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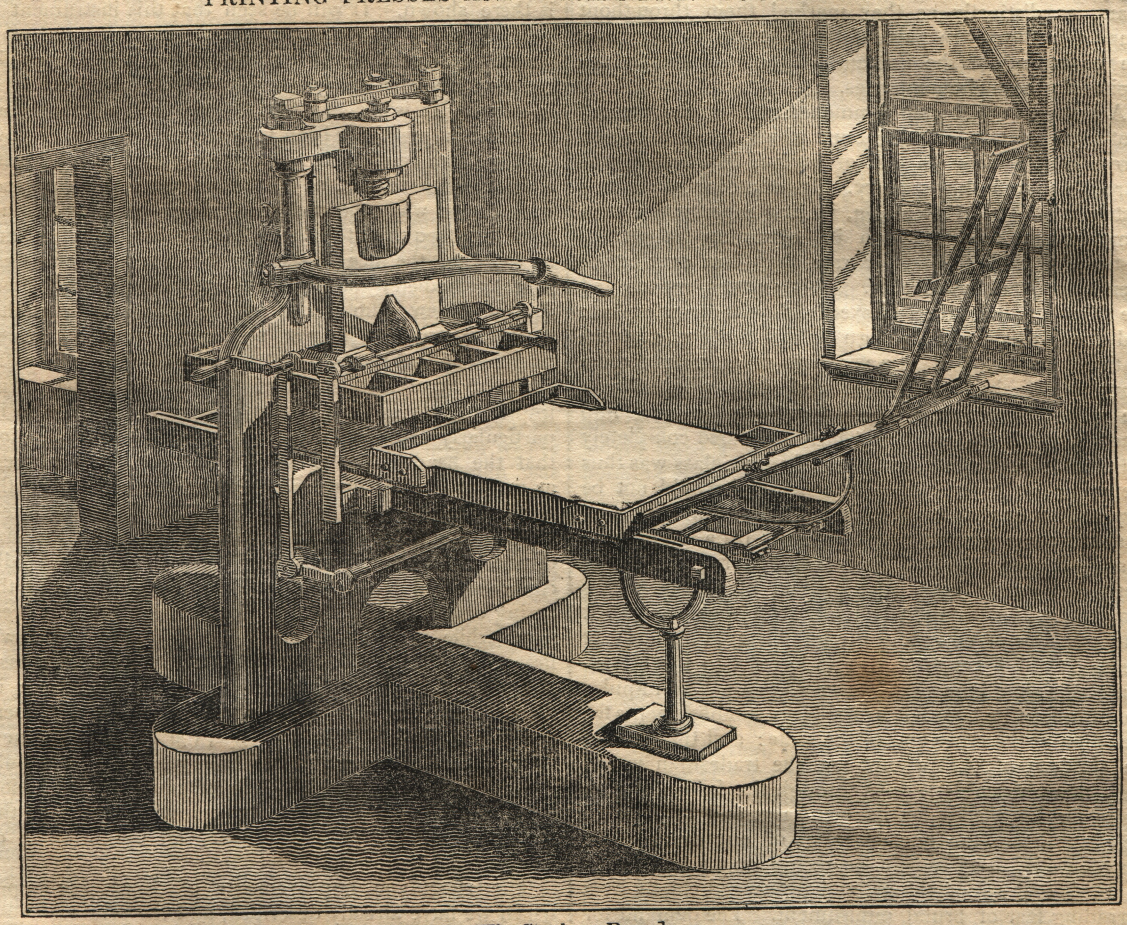
THE COMMERCIAL HISTORY OF A PENNY MAGAZINE.—No. IV.
(Conclusion).

PRINTING PRESSES AND MACHINERY.—BOOKBINDING.



[The Stanhope Press.]

