R. E. HOUSE.

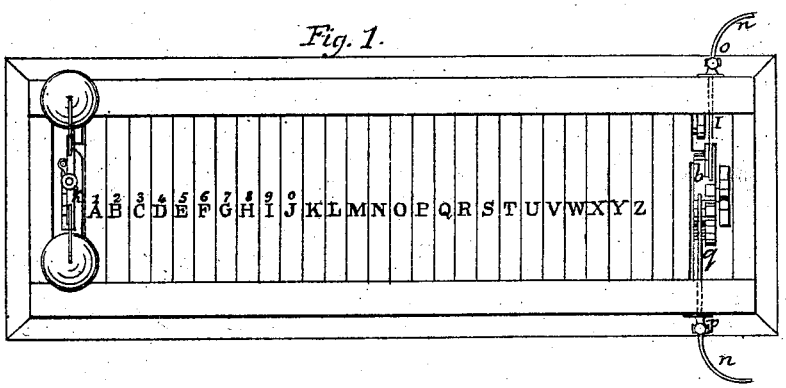
4 Sheets—Sheet 1.

Printing Telegraph.

No. 4,464.

Patented April 18, 1846.

Fig. 1.



Composing machine

Fig. 2.

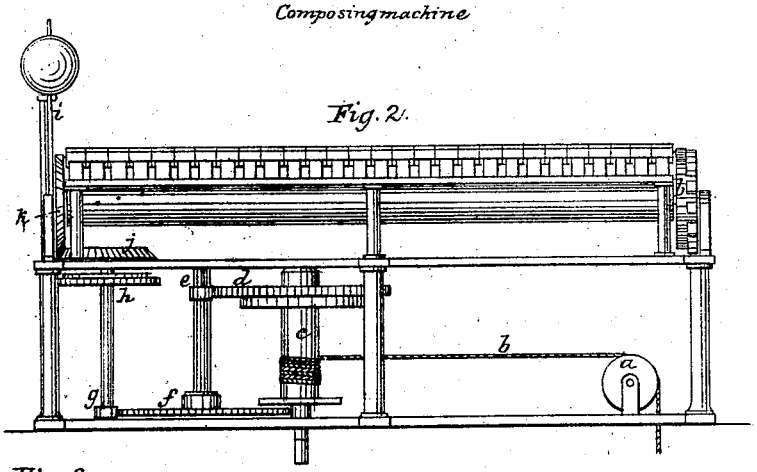


Fig. 8.

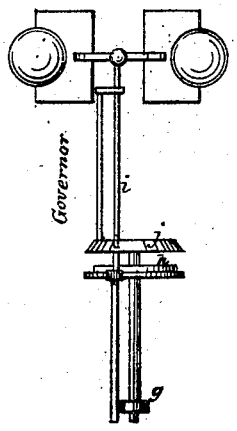


Fig. 9.

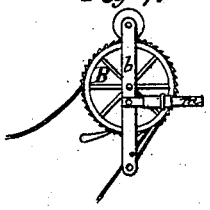


Fig. 5.

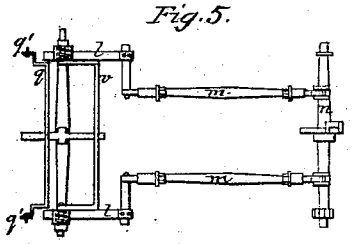


Fig. 10.

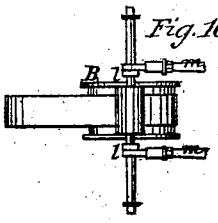
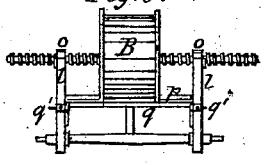


Fig. 6.



R. E. HOUSE.

Printing Telegraph.

No. 4,464. Patented April 18, 1846.

Fig. 2.

