

*Amber (Henry)*

**PERFORATED POSTAGE LABEL STAMPS.**

*Crawford 944*

**STATEMENT**

OF THE

**ADVANTAGES OF THE MACHINE,**

NOW AT SOMERSET HOUSE,

FOR

**PERFORATED SHEETS OF POSTAGE LABEL STAMPS,**

SO AS TO EFFECT THEIR

**INSTANT SEPARATION**

WITHOUT THE AID OF ANY CUTTING INSTRUMENT;

ALSO THE

**DIFFICULTIES THROWN IN THE WAY OF THE INVENTOR**

BEFORE HE SUCCEEDED IN RENDERING

THE MACHINE AVAILABLE FOR THE PURPOSES DESIGNED;

TOGETHER WITH THE

**CORRESPONDENCE**

BETWEEN

THE LORDS COMMISSIONERS OF HER MAJESTY'S TREASURY,

THE HONOURABLE THE COMMISSIONERS OF INLAND REVENUE,

AND

THE PATENTEE.

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"Be these juggling" Boards "no more believed,  
That palter with us in a double sense,  
That keep the word of promise to our ear,  
And break it to our hope."—

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PHILATELIC SECTION.

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## STATEMENT.

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THE Patentee and Inventor of "the machine for perforating Postage Labels, so as to effect their instant separation without the aid of any cutting instrument," conceiving himself unfairly dealt with by Her Majesty's Government, and having found all the explanations addressed to them on the subject unsuccessful in procuring the return of his outlay incurred in perfecting the invention to the satisfaction of the authorities to whom it was referred, and of obtaining the fair reward to which his perseverance and invention entitle him, is compelled to publish the following Statement and Correspondence, in the hope of receiving, through the influence of public opinion, that justice and consideration which he will otherwise be denied. He is, moreover, induced to adopt this step from the belief that the treatment dealt out to him exhibits a mistaken policy, tending to discourage inventive exertion addressed to objects of general public utility.

In the year 1847 the Patentee, as the result of much consideration, labour and expense, invented a machine for perforating the sheets of Postage Labels, so as to effect the object already referred to; and having ultimately succeeded in perfecting the same, he obtained, and is now the sole owner of, a Patent for the use thereof.

Amongst other public and private reasons which the Patentee found operating against the great utility and general use of the postage label system, one objection is, that the labels having to be separated either by cutting or tearing, great trouble and loss of time is thereby occasioned to those whose business entails upon them an extensive correspondence, as also to the postmasters of the principal receiving-houses, particularly during the last hour for posting letters intended to be dispatched by the evening mail, and during periods when an additional stamp is required to be placed on them, inasmuch as the postmaster, on disposing of a shilling's worth of stamps, for instance, is frequently called upon by the purchaser to dis sever them singly, for the purpose of attaching them to letters intended to be posted at his office; or if too late there, at the General Post-office, or one of the principal

branches, as extra stamped letters; and thus, at the period of the day when the press of official business demands the post-masters' exclusive attention, they are (to their great inconvenience and annoyance), importuned by persons requiring stamps to be dissevered; and it happens, not unfrequently, that the hour for closing the letter-box arrives before the public can be served.

These disadvantages are enhanced by the facts, that both care and time are required to fold one of the present sheets into a portable form; and that before one quarter of the sheet is folded, the crease, instead of following the direction of the guide lines, is found to have advanced considerably beyond them, whereby the folding, instead of facilitating the dissevering operation, increases the difficulty. These creases and the curls which are produced on the stamps by keeping them in a loose or rolled state, contribute materially to prevent their adherence to the letters; ~~as~~, by tearing the stamps from each other, the gum is removed from the edges, where its presence is most necessary to secure their perfect adherence; and it is probable that most of the numerous stamps which are daily found loose in the post-bags, fall off from the letters, in consequence of this objectionable mode of detaching the stamps. <sup>also</sup>

Another objection to the present system is, that books, desks and tables are usually used by clerks as a base for cutting the stamps, to the injury of the article whereon the cutting process is effected. It appears also, by Returns made to Parliament, that nearly one-half of the letters which pass through the Post-offices of the United Kingdom, instead of being paid by the labels affixed thereon, are pre-paid in money by the writers, whereby very considerable additional trouble and loss of time is entailed on the servants and other persons connected with the Post-office, and great additional expense is also incurred throughout the establishment.

The Patentee, believing the cause of the public preferring to pre-pay in money rather than by label, to be attributable chiefly to the inconvenience and objections pointed out by him, did—with a view to providing a remedy for such and other similar inconveniences and objections—invent, in the early part of 1847, a machine for perforating the sheets along the guide-lines, so as to allow the stamps to be instantly dissevered without the operation of cutting, as well as to secure the folding of sheets, or any less quantity of stamps, with unerring regularity, and with a saving of 90 per cent. of time; at the same time preserve them in a flat position as best suited to insure their instant and permanent adherence to the letters.

As such method of perforating the sheets necessarily produces scolloped or indented edges upon the stamps, they are rendered less liable to be removed by friction or otherwise after they have been attached to the letters.

The Patentee conceiving, if the proposed plan were carried out, it would prove a great public convenience, was induced to address, on the 1st October 1847, a letter to the Postmaster-general on the subject, who was pleased to refer the matter to the practical department of the Post-office, with the view of ascertaining whether or not it would be desirable to adopt the proposed plan.

The chief officer of such department having duly inquired into the several matters referred to him, reported to the Postmaster-general that, in his opinion, the plan, if carried out, would prove advantageous to the public.

On the receipt of this report, the Postmaster-general was pleased to forward it to the Commissioners of Stamps and Taxes, with a recommendation to adopt the system if they should be of opinion it was desirable to do so.

As soon as the Patentee was informed that such communication had been made to the Commissioners of Stamps and Taxes, he addressed to them a letter, in which he stated, in the following words, the terms he would undertake to furnish a machine competent to perform the required work :—

“ So fully confident am I that if the plan shall be adopted it will essentially contribute to the efficient working of the Postage Label system, and prove, moreover, a great convenience to the public, that I am willing my claims for compensation shall be contingent upon the complete success of the plan. I am also willing to furnish the machine on the understanding that I am not to be repaid the money it may cost me until the plan shall have succeeded.”

In consequence of this and the previous communication from the Postmaster-general, the Commissioners of Stamps and Taxes were pleased to refer the matter to their supervisor, Mr. Hill, with a view of ascertaining the efficiency of the machine, the cost of working it, &c.

After Mr. Hill had instituted the necessary inquiries, he reported (in effect) to the Commissioners, that the machine, in his opinion, was competent to perform the necessary work, and that, on public grounds, it was desirable to adopt the plan.

Shortly after, the Patentee received the following letter from the Secretary of the Commissioners :—

Inland Revenue, Somerset House,  
17th January 1848.

Sir,

THE Board having had before them your letter of the 28th October, relative to the machine you have invented for separating Postage Labels, I am directed to acquaint you, that they have been authorized by the Treasury to give a trial to that plan as an experimental measure.

By your letter, above-mentioned, you stated that you were prepared to supply the machines for the experiment, with the understanding that you were not to be repaid the cost of them until the plan was brought into successful operation, and I am to express the acquiescence of the Board in this arrangement.

The machines, when completed, may be sent to Messrs. ~~Bacon~~ <sup>XX</sup> & Patch, of Fleet-street, who have received the Boards' instructions in this matter.

I am, sir,

Your obedient servant,

Henry Archer, Esq.

THOS. KEOGH.

The Patentee replied to this letter, by stating that, although he had only proposed to furnish one machine, he nevertheless would comply with the wishes of the Commissioners, and have two constructed for them. To this communication he received the following reply:—

Stamps and Taxes, London,  
25th January 1848.

Sir,

HAVING laid before the Board your letter of the 17th instant, I am directed to acquaint you, that they concur in the course which you have taken; but that, in order to insure the completeness of the second machine for the purpose in view, it is desirable that you should communicate with Mr. Edwin Hill, and also that the machinists employed should distinctly understand the precise purpose to which each machine is to be applied.

I am, sir,

Your obedient servant,

Henry Archer, Esq.

THOMAS KEOGH,  
Assistant Secretary.