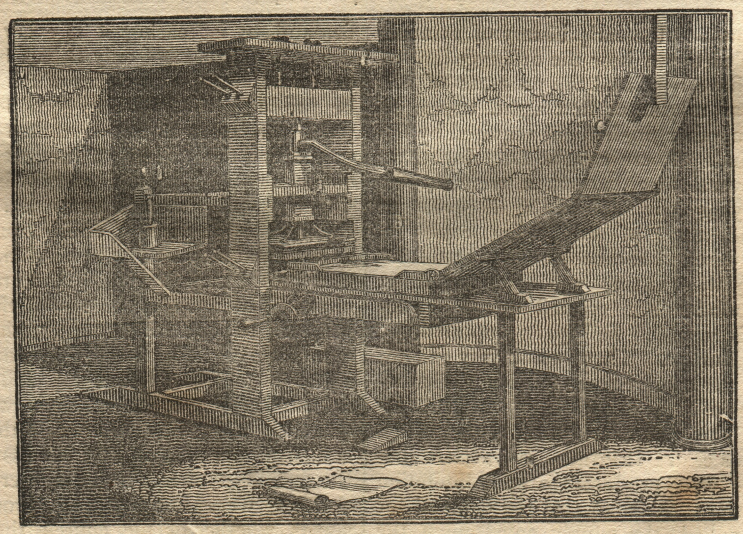
Those who have examined the early history of printing will scarcely have failed to see how the ordinary laws of demand and supply have regulated the progress of this art, whose productions might, at first sight, appear to form an exception to other productions required by the necessities of mankind. There can be little doubt, we think, that when several ingenious men were, at the same moment, applying their skill to the discovery or perfection of a rapid mode of multiplying copies of books, there was a demand for books which could not well be supplied by the existing process of writing. That demand had doubtless been created by the anxiety to think for themselves, which had sprung up amongst the laity of Catholic Europe. There was a very general desire amongst the wealthier classes to obtain a knowledge of the principles of their religion from the fountain-head,—the Bible. The desire could not be gratified except at an enormous cost. Printing was at last discovered; and Bibles were produced without limitation of number. The instant, therefore, that the demand for Bibles could be supplied, the supply acted upon the demand, by increasing it in every direction; and when it was found that not only Bibles but many other books of real value, such as copies of the ancient classics, could be produced with a facility equal to the wants of every purchaser, books at once became a large branch of commerce, and the presses of the first printers never lacked employment. The purchasers of books, however, in the fifteenth and sixteenth centuries, were almost wholly confined to the class of nobles, and those of the richer citizens and scholars by profession. It was a very long time before the influence of the press had produced any direct effect upon the habits of the great mass of the people. In our own country, the many hundreds of pamphlets of political and religious controversy that were issued during the times of the civil wars, were unknown to the larger portion of those who took sides in the quarrel. They were directed to the important body of landed proprietors, and the no less important leaders of the people in towns; and they were formed to influence, as they were in great part produced by, the active spirits, whether of the church, the bar, or the senate.

who were the most prominent directors of public opinion. It was not till the system of periodical literature was fairly established, and that newspapers first, and magazines and reviews subsequently, had taken hold of the popular mind, that the productions of the press could be said to be in demand amongst the people generally. Up to our own times that demand has been limited to very narrow bounds; and the circumstances by which it has been extended are as remarkable as those which accompanied the progress of the original invention of printing. The same principle of demand going before supply, and the same re-action of supply upon demand, will be found to have marked the operations of the printing press in this country, during the last five and twenty years, as distinctly as they marked them throughout Europe in the latter part of the fifteenth century and the beginning of the sixteenth. We will shortly recapitulate these circumstances.

A few years after the commencement of the present century, a system of education, which is now known throughout Europe as that of *mutual instruction*, was introduced into this country. In whatever mode this system was called into action, its first experiments soon demonstrated that, through it, education might be bestowed at a much cheaper rate than had ever before been considered practicable. This success encouraged the friends of education to exertions quite unexampled; and the British and Foreign School Society, and the National Society, had, in a very few years, taught some thousands of children to read and write, who, without the new arrangements which had been brought into practice, would in great part have remained completely untaught. A demand for books of a new class was thus preparing on every side. The demand would not be very sudden or very urgent; but it would still exist, and would become stronger and stronger till a supply was in some degree provided for it. It would act, too, indirectly but surely upon that portion of society whose demand for knowledge had already been in part supplied. The principle of educating the humblest in the scale of society would necessarily give an impulse to the education of the class immediately above them. The impulse would indeed be least felt by the large establishments for education at the other end of the scale; and thus, whilst the children of the peasant and the tradesman would learn many valuable lessons through the influence of a desire for knowledge for its own sake, and of love for their instructors, the boys of many of our great public schools would long remain acquiring only a knowledge of words and not of things, and influenced chiefly by a degrading fear of brutal punishment. The demand for knowledge thus created, and daily gathering strength amongst the bulk of the people, could not be adequately supplied twenty years ago by the mechanical inventions then employed in the art of printing. Exactly in the same way as the demand for knowledge which began to agitate men's minds, about the middle of the fifteenth century, produced the invention of printing, so the great extension of the demand in England, at the beginning of the nineteenth century, produced those mechanical improvements which have created a new æra in the typographical art.

In the 'Ancient view of a Dutch Printing-office,' given at the head of the 'Penny Magazine,' No. 107, the most rudely constructed of the early printing-presses is there shown. It will be seen that this instrument is nothing more than a common screw-press,—such as a cheese-press or a napkin-press,—with a contrivance for running the *form* of types under the screw after the *form* is inked. It is evident that this mode of obtaining an impression must have been very laborious and very slow. As the screw must have come down upon the types with a dead pull,—that is, as the table upon which the types were placed was solid and unyielding,—great care must have been required to prevent the pressure being so hard as to injure the face of the letters. These defects were at last remedied by an ingenious Dutch mechanic, Willem Jansen Blaew, who carried on the business of a mathematical-instrument maker at Amsterdam; in which business he had received instruction and encouragement from the great Danish astronomer, Tycho Brahe. The improvements in Blaew's presses do not require to be particularly described. It may be sufficient to mention that the head of the press in which the screw worked, as well as the bed upon which the table containing the *form* of types rested, were yielding; and that the screw consisted of three or four worms, according to the size of the cylinder. In this way the pressure was rapidly communicated from the screw to the types; and the spring above and below gave a sharpness to the impression, while it prevented it being too hard. Blaew's presses gradually drove out the more ancient press; but even as recently as the year 1770, Luckombe, in his 'History of Printing' then published, says, "There are two sorts of presses in use, the old and the new fashioned; the old sort till of late years were the only presses used in England." We subjoin a representation of Blaew's "new-fashioned" press, with which at the beginning of the present century all the printing of Europe was performed.

