

May 21, 1850.

WILLIAM CUBITT, President, in the Chair.

No. 840. "On Printing Machines, especially those used for Printing 'The Times' Newspaper." By Professor Edward Cowper.

THE object of this paper is to give a general idea of Printing Machines, and to describe particularly, the several machines which have been employed at the office of "The Times" for printing that journal, making such reference to the different steps of the invention as may be necessary for the illustration of the subject.

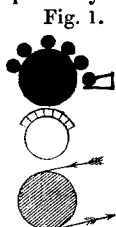
Previous to the year 1814, "The Times," in common with all other newspapers and books, was printed at the ordinary press, or at some improved form of press, such as the Stanhope press, &c., the operation of which was very simple. An assemblage of types, wedged tightly together in an iron frame, was laid on a flat table, and inked by hand with two large balls, by the pressman; a sheet of white paper was then placed on a skin of parchment stretched on a frame called the tympan, and retained there by a light iron frame called the frisket. The tympan and sheet were then turned down upon the inked type, run under the upper flat surface of the press by a handle and strap, and the impression was given by pulling the lever attached to the screw of the press. The type and sheet were then run out, the tympan and frisket were raised, and the printed sheet was removed. All these operations were performed by hand; and although the laying on the paper and pulling a lever appear to be very simple operations, yet, to take a proper quantity of ink on the balls, to distribute it equally, and to apply it to the types with perfect regularity, required considerable skill and practice. As, therefore, the improvement of the inking apparatus was the greatest difficulty in machine printing, the various contrivances which have been designed for accomplishing this object, deserve particular attention.

The first person who appears to have had any idea of printing by machinery, was Mr. William Nicholson, who, in 1790, took out a patent "for a machine, or instrument, for printing on paper, linen, cotton, woollen, and other articles, in a more neat, cheap, and accurate manner than is effected by the machines now in use." The following are his own words, divested of legal repetition:—"In the first place, I not only avail myself of the usual methods of making

[1849-50.]

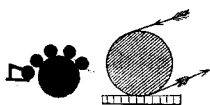
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type, but I do likewise make and arrange them in a new way, for by rendering the tail of the letter gradually smaller, such letter may be imposed on a cylindrical surface; the disposition of types, plates, and blocks upon a cylinder are parts of my invention, (Fig. 1). In the second



place, I apply the ink upon the surface of the types, &c., by causing the surface of a cylinder (smeared with the colouring matter) to roll over the surface of the types, &c., or else I cause the types to apply themselves to the said cylinder. It is absolutely necessary that the colouring matter be evenly distributed over this cylinder, and for this purpose I apply two, three, or more smaller cylinders, called distributing rollers, longitudinally against the colouring cylinder, so that they may be turned by the motion of the latter. If this colouring matter be very thin, I apply an even blunt edge of metal, or wood against the colouring cylinder. In the third place, I perform all my impressions by the action of a cylinder, or cylindrical surface; that is, I cause the paper to pass between two cylinders, one of which has the form of types attached to it, and forming part of its surface, and the other cylinder is faced with cloth, and serves to

Fig. 2.



press the paper, so as to take off an impression of the colours previously applied; or otherwise, I cause the form of types, previously coloured, to pass in close and successive contact with the paper, wrapped round a cylinder with woollen." (Fig 2).

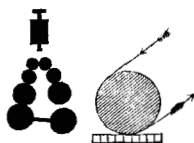
These words indicate the principal parts of modern printing machines, nevertheless Nicholson never brought his machine into practical use, nor could he succeed in making his arched type hold together on a cylinder, and had he done so, his plan of inking was so defective, that it could not have produced good work; whereas, if he had succeeded in making a good inking apparatus, he might have applied it at once to the ordinary flat form of type, and by passing the form under his cylinder, covered with paper, he would have been the first maker of a printing machine, instead of merely being the first to suggest its general principles.

The first working printing machine was the invention of Mr. Koenig, a native of Saxony; he submitted his plans to the late Mr. Thomas Bensley, the celebrated printer, and to Mr. Richard Taylor, the scientific editor of the "Philosophical Magazine." These gentlemen liberally encouraged his exertions, and in 1811 he took out a patent for improvements in the common press, which however did not produce any favourable result. He then turned his attention to the use

of a cylinder for obtaining the impression, and two machines on this principle, were erected for printing "The Times" newspaper, the reader of which was told, on the 28th of November, 1814, that he held in his hand, a newspaper printed by machinery and by the power of steam.

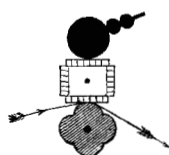
In these machines (Fig. 3), the form of type was placed on a table, and by means of a rack, was made to pass beneath two cylinders, round which the sheets of paper were wrapped, and were firmly held in their positions by means of tapes. The ink was placed in a cylindrical box, from which it was forced by a powerful screw, acting on a tightly-fitted piston; it fell then between two iron rollers; whence it then passed to a number of other rollers, two of which had in addition to their rotatory action a motion in the direction of their length, in order to distribute the ink more evenly, and from the last of these rollers it was applied to the types. This system of inking was so extremely complicated and difficult to manage, that it sometimes required two hours to get it into working order. Nevertheless, the introduction of the end motion to the inking rollers, was a great step in the right direction; and these machines worked "The Times" from 1814 to 1827, printing eighteen hundred impressions per hour.