On receipt of this letter, the Patentee employed an eminent mechanical engineer to construct the same, according to the plan submitted to the said Commissioners.

When the first machine, however, was constructed, it was found, upon trial, that the piercing rollers so wore the table upon which the sheets were laid, that it was considered that the wear and tear would be too costly for carrying out the plan with advantage to the public: the Patentee was therefore compelled to abandon the plan of puncturing the sheets by rollers. He, however, being convinced that it was possible

to construct a machine to answer the object designed, freed from such objection, had another puncturing machine constructed by other parties upon the *fly-press* principle; but finding that the bed of this machine would likewise suffer from the puncturing tools, though in a far less degree than the table of the first machine, he invented another machine for *perforating* the sheets, by means of punches, whereby the aforesaid objection to the carrying out of his plan was entirely removed.\*

The Patentee, however, not deeming it prudent to incur any further expense without securing his invention, was induced to take out a Patent to effect that object, and that immediately after he had done so, he—instead of making two single machines, had—with a view of saving expense in the working—a double punching machine constructed, to accomplish the desired object, and which, upon trial, in the presence of Mr. HILL, was found to answer in every particular.

On the following day the Patentee addressed the subjoined letter to the Assistant Secretary of the Commissioners of Stamps:—

37, Great George-street, Westminster,  
26th November 1848.

Sir,

IN reference to the communication made by me to the Commissioners in the year 1847, respecting a plan which I had invented for detaching the Postage Labels, I beg to inform you, that I have had two different machines since made by different machinists to carry out the plan I then proposed; but finding that neither of them realized my expectations, I had a new machine made, upon a totally different principle, which I am happy to say has succeeded beyond my most sanguine expectations.

I have taken out a Patent to secure my invention; but as my wish is, that the Commissioners should apply the entire of the money to be paid to me for the purchase of my right to promote an object which I am prepared to prove is of great national importance, and particularly in regard to Ireland, I feel persuaded that Her Majesty's Government will not hesitate to accede to the terms which it is my intention to propose as soon as the Commissioners are satisfied that the machine I have had constructed will answer the intended purpose.†

I have the honour to be,

Sir,

Your obedient servant,

HENRY ARCHER.

Thomas Keogh, Esq.,  
Assistant Secretary.

\* The Patentee has not attempted to claim from the Treasury any portion of the expense incurred by him on account of the two first machines.

† The Patentee forwarded a copy of this letter to the Treasury, as soon as he understood that the Commissioners of Stamps and Taxes had reported that the machine when tried was found to answer.



In reply to this communication, he received the following :—

Stamps and Taxes, London,  
6th December 1848.

Sir,

WITH reference to your letter of the 26th ultimo, I have to acquaint you, that Messrs. \* \* \* \* of Fleet-street, have been instructed to receive the machines prepared by you for separating Postage Labels, and to put the machines into use, so as to ascertain whether or not they will fully answer the purpose designed.

I am, sir,  
Your obedient servant,

THOMAS KEOGH,  
Assistant Secretary.

Henry Archer, Esq.

Reply :

37, Great George-street,  
7th December 1848.

Sir,

IN reply to your communication of the 6th instant, I beg to inform you, that I have directed the machine prepared by me for separating Postage Labels, to be forwarded to the Printers, as I consider it but fair and reasonable that the Commissioners should have ample opportunity of ascertaining whether or not it would fully answer the purpose designed, before they treat with me for the purchase of my patent right.

I have the honour to be,

Sir,  
Your obedient servant,

HENRY ARCHER.

The Patentee complied with such order, though with the full expectation, that as such printers were in the exclusive enjoyment of a most valuable contract which your Petitioner's invention might possibly altogether destroy, such invention would certainly derive no assistance at their hands, but would, on the contrary, be liable to every description of objection, real or imaginary. He entertained such fears, not from any supposition that the said printers were other than honourable, fair-dealing tradesmen, but on the general principles of human nature, as applied to matters of commerce; that it was not in the nature of things to be expected, that persons who are liable to be seriously injured by a given process, could feel an interest in its welfare.

In order fully to place before the reader the facts of this part of the case, it is necessary to state, that the said printers were, and are employed by the Government to print the Postage Label sheets, as such printers were the Patentees of a

system of engraving supposed to offer greater security against fraud than any other mode, and that upon such assumption it was originally deemed desirable to enter into a contract with them, although the price paid to them is (as will be found on inquiry) about three-fifths more than would cost for printing the sheets in the ordinary way.

The Commissioners perceiving that the co-operation of the said printers during the construction of the machine, was essential to its success, directed them (when they ordered the same to be made) to confer with the machinist employed by the Patentee, whenever it become necessary to consult them. Notwithstanding, however, such directions, and that, moreover, they were well aware, from various other circumstances, that the Commissioners, the Secretary and Mr. Hill were, on public grounds, most anxious to see the plan adopted, they thought proper to exhibit, on various occasions, their dislike and hostility to it, in so marked a manner, that the person engaged by the Patentee to construct the machine, was ultimately compelled to cease communicating with them. Under these circumstances, he and the party who constructed the machine had their misgivings increased when, by the direction of the said Commissioners, it was forwarded to their printers, to be put in use by them, and your Memorialist, therefore, was not at all surprised to find, that, upon the first day of trial, at the establishment of the said printers, the machine was found not to act, in consequence of the punching tools and the matrixes having been clogged and choked with gum. In consequence of this mishap, Mr. Hill, with a view of ascertaining whether the process of gumming the paper was or was not unfavourable to the operation of punching, requested Mr. De la Rue, a gentleman who has had great experience in such work, to give him his opinion on the subject.

Mr. De la Rue reported to Mr. Hill, that, so far from gum impeding, he found, from experience, that, if properly applied, it considerably facilitates the operation of punching, inasmuch as it gave a solidity and brittleness to the paper, which was highly desirable; and he was of opinion that the machine would never have clogged if the gum upon the sheets had not been moist when they were introduced into it.

The Patentee was, therefore, obliged to remove the machine from the said printers, in order to have it put in order by those who understood its peculiar construction, as well as to make some alterations and improvements suggested by Mr. Hill and Mr. De la Rue.

It is also necessary to state that the guide-lines of the sheets printed by the said printers were found to be so very irregular and variable in breadth, that it was impossible to punch the sheets in the proper direction; and Mr. Hill, therefore, directed them to prepare new plates, in order to print the guide-lines so mathematically true, as to remove effectually the objections referred to. It was also arranged that the said printers were to furnish the Patentee with one of the new sheets, as soon as the new plates were made, so as to ascertain whether the machine conformed exactly therewith. Accordingly he was furnished by the said printers with a model sheet as soon as they had completed the first set of new plates. This sheet the Patentee handed to the party who was engaged to put the machine in order.

When the machine was completed, it was found that it did not conform to this model sheet; and the machinist, assuming that the fault was owing to some defect in the machine, took it assunder again, and, at a great expense to the Patentee, altered it to suit the sheet so furnished by the said printers.

The machinist having subsequently obtained one of the sheets for which the machine was originally constructed, discovered, for the first time, that the new model sheet differed so very materially from it, that it was at once evident to him, that if the former had not been made different in size from the latter, the expense and delay of reconstructing the machine would have been avoided.

Immediately upon this discovery, the machinist waited upon the said printers, and having pointed out to them the difference between the two sheets, was, for the first time, informed by them, that, subsequent to their furnishing to the Patentee the new model sheet for his guidance, they discovered that the plate from which it was printed, was incorrect; yet the said printers, instead of instantly apprizing the Patentee, or the machinist employed by him, of this fatal defect, suffered them to remain in ignorance on the subject for nearly four months. The Patentee is induced to believe that the omission on their part was not accidental; from the fact, that when his machinist, at this interview, remonstrated with them upon their conduct, they hesitated not to tell him, that it was no business of theirs to trouble themselves about a matter that was not likely to be of any benefit to them.