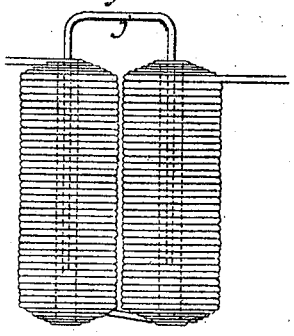


Fig. 3

Fig. 4.

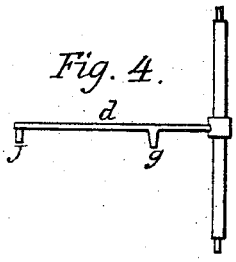


Fig. 5.

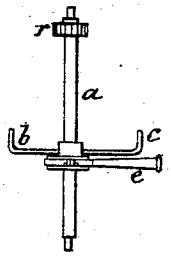
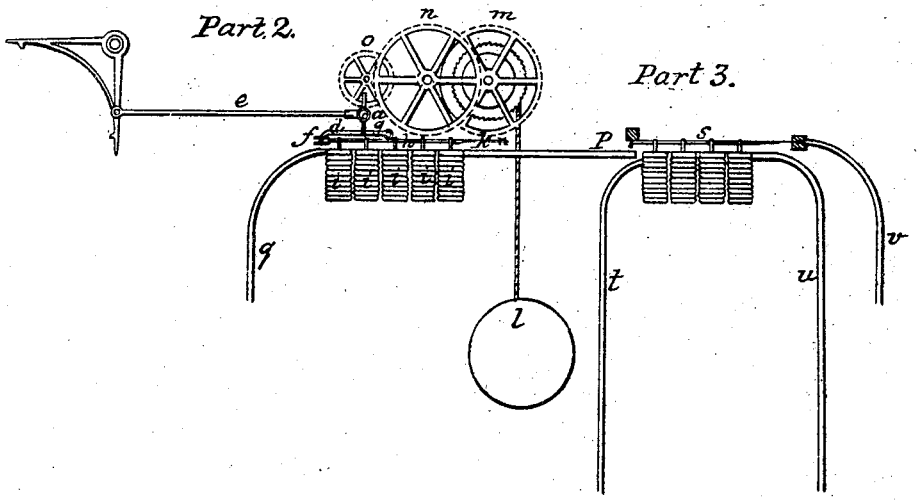


Fig. 1.



R. E. HOUSE.

Printing Telegraph.

No. 4,464. Patented April 18, 1846.

Fig. 3.

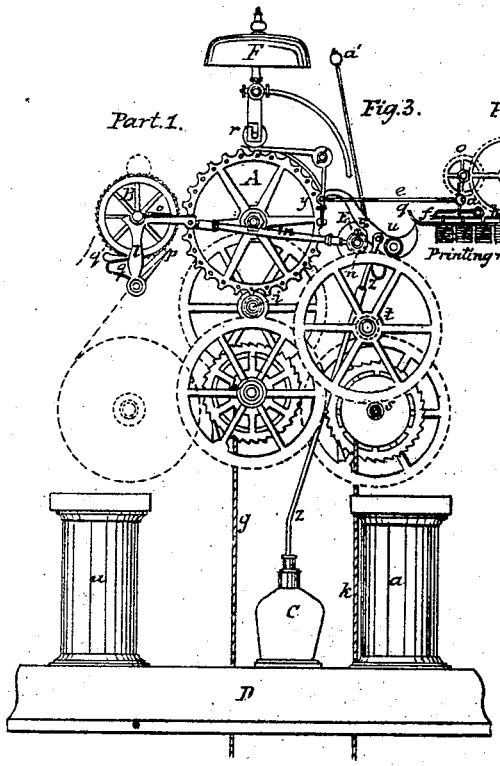


Fig. 4.