Fig. 3.



In 1813 Messrs. Donkin and Bacon obtained a patent for a machine (Fig. 4), in which the types were fixed on a revolving four-sided prism. The ink was applied by one roller, which rose and fell with the irregularities of the prism; the sheet of paper was wrapped on another prism, so formed as to meet the irregularities of the type prism. One of these machines was erected at the University of Cambridge. It was a beautiful piece of workmanship, and the ingenuity of the polygonal wheels, was admired by every body. The inking apparatus was, however, very defective, and no good work could be produced by it, so that the machine was not used; however a great point was gained, for in this machine were first used the inking rollers covered with a composition of treacle and glue introduced by Mr. Bryan Donkin.*

Fig. 4.

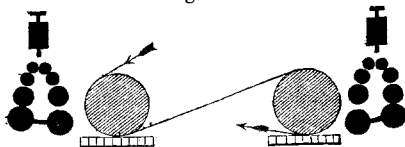


In 1815 Mr. Koenig invented a machine which he erected for

* This composition was first used in the Potteries, where it was made into slabs to receive the impression from a copper plate; but Mr. Donkin was the first who made it into a roller, and applied it to a printing machine.

Mr. T. Bensley, for printing both sides of the sheet (Fig. 5); it resembled two single cylinder machines placed with their cylinders towards each other; the sheet was conveyed from one cylinder to the other by means of tapes, the track of the tapes resembling the letter S laid horizontally; so that in the course of its track the sheet was turned over. At the first cylinder the sheet received the impression from the first form, and at the second cylinder it received the impression from the second form. The rollers were at first covered with leather, which never answered the purpose well, but they were subsequently covered with the composition of treacle and glue. It printed seven hundred and fifty sheets on both sides, equal to fifteen hundred impressions, per hour.

Fig. 5.



The only places in England where Koenig's machines were erected, were at "The Times" office, at Mr. Thomas Bensley's, and at Mr. Richard Taylor's, both of whom were part-proprietors of Koenig's patent, and at all these places they were ultimately superseded by Applegath and Cowper's machines.

In 1816 Mr. E. Cowper obtained a patent for curving stereotype plates and fixing them on a cylinder (Figs. 6 and 7); in these

Fig. 6.

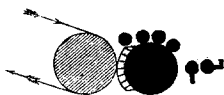
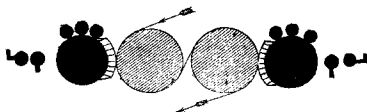


Fig. 7.



machines two cylinders for holding the paper, called "paper cylinders" were placed side by side, and against each was placed a cylinder for holding the stereotype plate, called the "type cylinder." On the surface of the type cylinder were four, or five inking rollers, kept in their places by their spindles resting in notches in a frame at each end of the cylinder, thus allowing freedom of motion and requiring no adjustment. The frame which supported the inking rollers, called the "waving frame," was attached by hinges to the general frame of the machine: the edge of the type cylinder was indented, and rubbing against the waving frame, caused it to wave, or vibrate to and fro, and consequently to give the inking rollers a motion in the direction of their length. The rollers distributed

the ink on three-fourths of the surface of the type cylinder, the other fourth being occupied by the stereotype. The ink was held in a trough, formed by a metal roller revolving against the edge of a plate of iron; in its revolution it became covered with a film of ink, which was conveyed to the type cylinder by an inking roller vibrating between them. On the type cylinder the ink was distributed as before described, and as the stereotype plates passed under the rollers, they became charged with colour: as the cylinder continued to revolve, the type came in contact with a sheet of paper, on the first paper cylinder, whence it was carried, by means of tapes, to the second paper cylinder, where it received the impression on its opposite side, from the type on the second cylinder. These machines produced from two thousand to two thousand four hundred impressions per hour.

Although these machines were only applicable to stereotype plates, yet they formed the foundation of the future success of Applegath and Cowper's machines, by showing the best method of furnishing, distributing, and applying the ink; thus in order to apply this method to a machine capable of printing from type, it was only necessary to do the same thing on an extended flat surface, or table, which had been done on a cylindrical surface; accordingly Mr. E. Cowper constructed machines on this principle, for printing one side of a sheet (Fig. 8), or both sides of the sheet (Figs. 9 and 10,) from type, and for which invention he obtained a patent.

Fig. 8.

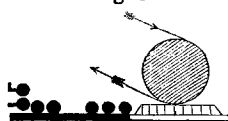
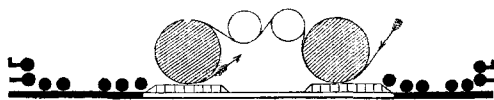