The stereotype improvements of Lord Stanhope, which we have already described, and the printing-press



[The Common Printing Press.]

invented by that nobleman, which bears his name, offered the first great practical improvements in the art of printing, with the exception of Blaew's press, that had been called into operation during a period of 350 years. The Stanhope press is represented in the wood-cut at the head of this number. It is unnecessary for us minutely to describe this very ingenious instrument. It is as superior to Blaew's wooden press as that was to the rude press that preceded it. Being composed entirely of iron, the surfaces brought into contact when the impression is given are perfectly level; and the combination of levers which give motion to the screw diminish the labour of the workman, while they add to its efficiency. This invention undoubtedly enabled printing of a better average quality to be produced; but it added very slightly to the speed with which impressions could be thrown off. Both at the Stanhope press and at the wooden press the same general rate of work was maintained, namely, 250 impressions on one side of a sheet per hour, to be produced by the joint labours of two men, one inking the types, the other laying on the sheet and giving the pressure.

While the mechanical power of the printing-press had remained for so many years pretty much the same as upon the first introduction of the art, the mode in which the ink was applied to the types had been quite unchanged for three centuries and a half. In the 'View of a Dutch Printing-office' it will be seen that the man at the second press is putting the ink on the types with two circular cushions, one of which he holds in each hand. These cushions, technically called *balls*, were universally used in printing twenty years ago. As the ancient weaver was expected to make his own loom, so, even within these few years, the division of labour was so imperfectly applied to printing that the pressman was expected to make his own balls. A very rude and nasty process this was. The sheepskins, called pelts, were prepared in the printing-office, where the wool with which they were stuffed was also carded; and these balls, thus manufactured by a man whose general work was entirely of a different nature, required the expenditure of at least half an hour's labour every day in a very disagreeable operation, by which they were kept soft. The quantity of ink wasted by these balls was enormous; so much so, that we have heard an ink-maker—who, like many other unthinking people, conceived that the waste of an article is an encouragement to production—lament that if he sold more ink in consequence of the extended demand for ink created by the printing machine, his trade was to the same extent injured by the diminution of the waste that attended the old operations of the printing-press. The printer's balls have now been superseded, and their waste of material and time got rid of, by an invention applicable not only to printing by machinery, but printing by hand.

Such was the state of the press department of printing, not only in England, but throughout the world, till the year 1814. As several approaches had been made before the time of Faust to the principle of printing books from moveable types, so the principle of producing impressions from a cylinder, and of inking the types by a roller, which are the great principles of the printing machine, had been discovered in this country as early as the year 1790. In that year Mr. William Nicholson took out a patent for certain improvements in printing, the specification of which clearly shows that to him belongs the first suggestion of printing from cylinders. But this inventor, like many other ingenious men, was led astray by a part of his project, which was highly difficult, if not impracticable, to the neglect of that portion of his plan which, since his time, has been brought into the most perfect operation. Nicholson's patent was never acted upon. The first maker of a printing machine was Mr. Koenig, a native of Saxony; and the first sheet of paper printed by cylinders, and by steam, was the 'Times' newspaper of the 28th November, 1814. The machine thus for the first time brought into action, was that of Mr. Koenig.