On leaving the establishment of the said printers, they delivered to him for his future guidance, a sheet which they said had been printed from one of the new plates that was found to be more correct than the plate from which the

former sheet had been taken. The Patentee was, therefore, obliged to have the machine again altered, to suit exactly the dimensions of this sheet. As soon as the required alteration was made, he informed the authorities at the Stamp-office, that the machine was ready for working; in consequence of which, a preliminary trial was made in the presence of Mr. Hill, at the establishment of Mr. Addenbrooke, the machinist who constructed it. It appeared, however, on this occasion, that the sheets which were printed from plate A. were different in size from those printed from plate C., and so on; but whether the difference was attributable to the shrinking of the sheets, or to a defect in the plates, or to both, could not be ascertained; under these circumstances, Mr. Hill came to the conclusion, that unless an *adjusting power* could be attached to the machine, to extend or contract its movement, to suit the various sizes of the sheets, he did not think it would answer the object designed. The Patentee, however, is free to admit that Mr. Hill, under these circumstances, came to a very proper conclusion; yet, as the said printers, on the occasion of their measuring several of these sheets, at the instance of Mr. Hill and the Patentee, shortly before the machine had been commenced, stated, that as all the sheets were found to shrink alike, there would be no difference in size; the Patentee submits that he has just grounds for complaining that he had not been correctly informed on the subject in the first instance; because if he had been then aware that the sheets did not shrink alike, or that the new plates would not have been made so as to secure a conformity in the size of the sheets, he might have had an adjusting power attached to the machine for one-half of what it has cost him. At one time it was considered impossible to combine the two powers without making an entire new machine; however, after various contrivances and failures, a plan was at length discovered, which enabled the machine to be instantly adjusted with unerring precision from a hair's-breadth to six inches or more.

The Patentee having communicated the fact to Mr. Hill, he, with a view of testing the efficiency of the adjusting power, had several sizes of the sheets passed through the machine in his presence, and finding that it uniformly punched them correct, he gave directions to the Patentee to forward the machine to the printers, to be put in use, with a view of ascertaining more fully whether it would answer the desired object. For the reasons already set forth, the Patentee considered that if he allowed the machine to be again returned to the said printers for the purpose of ascertaining

its competency for the required work, it was sure to be again worked in a manner but ill calculated to produce a favourable result, and he, therefore, explained to Mr. Hill his reasons for objecting to allow the machine to be worked by the said printers.

Mr. Hill, admitting the reasonableness of his objections, proposed, with his usual straight-forwardness, to accompany him; and the machinist (who was cognizant of the facts referred to) to Mr. Keogh, the Secretary of the Commissioners of Stamps and Taxes, with a view of ascertaining whether, under the circumstances, he would permit the machine to be tried at Somerset House, instead of at the establishment of the said printers.

Mr. Keogh, conceiving that it was due, both to the public and the Patentee, to secure that the machine should have a fair trial, frankly stated that he would bring the matter before the Commissioners the first opportunity, with a view of obtaining their consent to have the machine worked at Somerset House, under Mr. Hill's superintendence. A few days after this interview, Mr. Hill, having received the Commissioners' permission, requested the Patentee to forward the machine for use to Somerset House. In compliance with such request, the Patentee, on the 9th day of January last (1850), sent it to the Stamping Department in that establishment.

On the first day of trial, however, it so happened that many of the sheets which were passed through the machine were punched somewhat beyond the guide lines; and the machinist who constructed the machine, feeling confident that the defect was attributable not to the machine, but to the plates, asked Mr. Hill to allow him to measure the latter at the printers'. Mr. Hill having given him permission to do so, he attended the next day at the office of the said printers, and measured the several plates from which the sheets referred to were printed.

Although the plates now used by them were made, or professed to have been made, to suit the Punching Machine, more than one-half of them were found to be palpably defective; and it further appeared, that the greater portion of the sheets furnished by the printers on the first day of trial were printed from the defective plates; it was therefore manifest that the irregularities observed in the sheets which were punched on the first day of trial were not attributable to any defect in the machine; and this will appear the more obvious, when it is stated that the sheets, which by Mr. Hill's directions had subsequently been printed from the perfect

plates, were passed through the machine, no objection of any kind was observable. At the same time, it is right to add, that even these were not printed as mathematically correct as they ought to have been. Without reference, however, to this objection, it was found, after several days' trial, that the spoil occasioned by the machine amounted to one sheet in a hundred.

With a view of effectually removing the cause which produced this trifling amount of waste, an important alteration in the machine was suggested by Mr. Hill; and as the Patentee was desirous to make it, if possible, more complete, he consented that the proposed alteration should be made, although it entailed upon him an additional expense of 50*l*.

The machine, with this alteration, having been for some time worked at the Stamp Office, the Commissioners were pleased, in the month of April last, to report to the Lords of the Treasury that it fully answered the purpose for which it was designed.

As soon as the Patentee was informed of this fact, he deemed it proper, upon public grounds, to embody the foregoing statement in a Memorial, which he presented to the Lords of the Treasury on the 15th day of May last, and concluded the same as follows :

“That your Memorialist is advised and believes that the assumption on which the contract for printing the said sheets of Postage Labels was and is confided to the said printers, will be found on investigation to have no good foundation.

“That your Memorialist is advised and believes that the system of printing patented by the said printers does not offer that security against fraud which it is supposed that it would have done; in proof of which, your Memorialist begs to state that he has been assured by eminent engravers, that they would undertake, with the permission of the Government, to produce, in a few days, a plate that would print off any quantity of sheets, so exactly similar to those printed by the said printers, that no person would be able to distinguish the genuine from the counterfeit.\*

“But be the danger what it may, be the necessity of adopting the most inimitable system of engraving more apparent than it is,\*

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\* If the Postage Labels have not heretofore been forged, it is chiefly because their value being but a penny each, little or no temptation is held out to induce the ill-disposed to imitate them: besides, as spurious Postage Label sheets cannot, like counterfeit bank notes, be put in circulation by passing them in payment for goods purchased, it would be next to impossible to dispose of them without the co-operation of one or more of the Post-office distributors. Now, as it is not likely that any of these officers would risk their character, their business, salary and security, by becoming the responsible instruments for carrying out the fraud, it is reasonable to assume that no one of them would be found to lend himself to it; besides, it is obvious that in



your Memorialist humbly submits that, by entrusting private parties to engrave, print, gum and complete one million's worth of stamps annually in their premises in Fleet-street, where, too, is carried on extensive printing for other parties, a far greater risk is manifestly created than that which the label system could possibly be exposed to by printing the sheets in the ordinary way in the stamping department at Somerset House, where, for greater security, stamped envelopes, the tenpenny and shilling labels for foreign and other letters, and all other stamps are executed.

"Finally, your Memorialist submits, that independent of the said printers' system of engraving, ample security would be afforded by the adoption of his plan.

"I.—Because his punching machine is not only most expensive, ponderous, and difficult to make, but of such a nature as to prevent its being either made or worked in secret.

"II.—Because the art of paper-punching being only known to a few, it is probable that not even so many as six persons could be found in this country competent to construct the necessary machine; whereas, an engraving may at the expense of a few shillings be imitated in secret by numerous persons.

"Your Memorialist therefore submits, that by the adoption of his plan, not only would the Postage Label system be placed on a securer footing, and the convenience of the public greatly promoted, but the Government would annually save many thousands to the public.

"That your Memorialist believes the public interest would be best promoted by referring the whole question to an impartial and competent tribunal.

"Your Memorialist, therefore, humbly prays, that either a Select Committee of the House of Commons, or a Commission, be appointed to inquire and report,—

"Whether by adopting the plan of your Memorialist a considerable annual saving may not be effected, particularly by substituting not only a less expensive, but a more preferable mode of printing the Postage Labels than that patented by the said printers.

"Whether by adopting the latter mode the plates may not be engraved so mathematically correct as to insure that there shall be

proportion as the fraudulent distributor disposed of the counterfeit sheets, his usual demand from the Post-office would be diminished, and, as this could not well occur to any extent without awakening the suspicion of the proper authority at the Post-office, the fraud would be sure to be detected before the fraudulent distributor could have profited by it. Then again (to adopt the words of the present Chairman of the Commissioners of Stamps and Taxes, before the Select Committee on Mr. Rowland Hill's plan), "If a forgery takes place to a letter-cover, the letter itself will give a clue to the name and residence of the writer: therefore, if a letter put into the Post-office is stopped as being endorsed in a forged cover, the letter would be opened, and the writer would be applied to, who would probably be able to afford information as to the party from whom he purchased it, and, therefore, a considerable facility for the detection of forgery would be afforded." It is therefore submitted, that the remedy which has been adopted to guard against a risk which it is conceived is more imaginary than real, has obviously opened a very wide door to fraud.

no difference either in the breadth of the guide-lines or the size of the prints, whereby the punching system may be brought to greater perfection, and carried out at a considerable less expense.