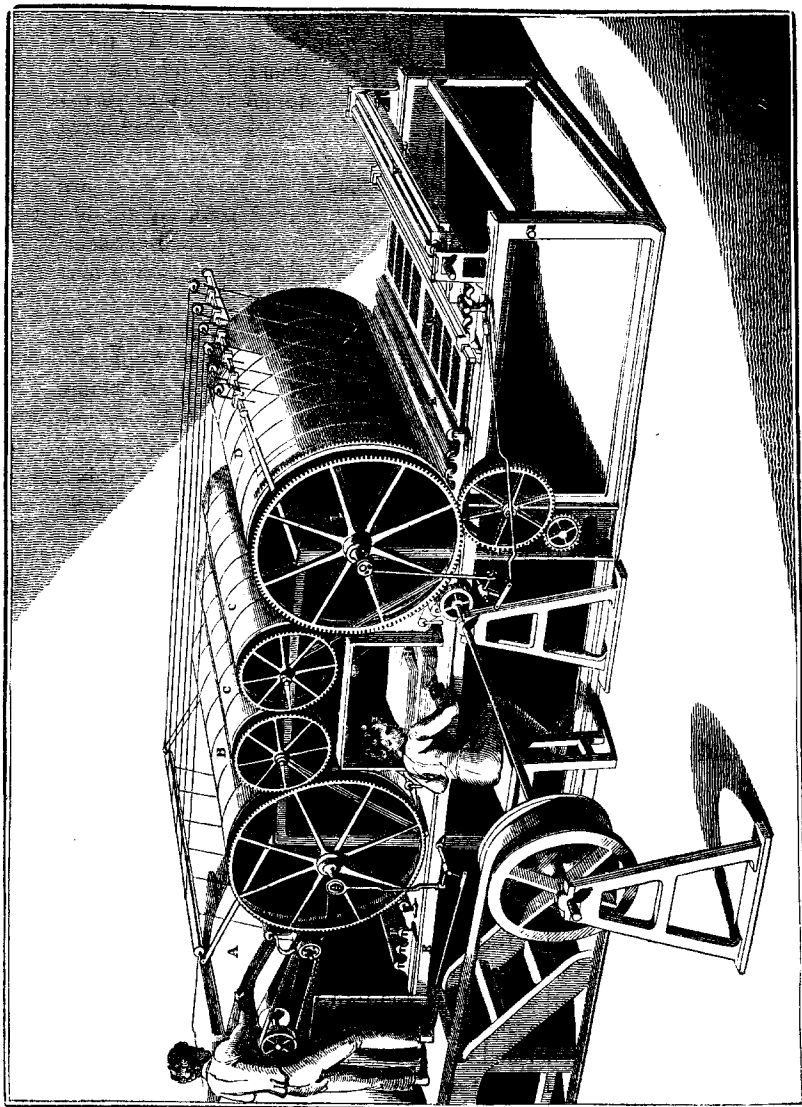
Fig. 9.



In Fig. 10, in which a boy is represented as laying on, **A**, is the sheet of white paper; **B**, the cylinder which prints the first side of the paper; **C**, drums over which the paper travels to, **D**, the cylinder which gives the final impression; **E**, the inking rollers under which the form is in the act of passing; **F**, the reservoir of ink, from which the inking rollers are supplied; **G**, the form receiving its last inking before it goes under the printing cylinder; and **H**, is a printed sheet, just being delivered into the hand of the taking-off boy. The lines at the top of the machine represent the tapes which run round the cylinder and secure the sheet.

In this machine the end motion of the distributing rollers was produced by a waving-frame, as in the cylindrical stereotype machine, until Mr. A. Applegath (who had become a joint proprietor

Fig. 10.



in these patents,) invented the diagonal position of the distributing rollers, which produced the end motion, in a more simple manner, and rendered the waving-frame unnecessary. Of these machines (henceforth known as Applegath and Cowper's presses.) some hundreds have been constructed with these combined inventions, modified in many ways for the various purposes of printing books, bank-notes, newspapers, &c.

The hand-inking roller, and distributing table, Figs. 11 and 12,

Fig. 11.

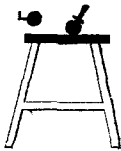


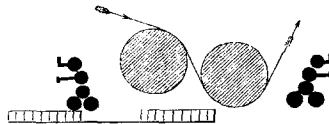
Fig. 12.



now so common in every printing-office in Europe and America, were included in Mr. Cowper's patent, and were applied by Applegath and Cowper to the common press, because the system worked so well in their machines. This invention has raised the quality of printing generally, and is acknowledged to have constituted an era in the art of printing. In almost all books above thirty years old some groups of words are very black, whilst other groups were not sufficiently black; these, which are technically called "monks" and "friars," are now altogether removed.

A variety of machines have been introduced since the first inventions of Applegath and Cowper; they are not however enumerated in this paper, because they have no reference to "The Times' machines," but Mr. Napier's press (Fig. 13) deserves honourable

Fig. 13.