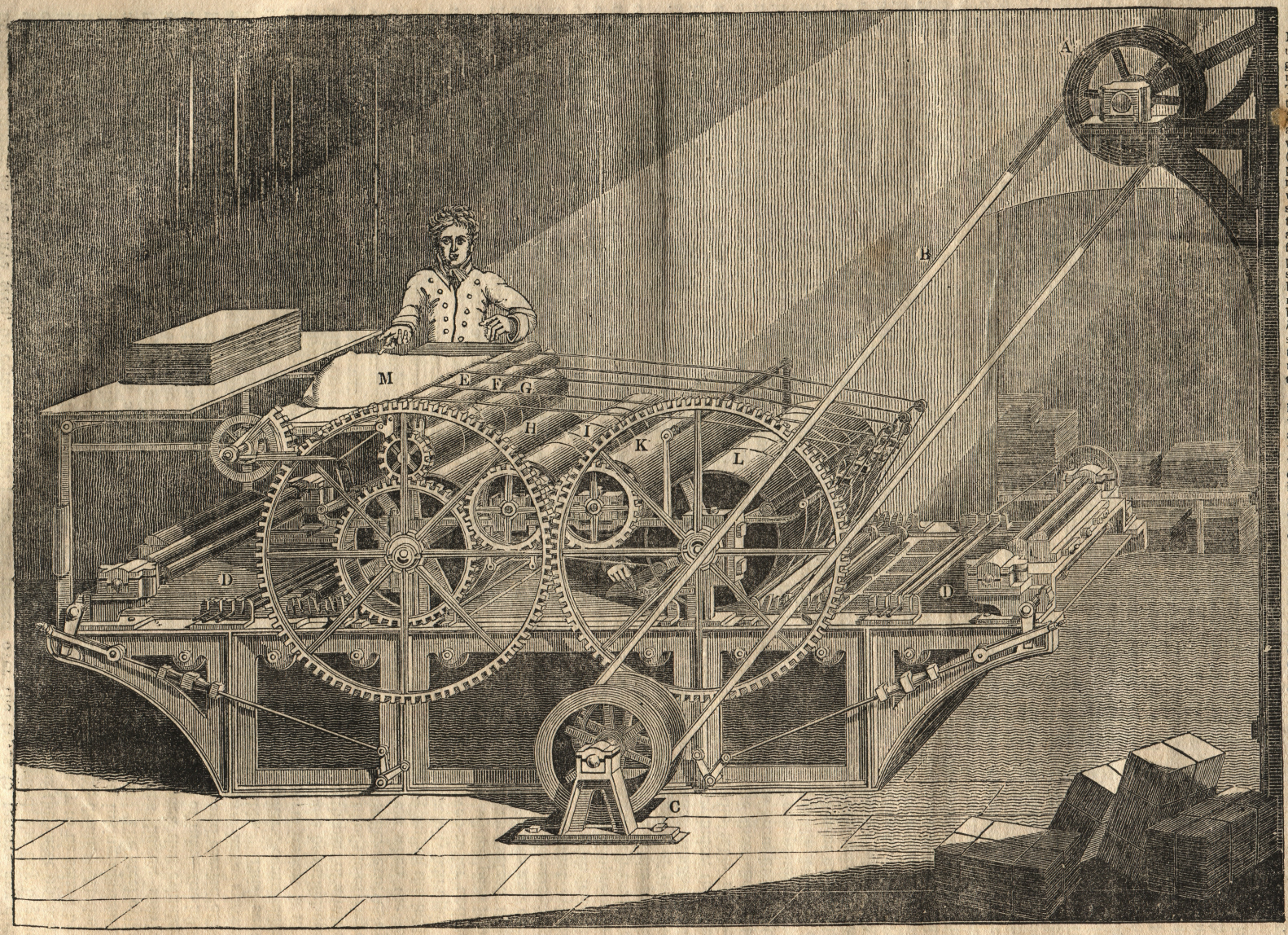
Before we proceed to a description of the printing machine, or take a view of its general effects upon the diffusion of knowledge, let us imagine a state of things in which the demand for works of large numbers should have gone on increasing, while the mechanical means of supplying that demand had remained stationary—had remained as they were at the beginning of the present century. Before the invention of stereotyping it was necessary to print off considerable impressions of the few books in general demand, such as bibles and prayer-books, that the cost of composition might be so far divided as to allow the book to be sold cheap: with several school-books, also, it was not uncommon to go to press with an edition of 10,000 copies. Two men, working eight hours a-day each, would produce 1000 perfect impressions (impressions on each side) of a sheet per day; and thus if a book consisted of twenty sheets, (the size of an ordinary school-book,) one press would produce the twenty sheets in 200 days. If a printer, therefore, were engaged in the production of such a school-book, who could only devote one press to the operation, it would require very nearly three-quarters of a year to complete 10,000 copies of that work. It is thus evident, that if the work were to be published on a given day, it must begin to be printed at least three-quarters of a year before it could be published; and that there must be a considerable outlay of capital in paper and in printing for a long time before any return could be expected. This advance of capital would have a necessary influence on the price of the book, in addition to the difference of the cost of working by hand as compared with working by machinery; and there probably the inconvenience of the tedious progress we have described would stop.

But take a case which would allow no time for this long preparation. Take a daily newspaper, for instance, of which great part of the news must be collected, and written, and printed within twenty-four hours. Before the application of machinery to the printing of newspapers, in 1814, there were as many daily London newspapers as at present; but their average size was much smaller than those now published. The number of each paper printed was less than at present; and the later news was much more incompletely given. The mechanical difficulties of printing a large number within a limited time required to be overcome by arrangements which involved considerable expense; and thus less capital was left to be expended upon that branch of the outlay by which the excellence of a newspaper is mainly determined,—namely, the novelty, the completeness, and the accuracy of its intelligence. Let us take, for example, the 'Times' newspaper for some years prior to 1814, when it began to be printed by machinery. When that paper was originally established, somewhere about forty years ago, the present system of reporting speeches in parliament on the same night that they were spoken was scarcely ever attempted. A few lines mentioning the subject of the debate, and the names of the principal speakers, were sometimes given; but anything like a sketch of the general debate, or a report of any remarkable speech, was deferred to a future day, if it were published at all. Mr. William Woodfall, the son of the celebrated printer of the 'Public Advertiser,' in which the letters of Junius first appeared, undertook, without any assistance, the arduous task of reporting the debates of both Houses of Parliament, day by day, in his father's paper, and afterwards in other daily journals. This person possessed a most extraordinary memory, as well as wonderful powers of literary labour. It is asserted that he has been known to sit through a long debate of