“Whether, instead of using a poisonous and filthy gummy mixture, it would not be more advisable to use the same quality of gum (pure white) as is used for gumming the French Postage Label sheets, and which your Memorialist has had applied to the punched specimen-sheet forwarded herewith, for the purpose of satisfying your Lordships that the alleged difficulty of printing the guide-lines mathematically correct may be readily overcome.

“Whether, instead of entrusting to private parties the engraving, printing, gumming, and completing of nearly one million’s-worth of Postage Label sheets annually in private premises, it would not be more prudent, economical, and safe, to engrave, print, gum, and complete them in the proper department at Somerset House, where, for greater security, all other stamps are executed.

“Whether, on the grounds both of economy and good management, it would not be advisable to print and issue the Postage Labels at the General Post-office, instead of at Somerset House, so that the necessity of having two Chief Distributing Departments for issuing the Postage Stamps throughout the country may be done away with, and all other serious inconveniences and difficulties removed\* which, on inquiry, will be found are continually experienced by both departments, in consequence of the Stamp-office having to conduct, in part, the work and business which it is conceived ought to be entirely performed by that department more immediately interested in bringing to perfection the Postage Label system at the least cost to the public.

“Finally, to determine what would be a fair remuneration to allow your Memorialist for his patent right, &c.”

Shortly after the presentation of this Memorial, the Patentee was informed, that the Lords of the Treasury had referred it to the Commissioners of Stamps and Taxes to determine what should be paid to him for the machine and invention. The Commissioners, however, conceiving they had no control over the funds of the Post-office, reported to their Lordships, that in their opinion the Post-office was the proper department to decide the question.

In consequence of this report, the Lords of the Treasury referred the matter to the Post office to be disposed of; but it so happened, that, just at that period (the latter end of August) the Postmaster-general, Colonel Maberly, and Mr. Rowland Hill, were out of town. A decision, however, was made in their absence by the acting officer. This decision is

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\* The subsequent correspondence, and the fact of the Patentee being kept nearly a year waiting in town for a settlement of his claims, will fully justify the remarks here made by him in his Memorial.



substantially the same as that referred to in the subjoined letter, which the Patentee received from the Lords of the Treasury, in reply to the following communication, which pressing circumstances induced him to address to them:—

Sir,

19th September 1850.

MAY I request you will be pleased to let me know when I may expect payment for the machine for perforating the Postage Label sheets which I furnished in January last to the Commissioners of Stamps and Taxes.

I have been detained in town several months in daily expectation of a settlement; and as further delay would subject me to serious inconvenience, injury and annoyance, I am induced, very much against my inclination, to draw your attention to the matter.

With respect to the question of compensation, I believe it will be found that it is not unusual for the Government in such cases to appoint one person as referee, and the party claiming, another; but having lately received a letter from the Hon. Lloyd Mostyn, M.P., in which he remarks, "Would it not be better for you to let the question of compensation for your invention be decided by Sir Charles Pasley or Sir Frederick Smith?" I feel bound to state, that in case the Treasury shall consider the course suggested by Mr. Mostyn the most advisable one, under the circumstances, to adopt, I should have no objection to refer the matter to either of the gentlemen suggested by him, or to any professional person qualified, as they are, to appreciate the mechanical merits of the machine, and the utility of the invention in a public point of view.\*

I have the honour to be,

Sir,

Your obedient humble servant,

HENRY ARCHER.

Geo. Cornwall Lewis, Esq., M.P.,  
&c. &c.

Treasury Chambers,

27th September 1850.

Sir,

IN reply to your application of the 19th instant, I am commanded by the Lords Commissioners of Her Majesty's Treasury to acquaint you, that their Lordships have been pleased to direct the Postmaster-general to pay to you the sum of 300*l.* for the machine for perforating the Postage Label Stamps, and a further sum of 200*l.* for your invention of the same.

I am, sir,

Your obedient servant,

Henry Archer, Esq.

J. M. LEAKE.

~~24, Upper Eccleston-place,~~  
Ecclestone-square.

\* The Patentee had previously informed the Comms of Stamps that if they thought proper to call in any qualified person in the trade to put a value on the Machine he would abide by his decision - The Comms however did not deem it advisable to adopt the proposed course -

Sir,

30th September 1850.

I HAVE the honour to acknowledge the receipt of your letter of the 27th instant, on the subject of my patented invention for punching the Postage Label sheets, in which you inform me that the Lords of Her Majesty's Treasury had been pleased to direct the Postmaster-general to pay me the sum of 300*l.* for the machine, and the further sum of 200*l.* for the invention.

I beg leave to say, in reply, that, since I first received the written directions of the Commissioners of Stamps and Taxes to make this machine, I have been detained in London nearly three years bestowing my time and attention to its construction and improvement, and, besides the expense of taking out letters patent, I have made payments and incurred liabilities to machinists and mechanics to the amount of 900*l.*, the greater portion of which expenditure was occasioned by the impediments thrown in my way by the present contractors for printing the Postage Stamps, as set forth in the Memorial which I handed to the Secretary of the Treasury on the 15th May 1850. I feel, therefore, that the compensation offered to me to be so wholly inadequate, that I am induced to believe the decision of their Lordships has proceeded on some erroneous ground,\* and therefore am induced to hope that they will be pleased to re-consider the same.

I am willing to accept the amount the machine has actually cost me, and to leave the question of compensation for the invention to reference, in the manner suggested in my letter to the Secretary of the Treasury of the 19th instant.

I beg leave at the same time to state, that since it is of importance the printing and punching should be performed by the same party, and in the same place, I am prepared, in conjunction with the eminent engraver, Mr. Branston, to contract not only for punching, but for engraving, printing and gumming the Postage Label sheets in a manner very superior to the present, at a price that will enable the Government to save 2,000*l.* a year to the country, the operation to be performed either at Somerset-house or at the Post-office, instead of at private premises, as at present

In order to test the comparative advantages of my improved over the present stamps, I would further propose that the old and the new stamps should be issued to the public in equal proportions for a

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\* As soon as the Patentee received the letter from the Treasury, he was officially advised to call at the Post office, with a view of ascertaining the grounds upon which so small a compensation had been recommended. On calling there, he was referred to the officer who had acted in the matter during the absence of the principal authorities. This gentleman candidly informed him, that when he made his report, he was not aware that the machine was of the size and magnitude represented by the Patentee at this interview; he also stated, that he was not until then aware that any length of time had been occupied in its construction, or that a Patent had been taken out to secure the invention.

given time, in order to bring the relative merits to the test of experiment and public opinion.

In case the latter should not be preferred by the public, I will not require any remuneration.

I have the honour to be,

Sir,

Your obedient humble servant,

HENRY ARCHER.

*P.S.* -- In order that their Lordships may be able to judge of the magnitude and peculiar arrangement of the machine, I beg to forward herewith a drawing of it.

About a fortnight after the Patentee forwarded the foregoing, he was officially informed, that a letter had been addressed by the Secretary of the Treasury to the Commissioners of Stamps and Taxes, to request that they would again communicate with the Post-office, with a view to the re-consideration of his claims. As soon as he received this communication, he waited upon the Secretary of the Commissioners of Stamps and Taxes, and was informed by him that the Commissioners had already received the letter referred to, and that they would immediately communicate with the Post-office on the subject; he also stated, that, as the compensation must come out of the funds of the Post-office, the Commissioners were of opinion that the question should be decided by that department. Under these circumstances, the Patentee was induced to wait on Colonel Maberly, with a view of affording him such information as he might require on the subject.\*

As soon as he had explained to him the object of his visit, he (Colonel Maberly), remarked, that as it was probable the Post-office would, in a pecuniary point of view, derive no advantage from the proposed improvement, he did not think that he was entitled to any remuneration, at least out of the funds of the Post-office. The Patentee then reminded him of the fact, that the Postmaster-general had written in 1847

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\* Before the Patentee waited upon Colonel Maberly, he was not aware that he formerly was opposed to the Postage Label system. On referring, however, to his evidence before the Select Committee appointed in 1839 to consider Mr. Rowland Hill's plan, he finds that Colonel Maberly was then of opinion (Q. 10907), "that every experiment that had been made he considered had shown the fallacy of Mr. Hill's plan; that it appeared to him to be a most preposterous plan, utterly unsupportable by facts, and resting entirely on assumption."