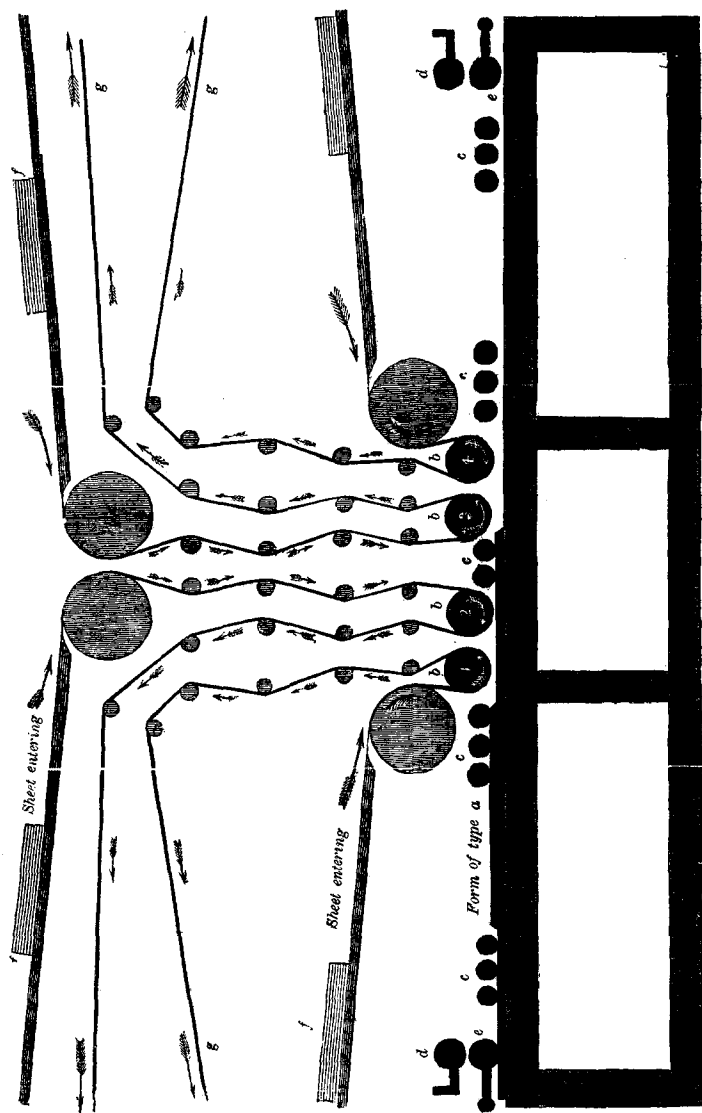


mention, on account of its ingenious construction: it has been deservedly successful, and is in extensive use.

The principal machines in use at "The Times" office at the present day are of two kinds; the first of which, the joint invention of Messrs. Applegath and Cowper, was erected in December 1827, (Fig. 14) the other, the invention of Mr. Applegath, was erected in May 1848. (Figs 15, 16, 17, and 18.)

In the machine by Applegath and Cowper, the form of type is placed on a table, and is made to pass backwards and forwards hori-

Fig. 14.



zontally under four paper cylinders, printing the paper at the alternate cylinders, the types receiving their ink from an apparatus similar to that already described. This machine is furnished with four feeding boards, at each of which a boy stands to feed in the sheets of paper. In order to obtain space for the boys to stand, without incommoding each other, two boys are placed on the floor, and two on a raised platform, and four other boys are conveniently placed at the ends of the machine, to receive the printed sheets. For the purpose of supplying the sheets to the machine, the "heap" of paper is placed at one end of the feeding board, the boy draws forward the top sheets by rubbing them with an ivory stick, each sheet is thus brought about one inch in advance of that below it until the edge of the topmost sheet projects beyond the board, and lodges on a wooden roller furnished with tapes, and which is constantly revolving; it however has no effect on the edge of the sheet, until at the proper time, another wooden roller, also furnished with tapes and in constant motion, drops down upon the edge of the sheet, which being thus nipped by the two rollers, immediately enters the machine between the two sets of tapes, and is carried by them round the paper cylinder, where it receives the impression, the tapes and sheet continuing their progress until they arrive at the place where the taker-off stands; here the tapes separate and the sheet falls into the hands of the taker-off.

Messrs. Applegath and Cowper engaged that this machine should print three thousand six hundred sheets per hour, but at the commencement it printed four thousand two hundred per hour, and subsequently reached five thousand per hour, and has even occasionally produced five thousand five hundred sheets per hour, each about four times the size of the old newspapers printed forty years ago.

Great however as the difference is between five thousand large sheets per hour, and two hundred and fifty small sheets per hour, (the speed of the common press) yet this number has actually been doubled by Mr. Applegath's recent invention of his Vertical Printing Machine which was erected at "The Times" office, in May 1848. (Fig. 15.)

This magnificent machine, consists of a cylinder about 5 feet 6 inches in diameter, on a portion of which the form of type is fixed, and on another portion the ink is distributed; but instead of the cylinder being placed in a horizontal position, as in all other attempts to put type on a cylinder, the cylinder is placed in a vertical position, and hence it is called a vertical machine. Around the type cylinder are placed eight other vertical cylinders, each about 12 inches diameter, or about one fifth of the size of the type cylinders;

these are the paper cylinders,* each of which is furnished with a feeding apparatus, where one boy lays on the sheets and another boy takes them off.

The feeding apparatus is very ingeniously contrived, to convey the sheet from its horizontal position on the feeding board, to its vertical position on the paper cylinder. By way of illustration, suppose the sheet as it lies on the feeding board, to have its four edges marked east, west, north and south; the west (or left hand edge) being placed under the drop-down roller, the sheet immediately descends into a vertical position, here it is seized by two pressing bars, or holders, the tapes which brought the sheet down, at the same moment retiring; two vertical rollers, furnished with tapes, now approach each other and seize the north edge of the paper, that most distant from the layer-on, the pressing bars, at the same moment, then, being raised vertically, releasing their hold; the sheet passes round the paper cylinder, when it meets the type and receives the impression, continuing its progress until the tapes separate, and the sheet is received by the taker-off.

