THE BRETT PRINTING TELEGRAPH.

CHAPTER XVIII.

Brett's Printing Telegraph—Description of the Composing Apparatus—The Printing Apparatus and Manipulation—The Compositor or Commutator described—Mr. Brett's Last Improvement.

BRETT'S PRINTING TELEGRAPH.

The printing telegraph system, patented by Mr. Jacob Brett, in Great Britain, is founded upon the House system, of America, and patented by Mr. Brett, in the first place, as a communication.

These gentlemen, Messrs. Royal E. House, of America, and Jacob Brett, of England, some years since, co-operated together in this printing telegraph. The former patented the same or a similar apparatus, in the United States of America. After the issuing of the first English and American patents, Mr. House continued his energies in the perfection of his mechanism until he produced the beautiful and effective printing telegraph, since used on many lines in the United States. Like results attended the labors of Mr. Brett, except that the system perfected by him has not been permanently used on the lines in Europe. The following description of the machinery will serve to explain the instrument patented by Mr. Brett, and known in Europe as his printing telegraph.

The apparatus comprises two essential mechanisms, the "Transmitter" or "Compositor," and the "Receiver" or "Printer." I will first describe the former.

DESCRIPTION OF THE COMPOSING APPARATUS.

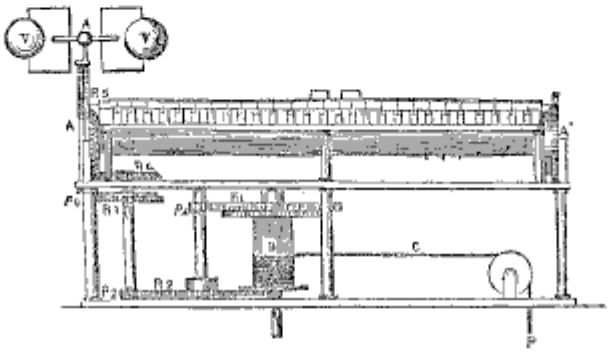
The compositor is a key-board, having some 28 keys, and 30 or 40 may be used, if desired, arranged as in figs. 1 and 2. Above these keys is an axis, A A′, which is called the axis of the keys, bearing at its extremity a wheel B, called a circuit-wheel. This wheel receives a movement from a weight P, fig.

2, attached to a cord c, which is rolled around the drum B, having a toothed wheel R′, which connects with a pinion P, placed upon the same axis as the wheel R_2. This wheel R_2 connects

Fig. 1.

in its turn with the pinion P_3. The pinion P_2 is fixed upon the same axis as the wheel R_3, and moves wheel R_3 with its own movement; this wheel R_3, in its turn, connects with a pinion P_4, fixed to the vertical axis A, which turns with the fly-wheel V. The axis of keys A A′, being fastened to the wheel R_3 by a

Fig. 2.



system of two wheels transmitting the movement R_4 and R_5 at right angles, turns itself under the influence of the weight P. There are fixed upon the axis of the keys 28, 30, or 40 metallic points—analogous to the pins of a music-box, or a crank organ—about a quarter of an inch high, which represent a helix on the surface of an axis, which correspond to the letters of the alphabet, figures, and other telegraphic signals. This same axis of keys, therefore, bears at its other extremity the said wheel of the circuit B, furnished with 14, 15, or 20 teeth, and which has for its object to open and shut alternately

the voltaic current, consequently to interrupt and to establish the current. One of the wires f_1, communicates through the printing apparatus, with the conducting wire of the line; the other wire, f_2, communicates with one pole of the battery. Two springs, r_1 r_2, are in metallic contact, as well as the wires f_1 f_2, with the two pressure screws n_1 n_2. The first of these springs presses upon the teeth of the wheel R, the second spring presses upon the drum of the same wheel. The fly-wheel V has for its object the regulation of the whole system of the composer, in order that the axis, after having been stopped by the lowering of one of the rods under the keys, may continue its revolution until the finger ceases to press the key. The teeth correspond exactly to the rods placed in the axis, so that when the rod of a key stops the axis, by touching against the little pins of the axis; the spring, r, touches the point of one of the teeth, and the circuit is closed.