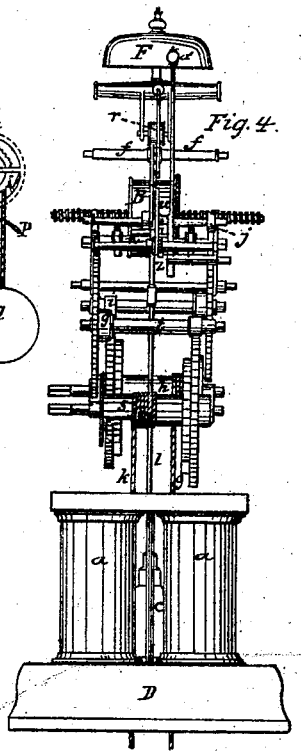


Fig. 7.

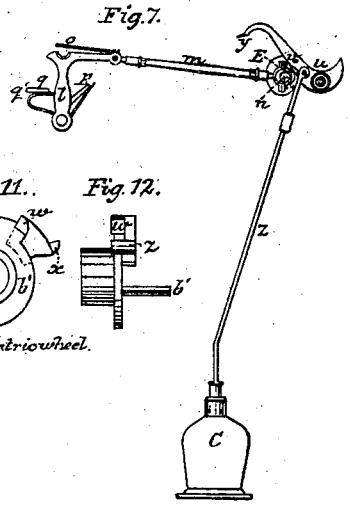


Fig. 11.

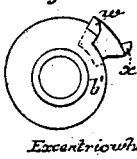
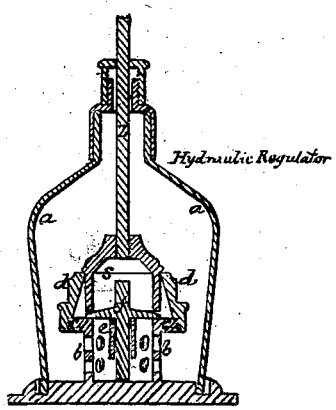


Fig. 12.

Fig. 13.

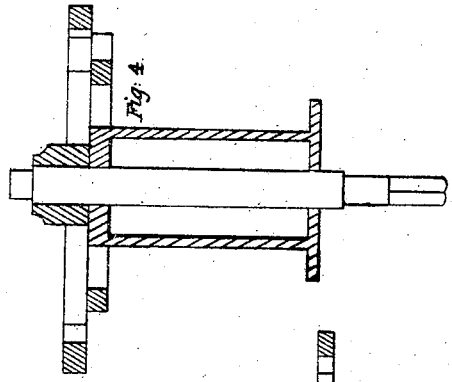


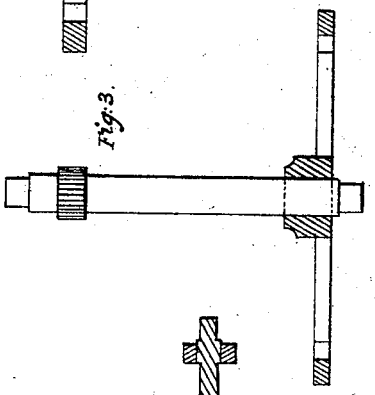
4 Sheets—Sheet 4.

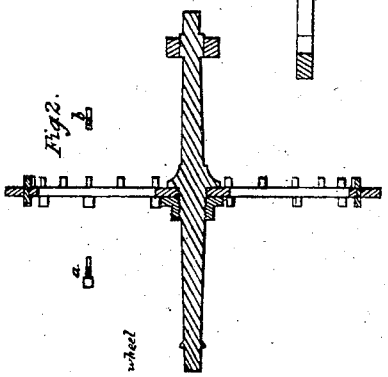
R. E. HOUSE.

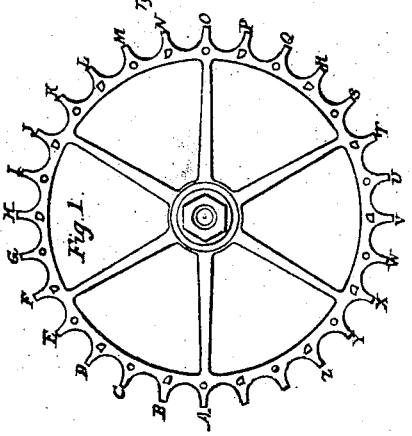
Printing Telegraph.