The type used is of the ordinary kind, and is fixed on a block of iron, the under side of which fits the side of the cylinder; the upper surface of the block is formed into facets, or flat surfaces, corresponding in width and number with the columns of the newspaper. The surface of the form makes, therefore, a portion of a large polygon, on which account the middle part of the column would give but a faint impression to the paper; but as the difference between the chord and the arc is very trifling, the versed sine of half the arc being only one-fortieth of an inch, this is compensated for by pasting a few slips of paper on the paper cylinder, and no difficulty has been found in producing an equal impression.

The inking apparatus is similar in principle to that already described, but the inking rollers are held in their vertical position by spiral springs, and instead of an end motion being given to the rollers, a portion of the large cylinder is made to wave up and down, which answers the same purpose.

As the eight boys can each lay on from twelve hundred to thirteen hundred sheets per hour, this ingenious machine produces ten thousand sheets per hour.

"The following is a description of this machine (Figs. 15, 16, 17, and 18), and will explain how the various movements are performed; the letters of reference are the same in each of the figures.

* In Fig. 15 only seven paper cylinders are shown, one being omitted to allow the type to be seen.

"*a, a*, is the large vertical drum, forming the centre of the system, mounted on the shaft *b, b*, and driven by the bevel wheel and pinion *c, d*, the shaft of the pinion *d* being supported on the floor, and carried to the prime mover.

"*f, f, f, f, f, f, f, f*, are the eight impression cylinders, driven by the spur wheel *e*; the same speed is therefore secured, between the circumference of the drum (with the type) and the circumference of each impression cylinder.

Fig. 15.

Applegath's "Times" Vertical Printing Machine.

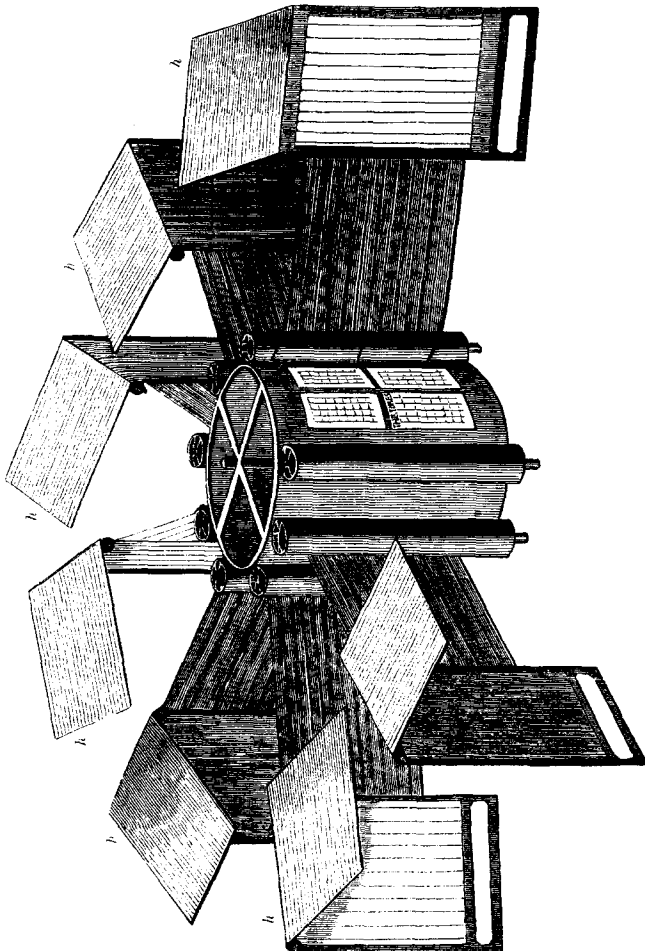


Fig. 16.

Plan.