The Patentee deems it also right to add, that he has no reason to believe that Mr. Rowland Hill, the gentleman most competent to determine the merits and utility of the proposed improvement, has ever been consulted on the question of compensation.

to the Commissioners of Stamps and Taxes, recommending the adoption of the plan, on the grounds that it was calculated in every respect to prove a very great convenience to the public. He further stated, that the Press at the period had fully recognized the utility of the invention; and he also signified to him his readiness to furnish all the bills and vouchers which he had received, with a view, as he stated, of satisfying him that the sum of 500 *l.*, which had been offered to him, did not even amount to one-half of the money he was out of pocket.

Colonel Maberly remarked, that he had no reason to doubt that what he, the Patentee, had stated in regard to the cost of the machine was correct; but as he considered that the Post-office had no right in a matter of the kind to consider the public convenience, he was free to own, that if he had been in town when the first letter was addressed to the Postmaster-general on the subject, the letter recommending the adoption of his plan, should never have been forwarded to the Commissioners of Stamps, at least with his consent. As, however, the plan had been adopted, he considered that the Lords of the Treasury, and not the Post-office, were the proper persons to determine what compensation he was entitled to. The Patentee remarked, that, even according to his (Colonel Maberly's) own showing, he had a strong claim on the Post-office for compensation, inasmuch as if his proposal was acceded to, the Post-office would not only save 2,000 *l.* a year of their present expenditure for printing, but be enabled to give the public the benefit of his invention *free of cost*. Colonel Maberly, in reply, observed, that as the Postage Labels were printed under the direction of the Commissioners of Stamps, the Post-office had no control over the expenditure incurred for printing them.

After waiting in town another three months, in daily expectation of a reply to his letter of 30th September last, the Patentee was induced to address the following to the Secretary of the Treasury:—

Sir,

2d January 1851.

THE great loss which I have already sustained, by waiting here so long for a settlement of my account, must be my excuse for again requesting the favour of a reply to the letter which I had the honour to address to the Lords of the Treasury on 30th September last.

I have the honour to be,

Sir,

Your obedient servant,

HENRY ARCHER.

Sir, Treasury Chambers, 17th January 1851.

WITH reference to your letter of the 2d instant, I am commanded by the Lords Commissioners of Her Majesty's Treasury to acquaint you, that their Lordships have re-considered your claim to be remunerated for the machine invented by you for perforating the Postage Label Stamps, and have directed the Postmaster-general to pay to you a sum of 400*l.* as the costs and charges for the machine, in lieu of the sum of 300*l.*, previously authorized to be paid to you, and in addition to the sum of 200*l.* granted to you as a reward for the invention.

I am, sir,  
Your obedient servant,

G. CORNEWALL LEWIS.

Sir, 17th January 1851.

I HAVE the honour to acknowledge the receipt of your letter of this date, informing me that the Lords of the Treasury, on re-considering my claim to be remunerated for the machine invented by me for perforating the Postage Label Stamps, have been pleased to direct the Postmaster-general to pay to me a sum of 400*l.* as the costs and charges for the machine, in lieu of a sum of 300*l.*, previously authorized to be paid to me, and in addition to the sum of 200*l.* granted to me as a reward for the invention.

I beg, in reply, to say, that as the sum of 600*l.*, which has now been offered to me for the machine and the invention, is quite inadequate to defray the mere outlay, (900*l.*) which in the letter I had the honour to address to their Lordships on the 30th September last, I stated had been incurred on account of the former, I consider I should be confessing myself lost to every sense of right principle and feeling were I to entertain the proposal for a moment.

When their Lordships, in compliance with the request made by me in that letter, were pleased to refer back my claims to the Post-office and the Commissioners of Stamps and Taxes for re consideration, I was naturally led to expect that no decision,—at least of an unfavourable character,—would have been come to without affording me an opportunity of vindicating the statements contained therein. As, however, the case has been disposed of without calling upon me either to explain or substantiate them,\* I feel that I have just grounds for again asking their Lordships to refer back the matter for re consideration; but Colonel Maberly having informed me, when I waited upon him in October last, that he considers the Post-office has no right to regard or pay for the public convenience, unless it was apparent that the postage revenue was likely to be

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\* The fact of their Lordships now offering an additional 100*l.* on account of the "Costs and Charges of the Machine," is an admission of the correctness of the statement made by the Patentee, and the insufficiency of their Lordships' former offer. It, however, appears strange that this increased offer should have been made without the usual course to ascertain the actual cost of the machine having been previously taken.

benefited by the proposed improvement, and as, moreover, the Postmaster-general, in his letter to me of the 26th September last, states, "that the question of compensation for your invention rests entirely with the Lords Commissioners of Her Majesty's Treasury," while the Commissioners of Stamps and Taxes consider, that, as the invention is connected with the Postage Label system, the Post-office alone should decide the question, it would be obviously useless for me to do so; I therefore feel that I have no other alternative left than to submit my case to the public, and seek through that influence the fair compensation which has been denied me by Her Majesty's Government. In the meantime I am induced to hope that the Commissioners of Stamps and Taxes will be pleased to issue a supply of punched Postage Label sheets, so that Parliament and the public may have a practical opportunity of judging of the merits and utility of the proposed improvement.\*

In contrast with the confiding conduct pursued by me, and the return which it has received, numerous instances must occur to their Lordships' minds, as they do to me, where inventors, who had proposed certain improvements in machinery, have obtained from the Lords of the Treasury from time to time advances, by instalments, of the money required to construct the necessary work for bringing such proposed improvements to the test of experiment; when instances, too, are familiar, where not only have these advances been from time to time made as the work progressed, but when the inventor has been paid several thousand pounds for his invention, as soon as it had been ascertained that the contrivance had answered the end for which it was devised.

I appeal to the correspondence which has taken place in the course of the business to which I have devoted so much time, attention and money, to show that I cheerfully undertook and sustained all risk and expense, contented that my claims for compensation and remuneration should be contingent on the complete success of the plan; that I willingly offered to furnish the machine, on the understanding that I was not to be repaid the cost thereof until it was found to answer; that under the approving sanction and encouraging auspices of the Commissioners of Stamps and Taxes, I prosecuted the task which I undertook to perform with untiring zeal and perseverance for nearly three years, contending with the almost insurmountable difficulties which were continually cast in my way

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\* By way of experiment, a large quantity of Punched Postage Label Sheets were issued, not long since, to some of the country distributors: the consequence was, the preference for those over the non-perforated sheets was so decided, that all subsequent applications from such distributors were limited entirely to the former. The Commissioners, however, declined to issue a fresh supply, in consequence of the Patentee refusing to accept the offer that had been made to him for compensation.

† With a view of encouraging the Patentee to persevere, he was frequently told (and he believes in perfect sincerity), that if he succeeded in perfecting the machine, he might calculate on being amply remunerated, as the utility and convenience of the machine was so apparent, that even such men as Mr. Hume or Mr. Cobden would not deny him liberal compensation.

by adverse parties connected with the printing department, deeply interested in frustrating my invention. In the full hope and confidence that I should ultimately be equitably and honourably dealt with, I have made disbursements and incurred responsibilities beyond what prudence would justify; and now that the machine (spite of interested obstructions, and after the severest test) has been found fully to answer the intended object, instead of being rewarded commensurately with the liberality I have evinced, the perseverance I have shown, and the liabilities I have incurred, I am treated not only like one whose conduct has been the very reverse, but who had not scrupled to overstate his expenditure, in order to extort from his employers more than what he was justly entitled to. In justice, however, to Her Majesty's Government, I am free to own that I do not believe I should have been treated otherwise than fairly, were it not that the three controlling Boards, which I have had to do with, have felt unwilling to act independently, each conceiving that the duty of awarding to me compensation did not properly belong to their department. Thus not only is a manifest injustice inflicted upon me, but the public is deprived of the benefit of an invention, the adoption of which the Postmaster-general and the Commissioners of Stamps and Taxes have not hesitated to recommend in their reports, on the ground of its obvious utility and convenience.