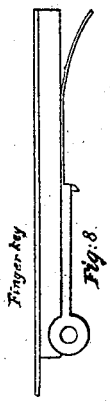
No. 4,464. Patented April 18, 1846.

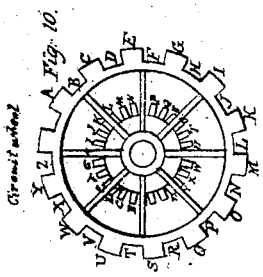


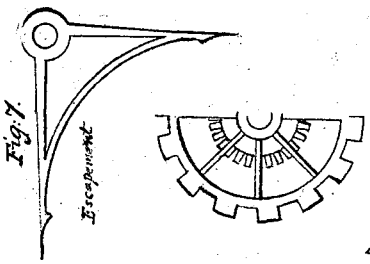


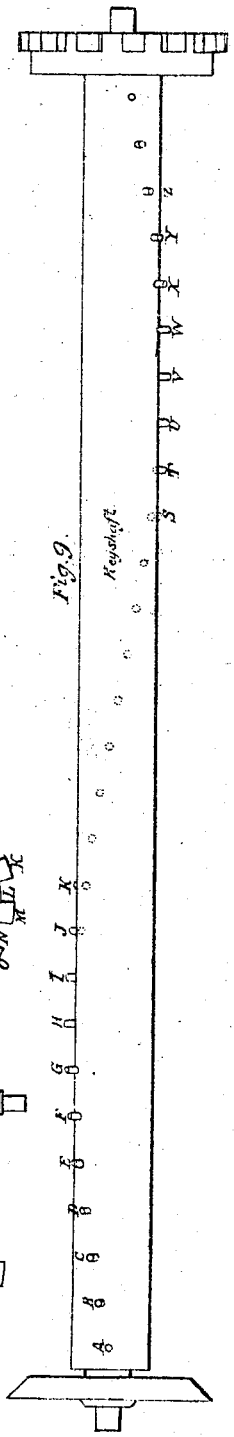












UNITED STATES PATENT OFFICE.

ROYAL E. HOUSE, OF NEW YORK, N. Y.

IMPROVEMENT IN MAGNETIC PRINTING-TELEGRAPHS.

Specification forming part of Letters Patent No. **4,464**, dated April 18, 1846.

To all whom it may concern:

Be it known that I, ROYAL E. HOUSE, of the city of New York, in the United States of America, have invented new and useful machinery for transmitting intelligence between distant places and permanently recording the same in letters or other signs by an application of the power of electricity or galvanism, which I do denominate and call "The Magnetic Letter-Printing Telegraph," of which the following is a full and accurate description.

I shall first describe the whole of said machinery as constructed and combined by me for practical operation, and then I shall point out and distinguish the particular parts and combinations which I claim as my invention, and which I desire to secure by Letters Patent.

Said machine consists of two parts: first, of that part which is to be stationed at the place from which intelligence is to be transmitted, and which, for convenience of distinction, I denominate the "composing-machine;" second, of that part which is to be stationed at the place to which intelligence is to be communicated, and which, for the same reason, I denominate the "printing-machine." These two parts are to be connected by electric or galvanic conductors, which conductors are to connect with any known generator of electricity or galvanism, and form a circuit through or along which, when connected, a current of electricity or galvanism will pass. These two parts of said machinery are chiefly propelled by the power of weights, the electric or galvanic force being applied and used only to regulate the motion of the printing-machine by means hereinafter described, and which requires much less power than is necessary to propel the machinery, and thus both the advantage of the instantaneous action of the electric or galvanic force and the greater power of the weights are combined in the accomplishment of the work for which the machinery is intended.