the House of Commons, not making a single note of the proceedings, and afterwards to write out a full and faithful account of what had taken place, extending to sixteen columns, without allowing himself an interval of rest*. The remarkable exertions of this most famous of reporters gave the newspapers for which he wrote a celebrity which compelled other newspapers to aim at the same fullness and freshness in their parliamentary reports. What Woodfall accomplished by excessive bodily and mental exertion, his contemporaries succeeded in bringing to a higher degree of perfection by the division of labour; and thus in time each morning newspaper had secured the assistance of an efficient body of reporters, each of whom might in turn take notes of a debate, and commit a portion of it to the press several hours before the whole debate was concluded. Perfect as these arrangements had become at the beginning of the present century, it is manifest that during the session of Parliament at least, when newspapers are most interesting, their circulation must have been necessarily limited by the mechanical difficulties of their production. We must explain this a little more in detail. A newspaper, being made up of many distinct articles, does not require, as a book does, that the whole of the types of which it is composed should be set up before one side of it is printed off. The outer side of a daily paper, which ordinarily consists of advertisements, communications, and paragraphs of minor importance, may be printed off some hours before the inner side, which contains the later news, is ready to be printed. Such an arrangement of course would prevent the whole paper being filled with the latest news, as is now frequently the case; and thus all the papers printed before the invention of the machine will be found to be constructed with reference to this principle of having one half printed long before the other half was ready to be printed. But let us see how that half, which contained the last intelligence, was brought out previously to 1814. If we refer to such a paper containing a report of any great parliamentary debate, we shall find the speeches generally given of a length not proportioned to their importance, but to the time of the evening in which they were delivered. Those reporters to whose share the earliest speeches fell gave them fully, because there was time for printing them; and this fullness left little space for the more important speeches which at that period generally closed the debate. The quality of reporting was therefore injured by the brevity required for all speeches delivered after midnight. Without this sacrifice the paper could not have been published at all on the day whose date it bore; and even with this sacrifice the difficulty of meeting the demand was excessive. The only mode in which it could be met was by setting up a portion of the paper in duplicate,—that is, setting up two sets of types, so that two presses might be engaged in printing it off at the same time. Sometimes in large papers, such as the 'Times,' a page only was worked at one press, to enable the pressmen to proceed with great speed. If the House of Commons now sits to four o'clock, and the 'Times,' or the 'Chronicle,' or the 'Herald,' cannot be ready for printing off till six o'clock at the earliest, the papers are nevertheless published, so that the country and the town may be supplied without intermission. In such a case, before the introduction of the printing machine, the morning coaches would have departed without a paper, and the people of London would have received them at the hour of dinner instead of that of breakfast. The printing press, as we have mentioned, will, at the ordinary rate, enable two men to take off two hundred and fifty impressions in an hour. By the most violent exertions the pressmen of a daily newspaper were enabled, with relays, to work off about five hundred copies in an hour. One press would therefore produce ten thousand copies in about twenty hours. It is manifest that such a rate of speed, if such a quantity were demanded, would be incompatible with the production of a daily paper, the condition of whose existence is that it must be wholly printed and issued in four and twenty hours. Let us double the speed by printing in duplicate; and we find that ten thousand copies can be produced in about ten hours. But even this rate carries the publication of several thousands of the ten thousand printed into the next afternoon. We may, therefore, assume that without triplicates, which we believe were never resorted to, no daily paper previous to 1814 could aim at the sale of a greater number of copies than could be printed off even with duplicates in six hours—of which number the publication would often not be complete till after mid-day. The number printed of the most popular daily paper, would therefore be limited to five thousand; and this number could not be produced in time without the most perfect division of labour aiding the most intense exertion, provided that paper were printed by hand. The 'Times' newspaper now produces ten thousand copies in two hours and a half, from one set of types.

