is in the cellar," "Are you down there?" &c., as illustrated in the various examples. He indirectly indicates it by some suggestive circumstance, as an action or gesture, which is so skilfully unobtrusive and natural as to effect its object without being discovered. Thus, when the ventriloquist looks or listens in any direction, or even simply turns towards any point, as if he expected sound to come thence, *the attention of an audience is by that means instantly directed also to the same place.* Thus, before a sound is produced, the audience expect it to come in the *suggested direction;* and the ventriloquist has merely, by his *adjustment of vocal loudness*, to indicate the necessary distance, when a *misjudgment of the audience will complete the illusion which he has begun.*

The effect which is produced on sound by its travelling from a distance is observed to be:

1. That its loudness is reduced in proportion to its distance.
2. That its *pitch* remains unaltered.
3. That its *quality* or *tone* is somewhat altered.
4. That its duration remains unaltered.
5. That the human speech is *somewhat obscured*, chiefly in the *consonant* sounds.

It must be remembered that the ventriloquist makes the sound, not as it is heard at its source, *but as it is heard after travelling from a distance.*

PRACTICAL ILLUSTRATIONS.

No. I.

THE VOICE IN THE CLOSET.

This is the voice in which Mr. Frederic Maccabe, the celebrated mimic and ventriloquist, excels; and the clever manner in which he can adopt it off-hand, as it were, will be best illustrated by the fact mentioned to us by a gentleman (whom we will call Mr. B.), in Mr. Maccabe's presence. Mr. B., who was an invalid, suffering from some nervous disorder, originating from overwork and anxiety, was travelling in Ireland in search of health, and when on his way from Dublin to Cork, he lay exhausted in a corner of the railway-carriage, muffled up in cloaks and wrappers in a paroxysm of pain. At Mallow, two gentlemen entered the carriage, one of whom was in exuberant spirits, and commenced telling some amusing anecdotes. At length the porter came to collect the tickets. They were all handed in but one, when the following colloquy ensued:

Porter. A gentleman hasn't given me his ticket.

Gentleman. Bill, in the next compartment, has the ticket (*tapping at the partition*). Haven't you, Bill?

The imaginary Bill, who appeared to be suffering from a severe cold, replied that he had, and the porter would not take it. The official went off to find the ticket, but Bill, in the meantime, had vanished. Back came the porter, and indignantly demanded the ticket. He was interrupted by a shrill voice in the opposite compartment, crying, "Porter! porter! why don't you come and take the ticket? there's some one insulting me!" Away went the chivalric porter, to come back puzzled and chafed to receive the ticket, which was handed to him. His hand had not reached the coveted piece of pasteboard, ere the yell of a terrier under the wheels caused the porter to draw back, amid bursts of laughter, during which the ticket was thrown out, and the train moved on. And Mr. Frederic Maccabe stood confessed, but not penitent.

VOICE NO. 1.—To acquire this voice, which we so name for distinction's sake, speak any word or sentence in your own natural tones; then open the mouth and *fix the jaws* fast, as though you were trying to hinder any one from opening them farther or shutting them; draw the tongue back in a ball; speak the same words, and the sound, instead of being formed in the mouth, will be formed in the pharynx. Great attention must be paid to holding the jaws rigid. The sound will then be found to imitate a voice heard from the other side of a door when it is closed, or under a floor, or through a wall. To ventriloquize with this voice, let the operator stand with his back to the audience against a door. Give a gentle tap at the door, and call aloud in the natural voice, inquiring, "Who is there?" This will have the effect of drawing the attention of the audience to a person supposed to be outside. Then fix the jaw as described, and utter in voice No. 1 any words you please, such as "I want to come in." Ask questions in the natural voice and answer in the other. When you have done this, open the door a little, and hold a conversation with the imaginary person. As the door is now open, it is obvious that the voice must be altered, for the voice will not sound to the ear when a door is open the same as when closed; therefore the voice must be made to *appear* face to face, or close to the ventriloquist. To do this, the voice must not be altered from the *original note* or *pitch*, but be made in another part of the mouth. This is done by closing the lips tight, and drawing one corner of the mouth downwards, or towards the ear. Then let the lips open at that corner only, the other part to remain closed. Next breathe, as it were, the words out of the orifice formed. Do not speak distinctly, but expel the breath in short puffs at each word, and as loud as possible. By so doing, you will *cause the illusion* in the minds of the listeners that they hear the same voice which they heard when the door was closed, but which is now heard more distinctly and nearer on account of the door being open. This voice must always be used when the ventriloquist wishes it to appear that the sound comes through an obstacle, but from some one close at hand. The description of voice and dialogue may be varied as in the following example:

EX. 1. THE SUFFOCATED VICTIM.—This was a favourite illustration of Mr. Love, the polyphonist. A large box or closed cupboard is used indiscriminately, as it may be handy. The student will rap or kick the box, apparently by accident. The voice will then utter a hoarse and subdued groan, apparently from the box or closet.

Student (*pointing to the box with an air of astonishment*). What was that?

Voice. Oh! let me out.

Student. Why, there is some one here, I declare. (*To box*) Who is it?

Voice. I won't do so any more. I am nearly dead.

Student. Who are you? How came you there?

Voice. I only wanted to see what was going on. Let me out, do.

Student. But I don't know who you are.

Voice. Oh, yes, you do.

Student. Who are you?

Voice. Your old schoolfellow, Tom ——. You know me.

Student. Why, he 's in Canada.

Voice (*sharply*). No, he ain't, he 's here; but be quick.

Student (*opening the lid*). Perhaps he 's come by the underground railroad. Hallo!

Voice (*not so muffled as described in direction*). Now, then, give us a hand.

Student (*closing the lid or door sharply*). No, I won't.

Voice (*as before*). Have pity (Tom, or Jack, or Mr. ——, as the case may be), or I shall be choked.

Student. I don't believe you are what you say.

Voice. Why don't you let me out and see before I am dead?

Student (*opening and shutting the lid or door, and varying the* voice *accordingly*). Dead; not you! When did you leave Canada?

Voice. Last week. Oh, I am choking!

Student. Shall I let him out? (*Opening the door*) There's no one here.

2. THE MILKMAN AT THE DOOR.—This affords a capital opportunity of introducing a beggar, watercress or milkman, and may be varied accordingly. We will take Skyblue, the milkman; and we would impress on the student that, although we give these *simple* dialogues, *they are merely intended as illustrations for the modest tyro*, not to be implicitly followed when greater confidence and proficiency are attained

Voice. Milk below!

Student. Is it not provoking that the milkman always comes when he is not wanted, and is absent when we are waiting for the cream?

Voice (*whistling a bar of* "*Polly Perkins*").

Student. Oh, yes, always the broken-hearted milkman; as if he was not as happy as a king.

Voice (*nearer*). Milk below! Why, Sally, where's the can?

Student. Sally will be long in answering, I think.

Voice. Sally's gadding with the police. Milk below!

Student (*slightly opening the door*). We don't want any milk, my good man.

Voice. No skim milk for the cat, or cream for tea?

Another Voice. Watercresses!

Student. Really this is intolerable. Go away.

Voice. You owe me threepence for last week's milk. I was to wait.

Student. This is intolerable; I'll send for the police.

Voice (*ironically*). Send for Sally and p'lice; I'll foller.

Student. Impudent rascal!

Voice. Keep your compliments at home, Master Idlebones.

Student (*opening the door*). I'll report you to your master.

Voice (*louder as the door is opened*). Will you, young whipper-snapper, pay us the thruppence, and let us go?

Student offers to pay, while the voice gets weaker in the distance with "milk below!" until it becomes inaudible.

A conversation may be held in a similar strain with the *cellarman;* and, as a rule, the lower notes of the voice will be best for voices in the basement, and formed as low in the chest as possible.

Student. Thomas, are you coming?

Voice below (*gruffly*). I should think I was.

Student. We are waiting for the beer.

Voice (*partly aside*). The longer you wait, the greater our honour. Mary, have another drop?

Student. Why, the scamp is drinking the beer! Thomas, who's there with you?