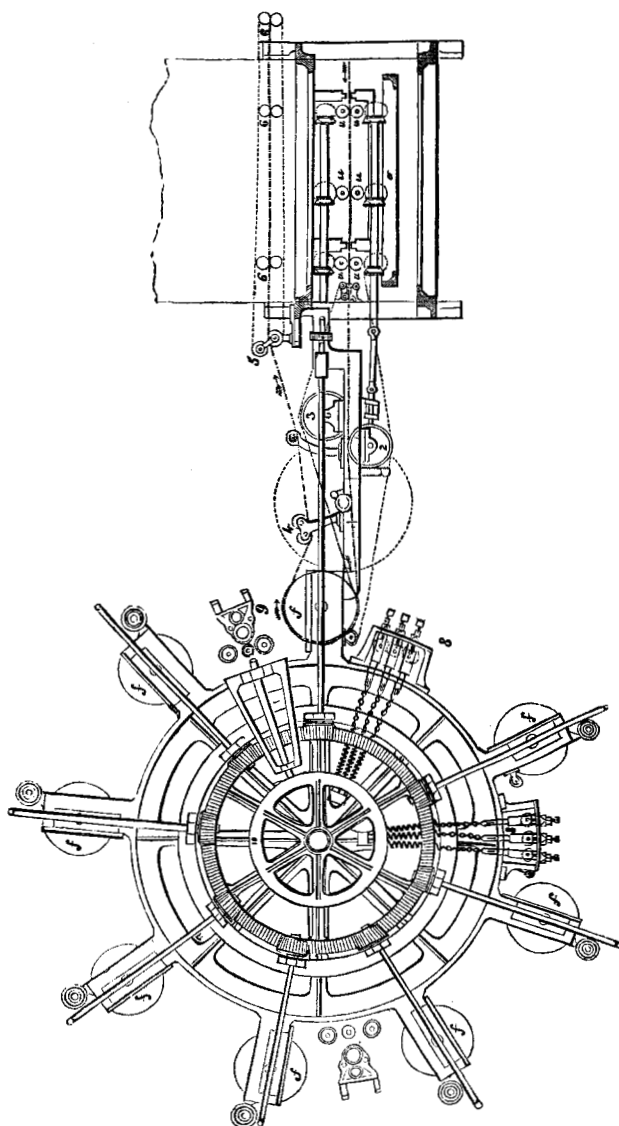


Fig. 17.

End View of Feeding Apparatus.

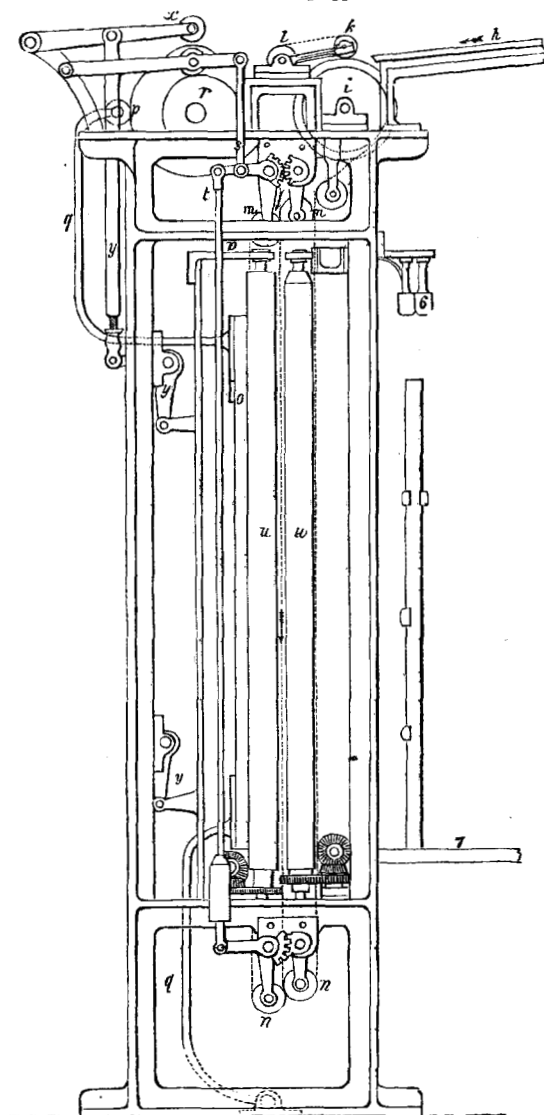
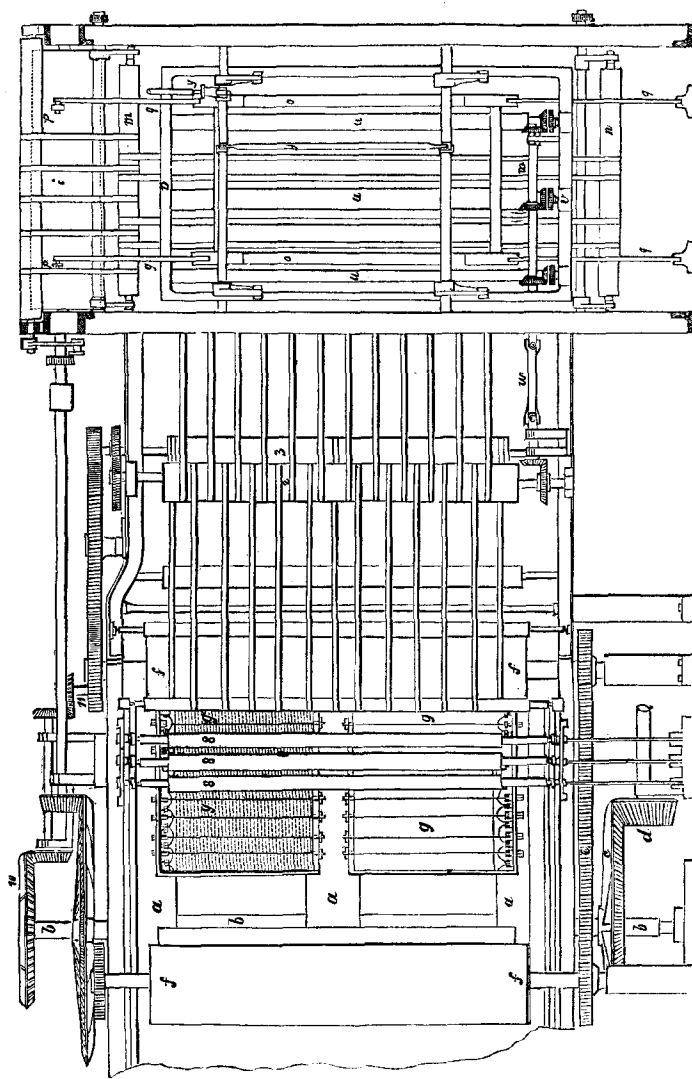


Fig. 18.