If the difficulties that existed in producing any considerable number of newspapers before the invention of the printing machine were almost insurmountable, equally striking will the advantages of that invention appear when we consider its application to such a work as the 'Penny Magazine.' Let us suppose that the instruction of the people had gone on uninterruptedly in the schools of mutual instruction, and that the mechanical means for supplying the demand for knowledge thus created had sustained no improvement. In this series of papers we have endeavoured constantly to show that the price at which a book can be sold depends in great part upon the number printed of that book. But at the same time it must be borne in mind, that the number of any particular work thus produced must be limited by the mechanical means of production. If the demand for knowledge had led to the establishment of the 'Penny Magazine' before the invention of the printing machine, it is probable that the sale of twenty thousand copies would have been considered the utmost that could have been calculated upon. This invention has forced on other departments of printing, and larger presses have therefore been constructed to compete in some degree with the capacity of the machine for printing a large *form* of types. Twenty years ago there probably was no press in England large enough to work off a double number of the 'Penny Magazine.' One thousand perfect copies, therefore, could only have been daily produced at one press by the labour of two men. The machine produces sixteen thousand copies. If the demand for the 'Penny Magazine,' printed thus slowly by the press, had reached twenty thousand, it would have required two presses to produce that twenty thousand in the same time, namely, ten days, in which we now produce one hundred and sixty thousand by the machine; and it would have required one press to be at work one hundred and sixty days, or sixteen presses for ten days, to effect the same results as the machine now effects in ten days. But, in point of fact, such a sale could never have been reached under the old system of press-work. The hand-labour, as compared with the machine, would have added at least forty per cent. to the cost of production, even if the sixteen presses could have been set in motion. Without stereotyping, no attempt would have been made to set them in motion; for the cost of re-engraving wood-cuts, and of re-composing the types, would have put a natural commercial limit to the operation. With stereotypes, the numbers printed would have been limited by the time required for the production of the stereotype-plates; in the same way as the number of a newspaper worked

* 'Nichols's Literary Anecdotes,' vol. i., p. 303.



Applegath and Cowper's Printing Machine.]

Apparatus for giving Motion to the Machine.—A. The Rigger, a wheel revolving upon a shaft which is turned by the Steam Engine.—B. An endless strap for transmitting the motion of the rigger, A, to the machine.—C. The "Dead" and "Live Riggers," two wheels, the former one moving freely on its axis without connexion with any part of the machine, and upon which the endless strap is slipped when it is desirable to stop it; and the other (the outer one) turning on a spindle, which passes horizontally beneath the bed of the machine, and which carries two small cogged wheels for communicating the motion of the strap to all parts of the machine. The first of these, called the driving pinion, lies immediately alongside the dead rigger, and, by turning the first great cogged wheel, puts the whole of the printing cylinders, drums, &c., in motion. The second, called the *upright* bevilled wheel, is borne on the end of the pinion, and is situated midway under the bed of the machine;—this bevilled wheel, through the intervention of an *horizontal* bevilled wheel, a sliding rack, and some other contrivances, gives to the bed or table of the machine upon which the type rests, a *horizontal motion backwards and forwards.*

Apparatus for Inking.—D. The Inking Table. This is supplied with ink by a vibrating roller, which, as it rises, touches another roller called the *Doctor*, thickly covered with ink from the reservoir, against which it is placed, and, as it touches it, carries off by contact a portion of the viscid ink along its whole length; it then descends, and for a moment slightly pressing itself upon the end of the table, leaves on it a portion of the ink which it had previously taken from the doctor. This ink is then spread over the surface of the table by three inking rollers, and afterwards taken from it and distributed over the face of the type by two or three other rollers.

Apparatus for Printing.—E. The Web Roller.—F. The Smoothing Roller.—G. The Entering Drum.—H. The First Impression Cylinder.—I. K. The First and Second Paper Drums.—L. The Second Impression Cylinder.—M. A sheet of white paper placed by the "laying on-boy" on what is called the web. From this, by a contrivance which could not be shown in the engraving, the sheet is caught and carried under the smoothing roller, F, where it is closely bound to the entering drum, G, by *five endless tapes*, which then conduct it smoothly and accurately through the following operations. It is carried round the entering drum and delivered to the first impression cylinder, H, where, in passing under it, it receives on one side, by a rolling pressure, the impression of the first forms of type; it is then carried by the tapes *over* the second, and *under* the third paper drums, I and K, to the second impression cylinder, L, where it is "perfected," or printed on the remaining blank side, and thrown out to the "taking-off-boy," who sits waiting to receive it, and whose hand is shown under K.

by hand is limited, as we have seen, by certain natural obstacles, which could not be passed with profit to those concerned in the production. At any rate the difference in the cost of printing by machinery and printing by hand would either have doubled the price of the 'Penny Magazine,' or in the same proportion diminished its size and its quality. Under those circumstances a sale of twenty thousand would have been a large sale. The saving of labour and the saving of time by the printing machine enable, in a great degree, this little work to be published at its present cost, and to be delivered, without any limitation to its supply, at regular periodical intervals throughout the United Kingdom. Without this invention a demand beyond the power of a press or two to meet would have become embarrassing. The work would have been perpetually *out of print*, as a failure in the supply of a book is termed. If extraordinary efforts had been made to prevent this, great expenses would have been created by the irregular exertion. The commercial difficulties of attempting a supply beyond the ordinary power of the mechanical means employed would have been insurmountable—the demand could not have been met.