I have the honour to be,

Sir,

Your most obedient servant,

HENRY ARCHER.

G. Cornwall Lewis, Esq., M. P.

Fig. 2.

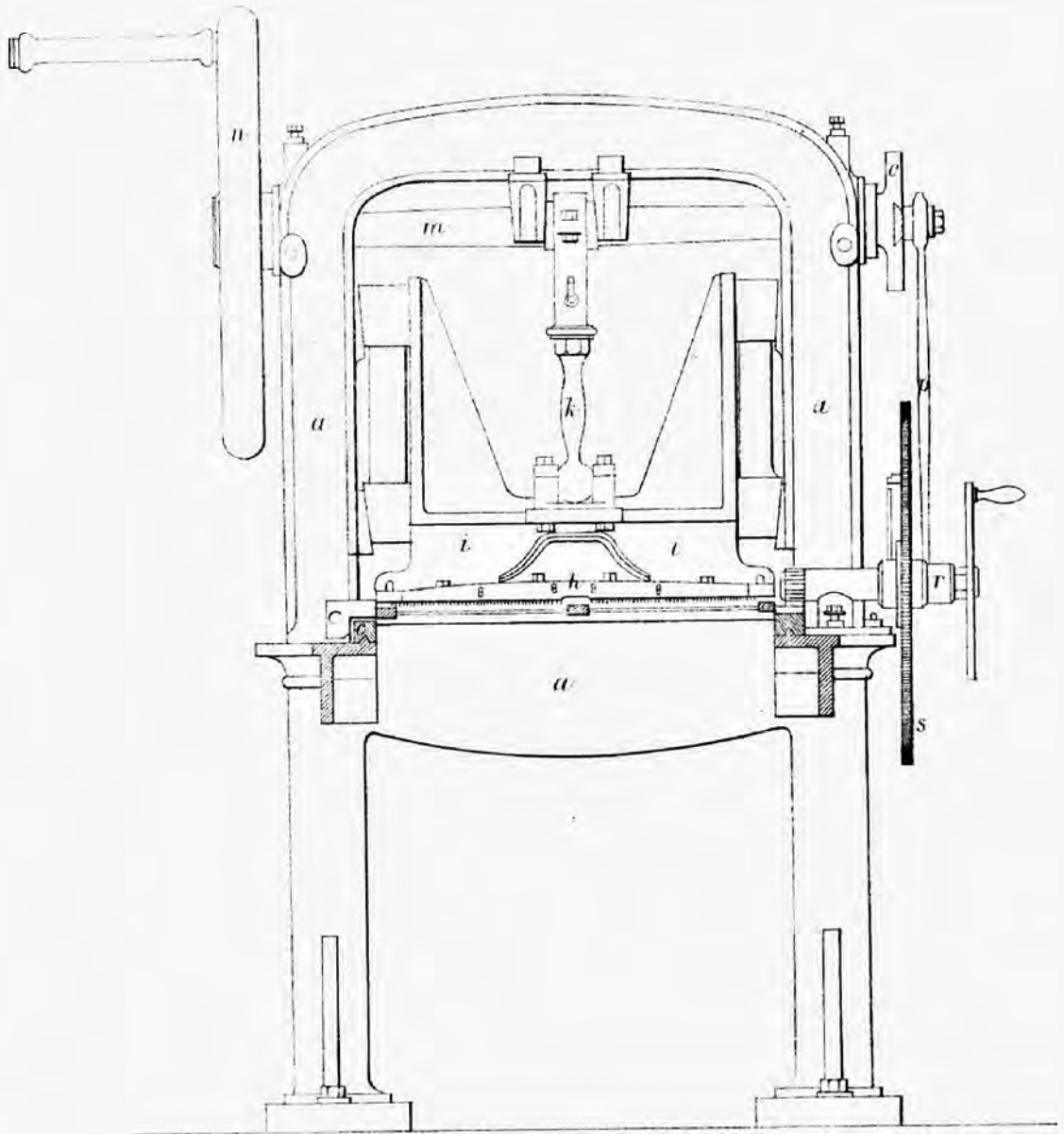


Fig. 5.

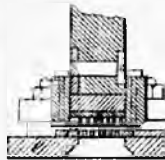
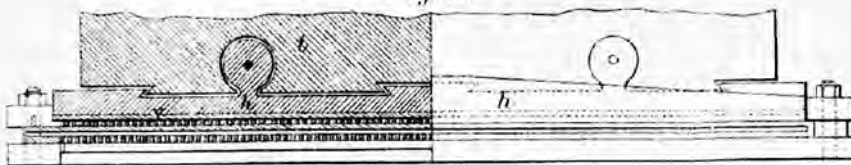


Fig. 3.

Fig. 11.

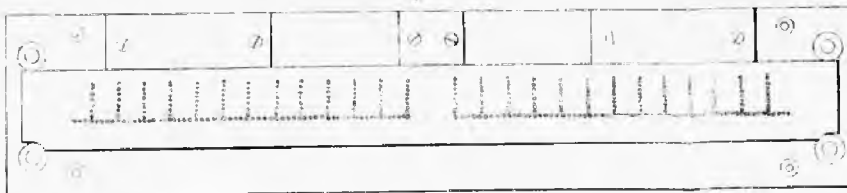




Fig. 1.