Elevation.



"The columns of types, as we have already mentioned, are fixed in the four type holders *g, g, g, g*. Between the columns of type are the "rules," which are fitted into the top and bottom of the type holder, in a similar way to a metal saw in its frame. These rules are made like the keystone of an arch, to fill up the space left at the junction of the columns, owing to the angle which the columns form with each other, in their position as sides of a polygon. The centre rule in the type holder is a fixture, in order to avoid the possibility of the type escaping from its place, in screwing it up; and each column is jammed up from one end by a set-screw, as shown at the top and bottom of the upper and lower type holders. The four pages of type, thus prepared, are bolted to the rings of the central drum. It will be observed, that the impression cylinders are not arranged symmetrically around the central drum. A greater space is left between one pair than between the others, in order to give room to get at the type, which can only be done when it is in the position shown in Fig. 16.

"Each of the impression cylinders requires an apparatus for supplying it with the sheets of paper (one only being shown in the plan); and the vertical position of the type requires that the paper shall be also brought to a vertical position, and be moved laterally in its passage through the machine. This difficult problem is solved in the following manner:—

"The sheets of paper are piled on the feeding board *h* (see end view of feeding apparatus, Fig. 17), and are pushed forward, one by one, by the attendant, over the centre of the feeding drum *i*, *k, k*, are two small fluted rollers, fixed on the dropping bar, and driven by tapes, off the roller *l*. At the right moment this bar turns on its centre *l*, and *k, k*, drops, and by its motion advances the sheet of paper between the rollers *i* and *l*. The motion of the sheet is then continued downwards by tapes passing around the rollers *m, m*, and *n, n*, Fig. 17. The paper is steadied in the whole of its course by numerous tapes, only a few of which are drawn to show their direction. The down tapes pass around the feeding roller and the smaller rollers *m, m*, and *n, n*, and carry the sheet with them, until its progress is arrested by two long narrow strips of wood *o, o*, covered with woollen cloth, and called "stoppers," one pair of which are advanced forward against the other pair that are fixed. The motion of this stopper frame is effected by means of the cam *p*, Fig. 17, which acts upon the arms *qq, qq*, attached to the frame. The rollers *m, m*, and *n, n*, then (and, of course, the tapes with them,) open, and leave the sheet in its vertical position, held up by the stoppers. The opening of the rollers *m, m*, and *n, n*, is

effected by their bearings being mounted in the ends of levers, and these levers are made to act upon each other, by means of the toothed segments shown in the cut. The cam *r*, Fig. 17, lifts the link *s*, which moves the top pair of rollers *m, m*, while the motion is conveyed to the lower pair *n, n*, by the connecting rod *t*, which is loaded with a weight at bottom, to keep the friction roller on the cam *r*.

"To return to our sheet of paper, which we left held up by the stoppers. These are now relaxed, and the weight of the paper is taken by two pairs of small fingers, or suspending rollers, at the top of the sheet, which are brought together by a cam, and, pressing slightly together, hold the sheet up during the instant of time that the stoppers are relaxing, and until the three pairs of vertical rollers *uu, uu, uu*, Figs. 17 and 18, are brought into contact, to communicate the lateral motion to the sheet. The vertical rollers are all driven at the same speed as the printing drum, by means of bevel wheels and pinions, as shown. The three front rollers, *u, u, u*, are mounted in a hanging frame *v, v*, and the pinions at the bottom are driven through the bevel pinions and the shaft *w, w*, which is made with a universal joint to allow of the motion of the frame *v, v*. The back rollers are driven in a similar way, but their centres are stationary.

"The proper motion is communicated to the hanging frame *v, v*, by a cam, similar to *p*, acting upon the lever and friction pulley *x*, the motion being communicated through the levers *y, y*, Fig. 17. Immediately on the rollers being brought into contact with the paper, it is advanced, by their motion, into the mouth of two sets of horizontal tapes, which pass round the drums 2 and 3, (also driven by gearing,) and carry the sheet onwards towards the impression cylinder *f*, where it is printed, and whence it returns in the direction of the arrows, the dotted line showing its path. The sheet of paper in its passage out meets with another set of endless tapes at the roller 4, Fig. 16, which assist it out as far as the rollers 5, where these tapes return and leave the sheet to complete its course by the action of a single pair of suspending tapes at the top of the sheet, and pressed lightly together by the pulleys 6.

"On arriving at the outer pulley these tapes are forcibly pressed together by a lever and stopped, and thus hold the sheet of paper suspended and ready for the attendant to draw down, and place on the taking-off board 7—an operation very easily performed. Each of the eight impression cylinders is provided with a similar feeding apparatus, and the same action takes place successively at each, thus producing eight sheets, printed on one side, for each revolution of the central drum.