Voice. Myself! (*Aside*) Make haste with the pot, Mary; he's in such a hurry!

Student. You drinking rascal! how dare you?

Voice. Coming, sir. The barrel's nearly empty.

Student. I should think so, tippling as you are at it.

Voice. Now, don't be saucy.

Student. The fellow's getting intoxicated. Thomas!

Voice. Wait till I come. I have waited for you many times.

Student. I suppose it is of no use hurrying you?

Voice. No, it isn't, my young tippler. I'm COMING! *coming!!* coming!!!

From this illustration the student may proceed to try the second voice.

No. II.

VOICE NO. 2.—This is the more easy to be acquired. It is the voice by which all ventriloquists make a supposed person speak from a long distance, or from or through the ceiling. In the first place, with your back to the audience, *direct their attention* to the ceiling *by pointing to it, or by looking intently at it.* Call loudly, and ask some question, as though you believed a person to be concealed there. Make your own voice very distinct, and as near the lips as possible, inasmuch as that will help the illusion. Then in *exactly the same tone and pitch* answer; *but, in order that the voice may seem to proceed from the point indicated, the words must be formed at the back part of the roof of the mouth.* To do this, the lower jaw must be drawn back and held there, the mouth open, which *will cause the palate to be elevated and drawn nearer to the pharynx*, and the sound will be reflected in that cavity, and appear to come from the roof. Too much attention cannot be paid to the manner in which the breath is used in this voice. When speaking to the supposed person, expel the words with a deep, quick breath. When answering in the imitative voice, the breath must be *held back, and expelled very slowly, and the voice will come in a subdued and muffled manner*, little above a whisper, but so as to be well distinguished. To cause the supposed voice to come nearer by degrees, call loudly, and say, "I want you down here," or words to that effect. *At the same time make a motion downwards with your hand.* Hold some conversation with the voice, and cause it to say, "I am coming," or, "Here I am," each time *indicating the descent with the hand.* (*See examples.*) When the voice is supposed to approach nearer, the sound must alter, to denote the progress of the movement. Therefore let the voice, at every supposed step, roll, as it were, by degrees, *from the pharynx more into the cavity of the mouth*, and at each supposed step *contracting the opening of the mouth*, until the lips are drawn up as if you were whistling. By so doing, the cavity of the mouth will be very much enlarged. This will cause the voice to be *obscured, and so appear* to come nearer by degrees. At the same time, care must be taken not to articulate the consonant sounds plainly, as that will cause the disarrangement of the lips and cavity of the mouth; and in all *imitation voices* the consonants must scarcely be articulated at all, *especially if the ventriloquist faces the audience.* For example: suppose the imitative voice is made to say, "Mind what you are doing, you bad boy," it must be spoken as if it were written, "'ind ot you 're doing, you 'ad whoy."* This kind of articulation may be practised by forming the words in the pharynx, and then sending them out of the mouth by sudden expulsions of the breath clean from the lungs at every word. This is most useful in ventriloquism, and to illustrate it, we will take *the man on the roof* as an illustration. This is an example almost invariably successful, and is constantly used by skilled professors of the art. As we have before repeatedly intimated, the eyes and attention of the audience must be

* It is very rarely that a ventriloquist shows a full face to his audience; it is only done when he is at a great distance from them, and is pronouncing the labial sounds in the manner given, for any movement of the jaws would help to destroy the illusion.

directed to the *supposed spot* from whence the illusive voice is supposed to proceed.

Student. Are you up there, Jem?

Voice. Hallo! who 's that?

Student. It 's me. Are you nearly finished?

Voice. Only three more slates to put on, master.

Student. I want you here, Jem.

Voice. I am coming directly.

Student. Which way, Jem?

Voice. Over the roof and down the trap. (Voice is supposed to be moving as the student turns and points with his finger.)

Student. Which way?

Voice (*nearer*). Through the trap and down the stairs.

Student. How long shall you be?

Voice. Only a few minutes. I am coming as fast as I can.