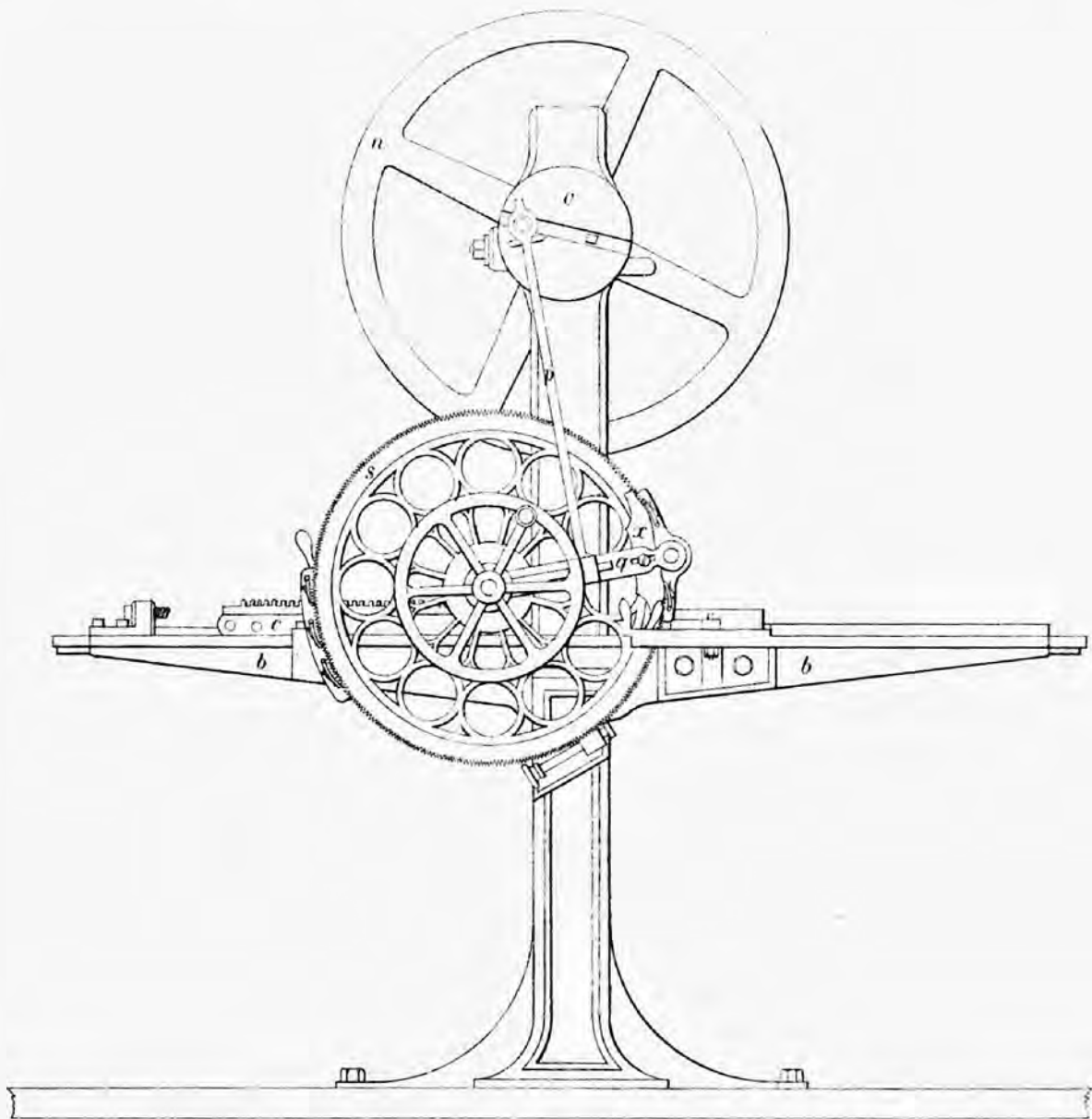


Fig. 6.

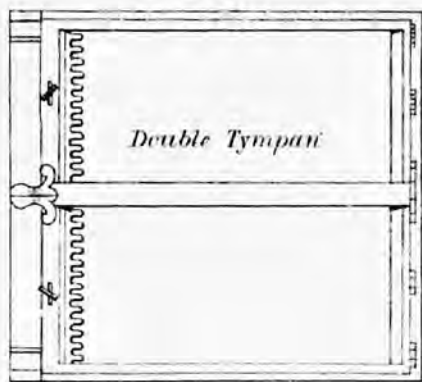


Fig. 7.



Fig. 2.

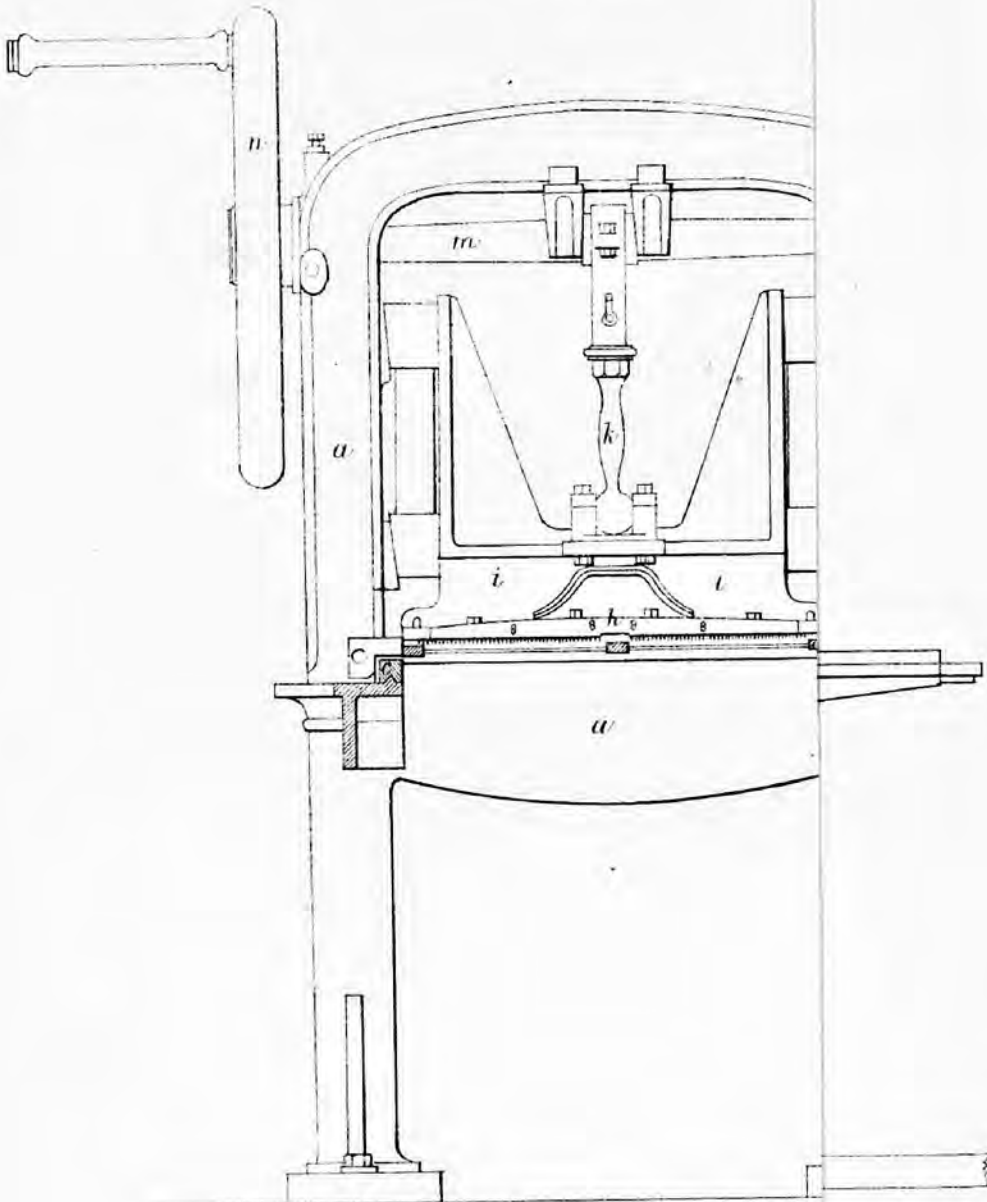


Fig. 5.

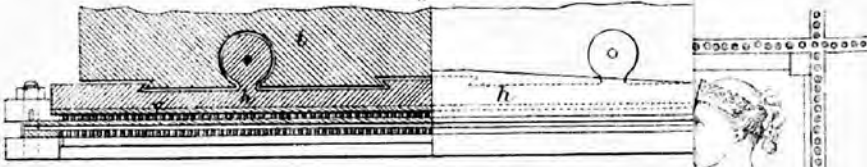
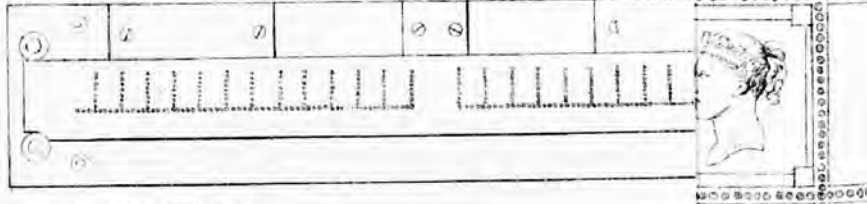


Fig. 4.



## A P P E N D I X.

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### DESCRIPTION OF THE MACHINE AND ITS OPERATION.

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THE machine is intended to be worked by steam-power; it is about eight feet high, and 20 feet in circumference. It is made of strong massive iron, the force required to perforate, or rather to punch, the sheets being enormous, so great, that on the occasion of the first trial at the manufactory, the iron-resisting axle *m*, that was then attached to the machine, though six inches in circumference, was, on the first revolution of the wheel, permanently bent, by the force exerted on the plunger.