Fig. 3.

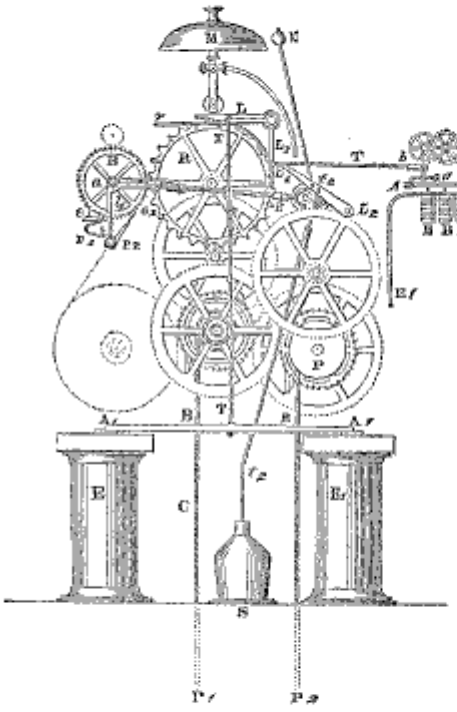
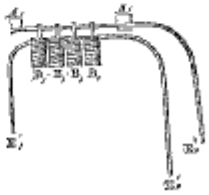


Fig. 4.

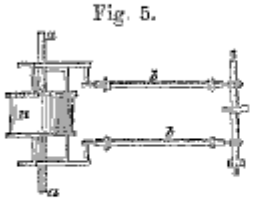


THE PRINTING APPARATUS AND MANIPULATION.

Figs. 3 and 4 represent the printing instrument, resting upon a support S. E E_1 are the two electro-magnets, the bar A_1 A_1 is

the armature; the extremities of the wire surrounding them, are fixed to the two pressure screws inserted at the base. One of these screws receives the wire coming from the composer, and the other receives the line wire. The armatures turn on a hinge around the north pole of the electro-magnet, to which they are respectively attached, and they are united by a rectangular bar B B, which bears on its middle a lever-rod or arm, T T, which the armatures draw, when they are attracted by the electro-magnets. A spring *r*, borne by one of the arms of the lever L L_1, tends to elevate the rod, and to detach the armatures, when the current does not pass. The two arms of the lever L L_1 form a right angled escapement-anchor, letting pass and stopping alternately the wheel R, of about three inches in diameter, and about one tenth of an inch thick, and furnished with 28, 30, or 40 teeth. Each of these teeth bears in relief a letter or point; one tooth alone remains blank to form spaces. These letters, the point, and the blank space, correspond to the letters, &c. of the cylinder of the composer. This wheel R is called a *type-wheel;* its anterior limb bears 14 little metallic points, about one tenth of an inch long. The prolonged arms of the escapement act upon these points. When one of the arms takes hold of a point, the other lets go another point, and this effect is reproduced at each oscillation of the armature. A weight attached to the cord c tends to turn the type-wheel constantly. When the circuit closes, the axis of the keys, as well as the type-wheel, tends constantly to turn under the action of the weight. The alternate breaking and closing of the circuit, produced by the keys, causes the armature to oscillate, and the oscillations of the armature, resisted by the action of the spring *r*, will give to the rod T a to-and-fro movement, which will change into an oscillatory movement the escapement anchor, and into a movement of periodical revolution of the type-wheel. The type-wheel will ordinarily make 160 revolutions in a minute, and it will stop when the rotation of the axis of the keys is stopped by the pressure of the finger upon one of the keys. The letters are printed thus: Wheel R is connected to a cylinder, upon which cylinder is enrolled a band of narrow paper, the said cylinder turning around with its axis *a a*, resting upon two supports, *s s'*, two pendulums or cranks *b b*, terminating in two eccentrics placed upon an axis, *a a*, perpendicular to the plane of the table, turn with the axis of the paper cylinder. By the movement of these eccentrics, fig. 5, the rotary movement of the axis

Fig. 5.