"We may now mention the plan which is adopted to counteract the deviation of the faces of the columns of type from a true circle. Strips of paper are pasted down the impression cylinder, in width equal to each column. Other narrower strips of paper are pasted in the centre of these, and other strips, narrower still, until the surface of the impression cylinder becomes a series of segments of smaller circles, agreeing sufficiently with the required curve, to produce a perfect impression of the type over the whole width of the column.

"The ink is supplied to the type by three inking-rollers 8, 8, 8, Fig. 18, placed between each two impression cylinders. These rollers receive their ink from revolving in contact with a curved inking-table, placed on the central printing drum, opposite to the form of type. The ink is communicated to the inking-table by two vibrating rollers, alternately in contact with it and the ductor-roller. The ductor-roller 9, Fig. 16, forms one side of an ink-box, from which, as it revolves by the bevel gearing 10 and 11, it withdraws a portion of ink. The two ink-boxes are kept full, by a reservoir placed above them. The inking-rollers are caused to press in contact with the inking-table by means of coiled springs, as shown, and their brass bearings are also furnished with set-screws, to hold them in close contact with the type, as it passes, in a similar manner to other quick machines.

"The spindles of the inking-rollers are also provided with small friction wheels, at the top and bottom, which run upon a brass bearer on the central drum; by which they are kept from being drawn into the drum by their springs, except at the proper time.

"There is an advantage incidental to the vertical position of the type and the paper; viz., that the ink does not sink into the type as it does when it is placed horizontally, and on that account the type is kept much cleaner.

"In looking at a copy of 'The Times,' it will occasionally be observed, that the impression is not exactly in the centre of the paper. Now, the only wonder really is, that it should be so nearly true. The type and the paper move at about the rate of 6 feet per second, so that an error of one-seventieth of a second in the arrival of the sheet of paper at the impression cylinder, would cause an error of one inch in the margin. Yet so accurately is this performed, that the waste of sheets is considerably less with this machine, than with the old horizontal ones.

"Some little difficulty was experienced at first, in carrying on the paper, when vertical, without buckling it. This difficulty was conquered by introducing an additional roller, to give the paper a slight

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angle, instead of drawing it out in a straight line, which had the effect of stiffening it, on the same principle as corrugating a plate of iron.

"The produce of this machine might readily be doubled, by having two forms of type on the central drum, instead of one (were it desirable for want of space for two machines, or other reasons), and the addition of eight other laying-on boards and feeding drums in a story above the present ones."

Some interesting statistics have been kindly furnished by the Proprietors of "The Times." On the 7th of May, 1850, "The Times" and its Supplement contained seventy-two columns, or seventeen thousand five hundred lines, being made up of upwards of a million pieces of type! The Supplement contained half a million of pieces of type, and was composed in the day-time. "The Times" contained forty-eight columns, or ten thousand lines made up of six hundred thousand pieces of type, two-thirds of which was written, composed, and corrected, after seven o'clock in the evening.

		H. M.
The Supplement was at press,	at	7 50 P.M.
The first form of "The Times,"	,,	4 15 A.M.
The second form,	,,	4 45 ,,

Seven thousand papers were published before a-quarter to six o'clock for the railways, and twenty-one thousand were issued by half-past seven o'clock for the morning mails. Both vertical machines were employed on that day, and thirty-four thousand papers were printed complete, by 8 h. 45 m., or in four hours. Twelve thousand copies are always required for the six o'clock railway trains, for Liverpool, Manchester, &c., and fifteen thousand copies more must be issued for the early delivery, the General Post, and the environs of London. The total number of papers printed and published daily, exceeds all the other morning and evening papers put together.

On the occasion of the late Sir Robert Peel making his celebrated speech on the Corn Laws, fifty-four thousand copies of "The Times" were printed consecutively.

The greatest quantity of printing ever done, in one day's publication, was on the 1st of March, 1848 (at the time of the last French revolution), when the paper required (there being a double Supplement) weighed 7 tons; the weight used daily being $4\frac{1}{2}$ tons. The surface to be printed every night is, with the Supplement, 30 acres! The quantity of ink used for this work is 200 lbs. The weight of the fount of type in use is 7 tons. One hundred and ten compositors and twenty-five pressmen are constantly employed.

The Supplement is generally sent to press at seven in the evening;

the first form of "The Times," at three in the morning, and the last form at four o'clock in the morning, but this depends upon the length of the debates, and the punctual arrival of the foreign expresses—sometimes both forms are sent to press together, and sometimes the second forms are delayed until five o'clock. The regular publication for London begins at half-past seven o'clock. The duty on advertisements, stamps, and paper, amounts to about £ 95,000 per annum.

The whole of the printing at "The Times" office is now performed by four of Applegath and Cowper's four-cylinder horizontal machines, each producing five thousand sheets per hour, and two of Applegath's new eight-cylinder vertical machines, each producing ten thousand sheets per hour.

To give some idea of the comparative speed of writing and printing, it may be stated, that the thirty-four thousand copies of "The Times" and its Supplement, which are printed in four hours, would, if required to be written in the same time, employ six hundred and twelve thousand of the most rapid writers !

May 28, 1850.

The Session terminated with a *Conversazione* given by the President to the Members and a large number of visitors, in the rooms of the Institution.