Fig. 1, on the accompanying plate, is a side view, fig. 2 a front view, of the machine: *a, a*, is the main framing of the press; and *b, b*, are horizontal bracket-arms, bolted to a cross-bar *a\**, of the framing *a*, and provided with V-bars, over which a sliding-frame, *c*, traverses. This frame *c* carries the sheets of paper intended to be perforated with holes. On the top of the cross-bar *a\**, a slotted plate, fig. 3, is bolted, and over the slot a perforated plate *f* is fixed. The perforated plate *f* is a matrix, to receive the ends of the punches; the mode of supporting and working which, will be understood from the following description: *g* is a plate, in which a series of pins are set, in such order of lines as will allow of their circumscribing each stamp of a row of stamps, and punching corresponding holes in the sheet of paper containing such stamps, as shown in fig. 7. The arrangement and fixing of the pins will be better understood on referring to figs. 4 and 5, which show the parts in connexion therewith in sectional elevation and plan view, on a larger scale. The matrix-plate *f*, fig. 4, shows the mode of arranging the pins when sheets of postage-stamps are to be perforated: *h*, is a metal plate, which carries the plate *g*, with its pins, and is attached to, and forms part of, the plunger *i*. This plunger (see fig. 2) is provided at its upper part with guides, which work against smooth surfaces of the framing, as is usually employed in such machinery for steadying its movement; and it is jointed to a shaft *k*, pendant from a strap-piece, which embraces an excentric: *h\** is a guide, embracing the lower end of the plunger, and intended to ensure the proper action of the punches with respect to the matrix-plate *f*: *m* is an axle, having its bearings in the upper part of the frame *a*, and carrying, at about the middle of its length, the excentric. At one end of this shaft a wheel *n*, is keyed, for working the machinery, and at the other end the axle carries a disc *o*, which has a straight dove-tail slot running across its centre. This slot is intended to receive an adjustable stud-pin of a connecting-rod *p*, the lower end of which is secured by a

pin to an arm *g*, projecting from loose bosses on the short shaft *r*. To the inner end of the shaft *r* a pinion is keyed, which gears into a rack on the side of the frame *c*, and is intended to drive forward that frame, together with the sheet of paper or other substance which it carries, so as to bring a different part of the sheet under the action of the punches at each descent of the block *i*.

The machine presents twenty-one rows of fine holes running crosswise of the sheet (between the rows of stamps), and thirteen rows of fine holes running lengthwise of the sheet, whereby every stamp, as already stated, is completely surrounded by perforations, and can, therefore, be readily detached by the use of the fingers alone.

The machine operates upon ten label sheets at once, viz. upon two heaps or packs, placed side by side, each pack containing five sheets, which are laid one upon another "in exact register," that is, laid so that every stamp and every marginal space in the upper sheets may be exactly over the corresponding stamp, and marginal spaces in the lower sheets.

Each pack of sheets is held firmly together by a double and hinged steel frame or tympan, which, when closed, clips the pack along the side and end margins, and holds the sheets in a position resembling that of a piece of cloth in a tambour frame. The double tympan (fig. 6) when thus charged with five sheets on each side are laid side by side in an iron horizontal sliding frame, which forms part of the machine, and which, when the machine is in motion, is mechanically carried forward the exact length of one stamp, after every stroke of the perforating apparatus. Each stroke of the perforating apparatus makes one line of holes right across each pack of sheets; and (at right angles therewith, and adjacent thereto) thirteen short lines of holes on each pack; each of these short lines being just the length of one stamp, and forming a portion of one or other of the longitudinal lines of holes, which, on the completion of the operation, stretch from one end of the sheet to the other. Every stroke, therefore, perforates one complete line of holes across each pack of sheets, and at the same time perforates a portion ( $\frac{1}{13}$ ) of each of the lines of holes which run lengthwise of the sheets.

Twenty-one perforating strokes are obviously necessary, although there are but twenty rows of stamps, because the last row has to be perforated at the bottom, in addition to the twenty preceding perforations.

The perforating apparatus resembles a comb, being formed of short steel wires, or pins, fixed vertically—not pointed, however, but flat-ended, like an uncut blacklead pencil.

By the motion of the machine, these pins descend upon the paper which lies below them upon a perforated steel plate, whose holes correspond in position and in diameter exactly with the descending pins. The flat end of each steel pin, therefore, forces five minute circles of paper (one from each sheet of the pack), down into its hole in the steel plate below. The punches then ascend, and the sliding frame carries the sheets forward by the length of one stamp,

when the pins descend again, and make another perforation, and this is repeated twenty-one times, when the sheets are completely perforated.

One great difficulty with which the inventor has had to contend, has arisen from the unequal shrinkage of the paper in drying, first, after the printing (for which the paper is previously damped), and, secondly, after the gumming. This renders the sheets unequal in the length of the impression, even though they may have been printed at one time, and from one plate. Thus, the stamps being longer (by, perhaps,  $\frac{1}{200}$ th or  $\frac{1}{300}$ th part of an inch each) on one sheet than on another, the sheets require to be assorted previous to their being perforated, and the machine requires an adjusting apparatus, by which, when all the sheets of one length have been perforated, the mechanism may be adapted to the perforation of sheets whereon the stamps are slightly longer or shorter; for although so slight a difference as  $\frac{1}{300}$ th of an inch is imperceptible in the length of one stamp, yet the sheet containing twenty stamps in length in the twenty successive movements of the sliding frame, the amount of error accumulates to  $\frac{20}{300}$ th or  $\frac{1}{15}$ th of an inch, which is sufficient to cause the spoilage of a few of the last rows of stamps, by carrying the cross-line of perforation out of the space between the rows, and upon the stamps, perhaps cutting off the word "Postage" at the top, or the words "One Penny" at the bottom.

The sliding frame, which, after every descent of the perforating punches, has to carry forward the packs of sheets suitably for the next descent of the punches, has a rack affixed upon its side, into which a pinion is geared, and which resolves about  $\frac{1}{6}$ th of a turn at every stroke, and thereby carries forward the sliding frame. To modify (infinitesimally) the forward motion of the sheet, increasing or decreasing that motion as may be required, therefore demands that the extent of the motion of the pinion should be so increased or decreased.

Motion is given to the pinion thus: upon the spindle *r*, upon which it is fixed, there is also fixed a large fine-toothed rotchet-wheel *s* (having 1,200 teeth). By the side of this wheel an arm, *q*, works up and down (like a pump-handle); it has its centre of motion upon the wheel-spindle; this arm carries a segment, *x*, to which three spring driving-catches are attached, one above another; and as the arm rises, one or other of these catches engages a tooth of the rotchet-wheel, and forces that wheel (and the pinion) partially round.

Commonly the rise and fall of the arm is such as to allow the catch, in its descent, to pass 199 teeth, and engage with the 200th tooth; so that the wheel having 1,200 teeth, is, as the arm descends, turned exactly  $\frac{1}{6}$ th part of a revolution, and so much it turns the pinion.

But when the sheets are somewhat longer than usual, it becomes necessary to turn the rotchet-wheel slightly more than the  $\frac{1}{6}$ th of its revolution; and, on the contrary, when the sheets are shorter than usual, the rotchet-wheel must be turned slightly less than a sixth.

To accomplish such changes, the space through which the arm rises and falls will require to be slightly increased or decreased, as the case may be. The arm, though it is lifted by the machine, falls by its own weight (aided by a spring); and there is a screw attached to the frame, and so placed, that its point shall receive and stop the arm when that has descended far enough; by turning the screw backward, so that it may not intercept the arm quite so soon in its descent, the range of the arm's motion may be increased, and that with any needful degree of minuteness, or the range may be shortened by turning the screw forward. Thus the driving catch, instead of engaging the 200th tooth, might be made to engage the 201st tooth, or the 199th, &c.; but such an addition or subtraction of a whole tooth is often found to cause a too great change upon the sheet, and for this reason it is that there are three catches acting, or ready to act, upon the ratchet-wheel, instead of one catch. These catches are so placed, that when catch No. 1 makes contact with a tooth of the ratchet-wheel, catch No. 2 falls short of contact with the tooth which it is most ready to act upon, by a distance equal to one-third part of the space between tooth and tooth; and catch No. 3 falls short of contact with its adjacent tooth by two-thirds of such space.

From this arrangement it follows, that if the range of motion of the driving-arm (and the catches) be increased from 200 teeth to 200 teeth and one-third of a tooth, then, when the catch No. 1 has carried the wheel through that space, the catch No. 2 will next engage a tooth, and carry the wheel through a second space of  $200\frac{1}{3}$  teeth, after which the catch No. 3 will engage its tooth, and move the wheel a third space of  $200\frac{2}{3}$  teeth, making 601 teeth in three moves, and, with three more moves, making 1,202 teeth for the whole length of the sheet. By this arrangement of the three catches, the 1,200 teeth are practically multiplied by three, so as to answer the purpose of 3,600 teeth, and, by virtual multiplication of the teeth, this produces a degree of minuteness which is found sufficient for the purpose.

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