a a becomes for these cranks a to-and-fro movement, which brings the cylinder of paper near to the type-wheel, and removes it therefrom, thus bringing it in contact with and separating it from said type-wheel alternately. It is also necessary that the cylinder of the paper should turn upon its axis, in order to present at each approach a new blank part of the paper to the type-wheel. This rotation goes on by means of the reverse escapement anchor, $e_1\, e$; the branch e_1 is fastened to the frame by a point *p*, around which it turns as around an axis; the branch *e* is fixed to the rod *l*, which is fastened to the axis *a* of the cylinder of the paper, and is, consequently, displaced with that cylinder. Two springs press the two branches of the anchor against the teeth of a wheel attached to the cylinder of the paper; when the cylinder withdraws from the type-wheel, the extremity e_1, pressing against the nearest tooth, causes the cylinder to turn, and the extremity *e*, acting as a stop, prevents the cylinder from turning backward. At the axis, around which this rotatory movement of the cylinder takes place, is a screw, fig. 5, entering into a hollow screw placed upon the support. The cylinder is displaced in the direction of its axis, so that the printed letters form upon its surface a continuous helix, so that no two letters can produce confusion, by being placed one upon the other.

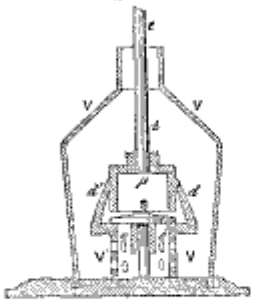
The most suitable substance for making a good impression is plumbago, reduced to a powder; it is placed in a groove or slot, cut upon the circumference of the roller *r*, and is covered with linen. A sufficient quantity of the powder passes through the pores of the linen to ink the type.

I have not yet indicated how the axis *a a*, with its eccentrics, is made to turn; it receives its rotation from a clock movement produced by a weight P_2. It turns incessantly, so long as nothing stops it, and each of its revolutions brings near to and removes away alternately from the type-wheel the cylinder of the paper. It is important that it should turn only when it is desirable to print, at which time the type of the letter which we wish to fix upon the paper is in contact with the cylinder. The result is obtained thus: $L_1\, L_2$ is a lever fixed at its strongest extremity L_2, upon an axis borne upon the frame of the apparatus, and around which it turns; the other extremity L_1 being bent back, presses against the posterior limb of the type-wheel, which limb is furnished with 28 points, similar to those of the anterior limb, and corresponding to the 28 letters or signs on the circumference; the bent extremity of the arm of the lever L_1 connects with the points, and rests upon them, rises with the point which bears it, leaves this point,

and falls back upon the succeeding points, &c. A metallic rod t_1, fixed near the extremity L_2 of the lever, communicates with an hydraulic apparatus, called a *governor*, the mechanism of which I will presently describe. The object of the "governor" is to regulate the movement of the lever L_1 L_2, so that it rises rapidly and descends slowly with a graduated velocity. The arm of the lever L_1 L_1 bears a point or horizontal rod, p', which glides over the eccentric E, placed on the axis a, and turning with that axis. The portion of the circumference of the eccentric E, the farthest removed from the axis, is thicker, and has two notches about a quarter of an inch apart, which notches catch one after another of the points as p', so that the eccentric stops in its rotation. Now, let the point p' rest upon the portion of the eccentric nearest to the axis, the eccentric which presents to it by turns the various points of the surface, brings to it the first notch into which it falls, stopping the movement of the eccentric. The point p' cannot get out, and will not permit the eccentric to turn, except said point p' has been raised with the lever L_1 L_2, by one of the points of the type-wheel. After the raising of the point p, the eccentric has turned again, and bringing to the point the second stop, the movement stops a second time, and can only recommence when the point following is disengaged from the stop, at the moment when the extremity L_1 of the arm of the lever shall leave that of the points of the type-wheel which has raised it. The point p^1 will then be upon the part of the eccentric nearest to the axis. It is seen by this movement that the axis a is forced to turn, when the type-wheel stops, and then by means of the cranks brings the paper into contact with the letter or sign, covered with the plumbago, which prints this letter or sign upon the paper.