Having thus explained the general advantages of the printing machine for meeting the demand which now exists for books of large numbers, we will conduct our readers to Mr. Clowes's printing establishment, where there are more printing machines at work than at any other office in the world. It may be convenient, however, first to refer to the engraving of the sort of printing machine there principally employed, with the description of its several parts.

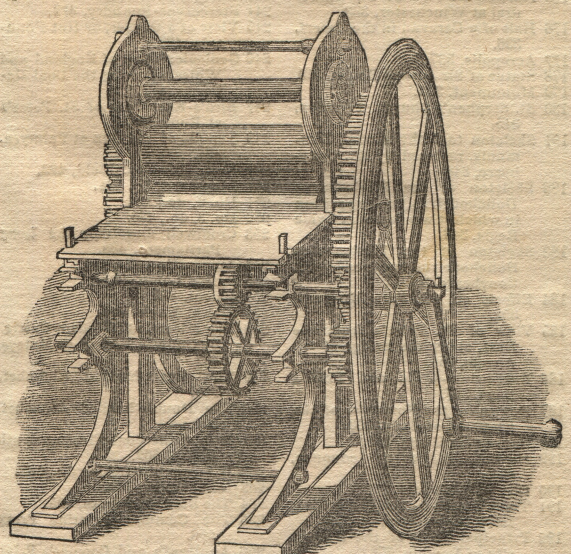
The visitor to Mr. Clowes's office will be conducted into a room in which there are ten machines generally in full work. In an opposite room are six similar machines. The power which sets these in motion is supplied by two steam-engines. Upon entering the machine-room the stranger will naturally feel distracted by the din of so many wheels and cylinders in action; and if his imagination should present to him a picture of the effects which such instruments are producing, and will produce, upon the condition of mankind, it may require some effort of the mind to understand the mode in which any particular machine does its work. Let us begin with one on which the 'Penny Magazine' is preparing to be printed off. One man, and sometimes two men, are engaged in what is technically called *making ready;* and this with stereotype plates is a tedious and delicate operation. The plates are secured upon wooden blocks by which they are raised to the height of moveable types; but then, with every care in casting, and in the subsequent turning operation, these plates, unlike moveable types, do not present a perfectly plane surface. There are hollow parts which must be brought up by careful adjustment; and this is effected by placing pieces of thin paper under any point where the impression is faint. This process often occupies six or seven hours, particularly where there are casts from wood-cuts. Let us suppose it completed. Upon the solid steel table at each end of the machine lie the eight pages which print one side of the sheet. At the top of the machine, where the laying-on boy stands, is a heap of wet paper. The visitor will have seen the process of wetting previously to entering the machine-room. Each quire of paper is dipped two or three times, according to its thickness, in a trough of water; and being opened is subjected, first to moderate pressure, and afterwards to the action of a powerful press, till the moisture is equally diffused through the whole heap. If the paper were not wetted, the ink, which is a composition of oil and lamp-black, would lie upon the surface and smear. To return to the machine. The signal being given by the director of the work, the laying-on boy turns a small handle, and the moving power of the strap connected with the engine is immediately communicated. Some ten or twenty spoiled sheets are first passed over the types to remove any dirt or moisture. If the director is satisfied, the boy begins to lay on the white paper. He places the sheet upon a flat table before him, with its edge ready to be seized by the apparatus for conveying it upon the drum. At the first movement of the great wheel, the inking apparatus at each end has been set in motion. The steel cylinder attached to the reservoir of ink has begun slowly to move,—the 'doctor' has risen to touch that cylinder for an instant, and thus receive a supply of ink,—the inking-table has passed under the 'doctor' and carried off that supply,—and the distributing-rollers have spread it equally over the surface of the table. This surface having passed under the inking-rollers, communicates the supply to them; and they in turn impart it to the *form* which is to be printed. All these beautiful operations are accomplished in the sixteenth part of a minute, by the travelling backward and forward of the carriage or table upon which the *form* rests. Each roller revolves upon an axis which is fixed. At the moment when the *form* at the back of the machine is passing under the inking-roller, the sheet, which the boy has carefully laid upon the table before him, is caught in the web-roller and conveyed to the endless bands or tapes which pass it over the first impression cylinder. It is here seized tightly by the bands, which fall between the pages and on the outer margin. The moment after the sheet is seized upon the first cylinder, the *form* passes under that cylinder, and the paper being brought in contact with it receives an impression on one side. To give the impression on the other side the sheet is to be turned over; and this is effected by the two drums in the centre of the machine. The endless tapes never lose their grasp of the sheet, although they allow it to be reversed. While the impression has been given by the first cylinder, the second *form* of types at the other end of the table has been inked. The drums have conveyed the sheet during this inking upon the second cylinder; it is brought in contact with the types; and the operation is complete.