The voice now approaches the door, and is taken up by the same tone, but produced as in the first voice. As another illustration, we will introduce the reader to

THE INVISIBLE SWEEP.—This is a striking example of the second voice. Let the student pretend to look up the chimney, and rehearse the following or some similar colloquy:

Student. Are you up there?

Voice. Yes. Chimley want sweep.

Student. Really, it is extraordinary! What are you doing?

Voice. Looking for birds' nests.

Student. Birds' nests! There are none there.

Voice. Dick says there be.

Student. Come down!

Voice. I shan't.

Student (*stirring the fire*). I 'll make you show yourself.

Voice. I say, don't; it 's so hot.

Student. Come down, then.

Voice. Don't be so stupid. Let I alone.

Student. Will you come down?

Voice. Yes, I will.

Student. What 's your name?

Voice (*much nearer*). Sam Lillyvite. I say, what do you want me for among company?

Student. To show yourself.

Voice (*nearer*). What for?

Student. To let these ladies and gentlemen see that there are many strange things between heaven and earth, but not Sam Lillyvite, the sweep.

Another good illustration is to hold a conversation with a friend who lives on the first floor, and with whom you can converse on any subject—as the *retired and mysterious student;* but the moment the student can master the elementary sounds, he will not need our assistance in providing him with dialogues, which, however simple they may be to read, have *an extraordinary effect when properly* spoken. In sundry books wherein ventriloquism is mentioned, the voice of the ventriloquist is described as being "thrown into" the spot whence it appears to proceed. This, however, is a total mistake, and, unless the ventriloquist keeps himself between the voice and the audience, the latter will not be deceived.

POLYPHONIC IMITATIONS.

THE TORMENTING BEE.—It is related that Mr. Love, when young, took great delight in imitating the buzzing of insects and the cries of animals; indeed, it is difficult to decide whether he or Mr. Thurton most excelled in this particular species of mimetic illusion. In all imitations of such noises, the bee should be heard to hum gently at first, so as in a private party not likely to attract attention till the right pitch is obtained; and be it remembered that the sound, without being particularly loud, can be made to penetrate every corner of a large room. The illusion is greatly increased by pretending to catch the offending and intrusive insect. The humble-bee, the wasp, and the blue-bottle fly are best to imitate, and afford an agreeable relief to the other exercises of ventriloquial power. To imitate the tormenting bee, the student must use considerable pressure on his chest, as if he was about to groan suddenly, but instead of which, the sound must be confined and prolonged in the throat; the greater the pressure, the higher will be the faint note produced, and which will perfectly resemble the buzzing of the bee or wasp.

Now, to imitate the buzzing of a blue-bottle fly, it will be necessary for the sound to be made with the lips instead of the throat: this is done by closing the lips very tight, except at one corner, where a small aperture is left; fill that cheek full of wind, but not the other, then slowly blow or force the wind contained in the cheek out of the aperture: if this is done properly, it will cause a sound exactly like the buzzing of a blue-bottle fly. In these two instances it will show how necessary it is for the ventriloquist to study minutely the different effect of sounds upon his hearers in all his exploits. And to make the above properly effective, he should turn his face to a wall; with a handkerchief strike at the pretended bee or fly, at the same time pretend to follow his victim first this way and then that, and finally to "dab" his pocket-handkerchief on the wall as though he had killed it. The sound should be at times suddenly louder and then softer, which will make it appear as if it is heard in different parts of the room.

THE SPECTRE CARPENTER.—The noise caused by planing and sawing wood can also be imitated, and causes a great deal of amusement without much difficulty. The student must, however, bear in mind that every action must be *imitated* as well as the noise, for the eye assists to delude the ear. We have seen ventriloquists carry this eye-deception so far as to have a few shavings to scatter as they proceed, and a piece of wood to fall when the sawing is ended. To imitate planing, the student must stand at a table a little distance from the audience, and appear to take hold of a plane and push it forward. The sound as of a plane is made as though you were dwelling on the last part of the word hu*sh*—dwell upon the *sh* a little, as *tsk*, and then clip it short by causing the tongue to close with the palate, then over again. Letters will not convey the peculiar sound of sawing—it must be studied from nature.

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