The hydraulic regulator or governor is formed, first, of a glass vase v, fig. 6, filled with water, or some other liquid; second, of an internal vase, v, pierced with holes, through which the liquid may pass, and terminating by a flange, upon which the upper part of the apparatus is screwed. s is a pointed metallic valve, rising from within outward, p is a hollow piston, raised and lowered by the rod t t moving in the chamber c c' of the interior valve v', leaving only a small circular space, through which the water can pass. When the piston is raised by the lever L_1 L_2, fig. 3, to which the rod t is attached,

Fig. 6.



a vacuum is made in the chamber $c\,c'$, and the water comes suddenly and fills it; when, on the contrary, the piston descends, the water can only with difficulty escape from the chamber $d'\,d$, its passage consequently becomes very slow, and the movement is thus retarded, as it is required, in order that the telegraph may work perfectly.

Everything being arranged as I have just said, and the electric communication being established, if the operator of the sending station presses one of the keys with his finger, the key A, for example, the type-wheel will stop, when the same letter A arrives in front of the paper; then the lever L L_1, fig. 3, will turn, bring the cylinder in contact with the wheel, and press the letter against the paper, which will receive the impression of that letter. As it withdraws, the cylinder will turn upon its axis, and will present—on being brought back by the movement of the axis and of the cranks—a new white space to the new letter to be printed.

The mechanism for sounding the bell is very simple. M, fig. 3, is a bell, N is the clapper, borne upon a rod or spring fixed to the frame by an axis, around which it turns, and of which the lower part is a small lever-arm, resting upon a pin about one fifth of an inch long, when the eccentric turns, raises the little lever-arm of the spring, and causes the clapper to descend and strike the bell.

I have said nothing yet of the other portion of fig. 3. This portion represents another manner of employing the voltaic action. The rod or lever-arm T is now horizontal; it is fastened on the one part to one of the arms of the escapement, by means of a pin, upon which it works, on the other part to an eccentric placed upon a horizontal axis b', represented with the eccentric in fig. 7. This same axis b bears a lever, e', represented in fig. 8, and furnished with points g and g', designed to stop the crooked parts to the right and left of b, in fig. 7. B B B B B B, fig. 3, are hollow bobbins or spools, magnets which attract when the current traverses them; these little vertical magnets $a\,a$, are attached to the armature A $A_/$ of $B_/$ $B_/$ $B_/$ $B_/$, another but a similar system of magnets; $A_/$ $A_/$ is the armature, E_2 E_2 are the extremities of the wire of the second system. When the first circuit is closed by the armature A A, the extremity E_2 is then in contact with E_1, and the second circuit is closed in its turn. The two circuits are also opened at the same time.

Fig. 7

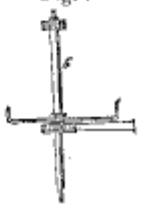
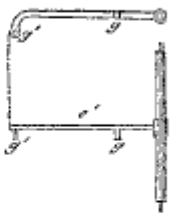


Fig. 8.

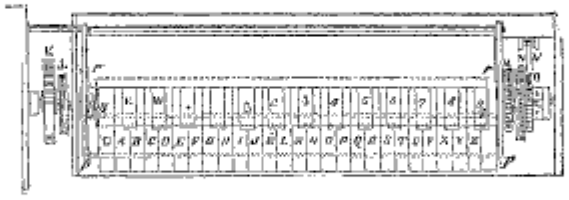


Nothing, however, prevents placing the second electro-magnet system with a local battery or electro-magnetic machine. The second system is in reality only a relay. The lever E′ descends and rises with the armature, according as the circuit is closed or opened.