The machine which we have thus imperfectly described is a most important improvement of Koenig's original invention. That, like most first attempts, was extremely complicated. It possessed sixty wheels. Applegath and Cowper's machine has sixteen only. The inking apparatus of this machine is by far the most complete and economical that ever was invented. Nothing can be more perfect than the distribution of the ink, and its application to the types. It has therefore entirely superseded Koenig's machine: and as the patent has expired, its use is rapidly extending, not only in England, but throughout Europe. Our limits will not permit us to attempt any description of the other machines which are employed in London. The most remarkable are the two now used by the 'Times' newspaper, each of which produces four thousand impressions per hour on one side of a sheet. These machines are modifications of Applegath's and Cowper's; and the additional speed is gained by having the sheets laid on at four different points instead of at one, and by employing four printing cylinders to press in succession upon one *form*. The hand machine of Napier, which is a most ingenious invention, is in use in several London offices.

When a newspaper is printed off, it is at once removed from the machine or the press to the publisher's counter, and then sold wet to the distributors. It is important that the 'Penny Magazine' should be delivered dry, especially those numbers which are made up into parts. A printer's warehouse, from which books are issued in large quantities, is a scene of great activity. The drying process is now a tolerably rapid one, by the conveyance of steam or hot air through the drying rooms. The sheets are here hung upon poles, and in a few hours acquire the necessary hardness. They are next counted into quires; and if time permits, the quires are made perfectly smooth and compact by heavy pressure. The

hydraulic press, which is one of the most useful inventions of the late Mr. Joseph Bramah, has in most printer's warehouses superseded the use of the common screw press.

Our account of the processes which unite for the production of a 'Penny Magazine' would be imperfect did we not notice the business of the Book-binder. The folding and sewing of the weekly numbers and monthly parts which we issue furnish employment to a great number of persons, principally women. The sheets are delivered by the printer to various master book-binders, in whose workshops they are made up into numbers, or parts, or volumes. The growing demand for particular works, of which large quantities are issued, has given a remarkable impulse to the book-binding business of the metropolis. That business a few years back was chiefly divided amongst three classes;—those who bound books elegantly in leather,—an art which cannot be carried to perfection without great division of labour, and by which division the fine book-binding of London is still unrivalled;—those who were engaged in the commoner binding of school-books and cheap Bibles;—and those who devoted themselves to the rapid folding and sewing of magazines, and other periodical works. But within the last seven years the introduction of the cheap and yet neat and substantial binding in cloth, which was first attempted by Mr. Pickering, of Chancery Lane, has created a new branch of business, of equal importance to any of the previously existing branches. By this new process that cheapness is obtained which results from the performing any particular species of work upon a large scale instead of in detail; and that expedition which is a consequence of the minute division of labour which belongs to all considerable operations. Take the present volume of the 'Penny Magazine' as an example. During the last three or four months, 12,000 copies of each number (the quantity required for the first issue of the volume) will have been delivered to two book-binders. Each of these binders, at periods when his work-people are not very busily employed, will have gone on folding each number as he successively received it. In addition to the folding, he will have subjected parcels of each sheet to the action of a rolling machine, by which the sheets are tightly squeezed, so that the volume may be solid and flat



[Book-binder's Rolling Machine.]

when placed within its covers. This solidity and flatness used to be attained by beating the books with a large hammer,—a very laborious and very tedious operation, which materially increased the cost of book-binding, and degraded a very pretty art to a most toilsome task of heavy labour and little skill in one of its processes. The book-binders, however, have clung to the practice with great pertinacity, chiefly, perhaps, from its long existence amongst them. In the following copy of an ancient print the book-binder is seen hammering away, as many book-binders still hammer.

[Ancient Book-binder.]

The 'Penny Magazine' is, however, spared the infliction of these thumps; of which the effect in newly-printed books is, in most cases, to render them perfectly illegible, by transferring the ink of one page to the opposite. The pressure of the rolling machine can be much better adjusted to the state of the sheets.

While each number of the 'Penny Magazine' has thus been folded and made flat, the covers for the volumes have been at the same time preparing. The cloth has been attached to the boards; and the gold lettering has been impressed upon the back by a tool fixed in a stamping-press, which tool, being hollow, is heated from within side, like the Italian-iron of the laundress. At the time when this number is printing, the book-binders will have completed all these preparations for the issue of the volume. The moment that they receive this—the last sheet—from the printer, every exertion will be made to perfect the work which has been so long in progress. In less than an hour the requisite number of the sheet will be folded. Many women will be engaged in sewing the sheets together; and, as fast as they are sewed, the book-binders will be employed in cutting the edges, glueing the back, and fixing the volume in its linen cover. Some hours will be required for the perfect drying of the glue and paste; and the complete volume will again be subjected to the action of a powerful press. But, on the 1st of January, 12,000 copies of this volume will have been distributed throughout the kingdom. The final process of its binding will have occupied five or six days. Ten years ago the operation would have employed nearly as many months.

*** The Office of the Society for the Diffusion of Useful Knowledge is at 59, Lincoln's-Inn Fields.

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LIST OF ILLUSTRATIONS

END OF VOLUME THE SECOND.