The axis *b*, in its eccentric rotation, moves away and approaches near the points *g* and *g′*, which are, by turns, in contact with the points crooked to the right and left of *b*, fig. 7. If the armature is attracted, the point *g′* is lowered, and leaves the crooked point to the left of *b*, fig. 7. The axis and the eccentric make a demi-revolution, and the rod T is drawn toward the left, but at the same time the point *g* rises, presses against the point to the right of *b*, and the movement is stopped; it recommences if the armature, in raising itself, lowers the point *g*, and disengages said point from the crooked point to the right of *b*, fig. 7; the axis and the eccentric will make a new half turn, and the rod T will be carried forward. The axis and the eccentric are set in motion by the weight P, by means of the system of cog-wheels represented in the drawings. When the current ceases, the armature is raised by the spring placed at K. The alternate movement of the rod T acts also upon the lever L_1 L_2, precisely in the same manner as in the case when that rod is vertical. Mr. Brett has greatly improved this apparatus, and has rendered the correspondence much more sure, so that by a combination of wheels, called by him "stop-wheels," the type-wheel, and the needle accompanying it, return to zero, or to the point of departure after each impression of a letter.

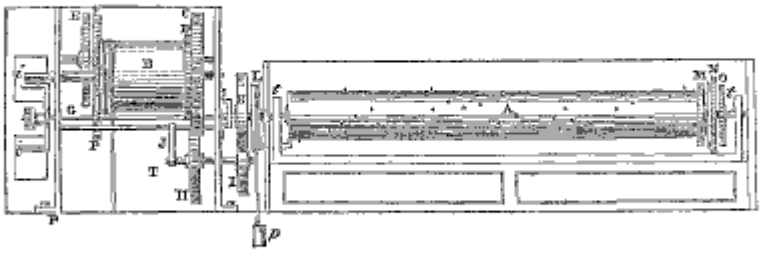
The new compositor is represented by figs. 9 and 10: A, fig. 10, is the axis of the pins in communication with the keys and circuit wheel, N; I is a friction wheel or moveable cylinder fastened to the lever arm, J. The axis of this lever has its centre of rotation on the axis of the tooth wheel, H, and of the pinion, P. The wheel, H, transmits its movement to the wheel, F, having the same number of teeth, so that when the part P Q A, of the frame fig. 9, is depressed by the pressure on one

Fig. 9.



of the keys, the rod, T, disengages the friction wheel, K, at the same time the tooth wheel, H, causes the wheel, F, to move. The two friction wheels, I K, turn, moving the axis of the keys A, together with the circuit wheel, M, and the catch wheel, O. The pinion, G, bears a fly wheel, *i i*, which regulates the velocity of the machinery. A weight attached to a cord which is enrolled upon the cylinder, B, communicates the movement to the wheels, E and F, to the pinion, G, and to the wheel, C, together with the catch wheel, D. Another weight, *p*, attached to a cord, rolled around the pulley, L, brings the axis, A, borne by the gudgeons, *t t*, to its first position, when it has turned, after the friction wheels are disengaged. The number of teeth of the circuit wheel, N, is equal to half the number of the letters or signals. It turns upon the same hollow axis, with the stop wheel, O. A point projecting from the circuit wheel acts upon a second stop wheel, M, which latter wheel has its centre

Fig. 10.



upon the axis of the keys, A. When this axis turns with the friction wheels, I K, it moves the wheel N; but when the friction wheels are disengaged, and the axis, A, turns upon itself, moving the friction wheel, M, the circuit wheel, N, together with the wheel, O, is stopped by the click, V, fig. 9, so that this circuit wheel turns in one direction only, notwithstanding the to-and-fro movement of the axis, A. If, therefore, we lower one of the keys, and with it the bars *p q*, fig. 9, by the means of the lever arm, these bars, in lowering, raise the upper part of the frame and the axis, T, turns a rod attached to one of the extremities of T, raises the lever, J, and with it H and I, the friction wheel, K, is set at liberty; the axis, A, turns until it is stopped by the pin of the key cylinder, corresponding to the key which has been lowered. If you cease to press, the lower part of the frame rises, the pin ceases to stop the key cylinder, the action of the weight, *p*, makes itself felt, the cylinder returns to its primitive position, but the click, V, still acting, the stop wheel, O, keeps the type wheel, N, in the posi-

tion to which it has arrived. The type wheel will make a new movement forward if you lower another key.

THE COMPOSITOR OR COMMUTATOR DESCRIBED.

Figs. 11 and 12 represent the compositor or commutator, finally adopted by Mr. Brett. The axis, A, bears a circuit wheel, C, fig. 12, the number of teeth of which equals half the number of letters or signals of the telegraph. Two catch

Fig. 11.

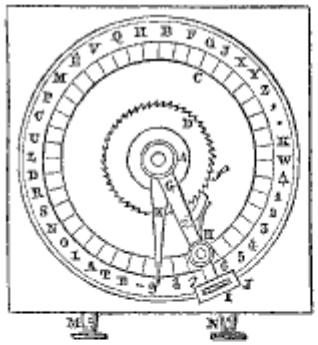
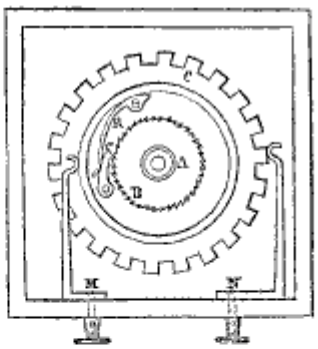


Fig. 12.



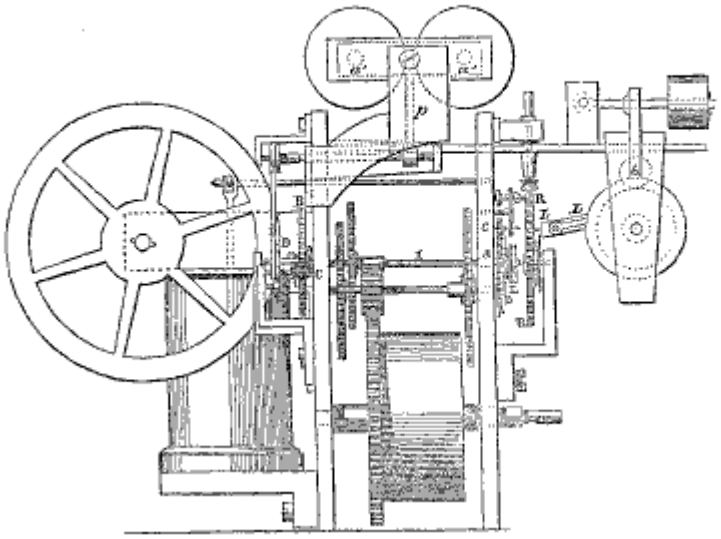
or stop wheels, B and D, turn upon the same axis; the number of their teeth being double that of the circuit wheel. They are made of one single piece; and the wheel, B, is fixed to the circuit wheel; a click, *e*, pressed by a spring, R, which prevents it from turning backward, and permits it to turn only in one direction. The axis, A, fig. 11, also bears a lever arm or crank, G H I, with an indicator, K, which points upon the dial to the letter which we wish to transmit or print. A click, F, also pressed by a spring, catches into a stop wheel, D, and serves to make it turn toward the right at the same time with the crank, the stop wheel, C, and the circuit wheel, D; but when the crank is moved to the left, in order to bring the index, K, upon a letter, the click slides over the teeth of the wheel, D, which remains at rest; thus the click, *e*, fig. 12, prevents the wheel B, and the circuit wheel from turning. Two copper bands or springs, M N, press, one upon the exterior part of the circuit wheel, and the other upon the teeth of the circumference of the same wheel, and communicate by means of two pressure screws with the two poles of the battery of the conducting wires of the circuit. The roller, I, fixed at the extremity of the crank, H, serves for the better guiding and maintaining it in its rotary movement. A stop pin, J, renders it fixed when the indicator, K, arrives at the desired letter. The

movement of the apparatus is as follows: Turning the crank to left, brings the indicator, K, upon the letter to be printed at a distance; then turning the crank to the right in order to come back to the fixed starting point, the circuit wheel is caused to turn, which establishes and breaks the circuit as many times as is necessary, in order that the type wheel may present to the paper the particular letter marked by the indicator.

MR. BRETT'S LAST IMPROVEMENT.

Fig. 13 represents the new form given by Mr. Brett to his printing telegraph. The weights are replaced by a spring,

Fig. 13.

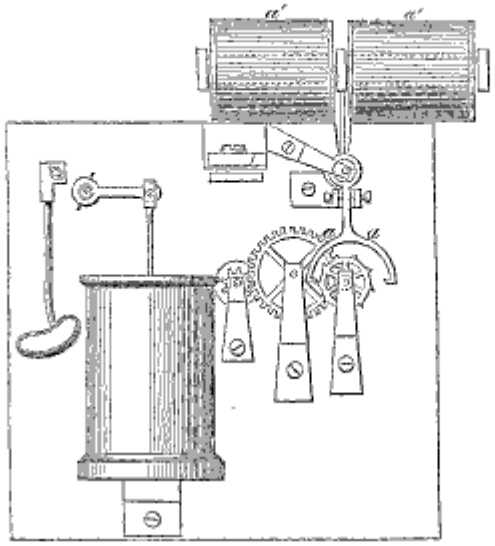


two systems of common wheels gives motion to the type-wheel, and communicates the movement to the paper. The type wheel, R, is moved by the pinion, A, and the arbor, I, and its rotation is regulated by the electric escapement represented in fig 14. The pinion, A, communicates with a toothed wheel, B, furnished with a second pinion, C, placed upon the same arbor as the escapement wheel, D. This escapement wheel is by turns stopped and released by an escapement anchor, *a*, of which the axis bears a permanent magnet, *p*, serving as an armature to the electro magnet, *a a'*. According as the electric current traverses in one direction or another the wire of the electro-magnet, the armature is attracted or repelled; this alternative movement is transmitted, first to the anchor, then to the escape-

ment wheel, then to the arbor of the pinion, A, and finally to the type-wheel, which moves regularly step by step.

The type-wheel, R, is fixed upon a hollow axis, A, and this axis bears on one side a little toothed wheel, applied against the face of the type-wheel; on the other side a fixed pulley, L, upon which is coiled a cord bearing a weight, the action of which constantly brings back the type-wheel to the starting point, or zero. A new toothed wheel is fixed to this pulley, and a circular metallic disk is fixed to the arbor, I, bearing a click which engages with the teeth of a little toothed wheel, and prevents it from turning back. A toothed wheel, R, of larger

Fig. 14.



diameter, is also fixed upon the same axis, I, so that it may turn for a certain time, and then turn backward, in order to lower the prolongation of the disk, D, bearing a point which engages in a little opening made on the circumference of the toothed wheel, *r*, very near its rim; this toothed wheel is set in motion by the action of the extremity of a lever operating by means of an eccentric, as has been explained in the description of the first machine or apparatus. Now if one of the letters, or one of the characters of the type-wheel, has been brought before the paper, a lever similar to $L_1 L_2$, fig. 3, engages in the opening made in the stop wheel that presses against the type wheel. This lever causes the said stop wheel to turn, and with

it the eccentric already described, which puts in motion the whole train of wheels of the printing machinery, and in its turn, during its revolution, presses a piston against the paper, and the letter is printed. While the paper advances after the printing of the letter, sufficient to make room for the next letter, another lever presses again upon the teeth of the wheel, *r*, giving it a rotary movement, sufficient to disengage the click of the disk, D. The type wheel being set at liberty, returns to zero, and resumes its first position upon the arbor, I. You may now proceed to print another letter.

The arbor of the lever, has a second arm fastened by means of a rod, to an hydraulic and pneumatic piston, similar to that which has been represented in the figure, and which serves to render the impression of the character perfect, regular, and neat.

Mr. Brett calls attention to the disposition given by him to the letters upon the disk of the type wheel, this disposition being very necessary to abridge the labor in the transmission of dispatches; in fact, the letter E, for example, in the English language, and still more so in the German, occurs three thousand times, while the letter z appears but once.

I hope the foregoing description will enable the reader to understand the intricate mechanism of this apparatus. The drawings and the lettering are not as perfect as I had hoped to attain. The letters mentioned in the description are not all to be found in the drawings, and in this imperfect state I present the apparatus with its novelty.