I shall first explain the composing-machine, and, in order that the same may be better understood, I shall describe it in connection with the drawings which are hereunto annexed, and which form a part of this specification; and, in order to prevent the necessity of otherwise specifying the size and proportions of the different parts of said machinery, I have caused the said drawings to be made so as to give the sizes and proportions, the drawings on Sheet I being one-third of the size of the working machine, except Figures. 11, 12, and 13, which three figures and the drawings on Sheet II are the full size of the working machine.

The composing-machine, as before stated, is to be stationed at the place from which the intelligence or message is to be communicated, and is to be worked or operated upon by the person desiring to transmit such intelligence or message. Its object is to break or close the circuit of conductors, and to continue the same either broken or closed, at the option of the operator, and in such manner as to cause any given letter to be printed by the printing-machine.

Said composing-machine has twenty-eight keys, which I call the "finger-keys," a shaft placed under the keys, which I call the "key-shaft," a wheel fixed to the end of this shaft, which I call the "circuit-wheel," a governor attached to the machine, and a weight and pulley with a series of wheels and pinions to give motion to said key-shaft.

The parts of the composing-machine are to be arranged in any suitable frame, made of metal or wood, metal being preferable. The precise form of the frame is not material, it being only necessary to have it so made as to be suitable to sustain the different parts of the machinery in the positions and connections as I shall hereinafter describe. This part of my machine is represented by Figs. 1 and 2 of Sheet I of the drawings. Fig. 1 exhibits the plan, and Fig. 2 the side elevation, in giving a particular description of the parts of which I will commence with the power by which the machinery is propelled, following it through its different connections, and pointing out the object and construction of said parts.

This composing-machine is propelled by a weight attached to the cord *b*, passing over the fixed pulley *a* and winding round the barrel *c*. This barrel is hung on an axle, which has at one end the cog-wheel *d*, the barrel being connected with the axle and cog-wheel by a ratchet arranged in the ordinary and well-known manner of similar fixtures in other machinery for winding up a weight. The cog-wheel *d* works into the pinion *e*. The cog-wheel *f* carries the pinion *g*. The cog-wheel *h* takes into a pinion on the shaft *i*, which car-

ries the governor. The upper end of the axle to which is attached the cog-wheel *h* passes through a cross-piece of the frame in which it runs. On the upper end is fixed the bevel friction-wheel *j*. This wheel acts upon and carries a similar wheel, *k*, attached to the end of the key-shaft, and in this way motion is communicated to said key-shaft. The weight of the end of said shaft rests upon said friction-wheel, so as to cause friction sufficient to cause it to revolve. Said shaft extends lengthwise through the frame, and may run in any convenient bearings fixed in the ends of said frame. In this shaft are fixed twenty-eight pins, extending out from the surface of the shaft about a quarter of an inch, and being placed in a helical row extending the whole length of said shaft, and the row passing once round the same. These pins are represented in Fig. 2 of Sheet I and Fig. 9 of Sheet II of the drawings, twenty-six of them being represented by the several letters of the alphabet, one of them by a dot, and one of them being left blank, so as to correspond with the representation of the alphabetical finger-keys to which they respectively belong and in connection with which they operate, as I shall further explain.

Fixed upon the end of the key-shaft is the metallic wheel *l*, which revolves with said shaft, and is used for breaking and closing the circuit of conductors, and I have therefore called it the "circuit-wheel." Fig. 9 of Sheet II of the drawings is a side elevation of said key-shaft and circuit-wheel. This is a double wheel—that is, the inside of the wheel is about three-quarters of an inch less in diameter than the outside. On the periphery of the outside or larger part of this wheel are cut fourteen cogs, forming between them fourteen spaces. The periphery of the inside or smaller portion of this wheel is smooth. This wheel is connected with the circuit of electric or galvanic conductors, and forms a part of the same, as follows: *m* and *n* in Fig. 1 of Sheet I of the drawings are ends of wire or metallic rods forming a part of said circuit, which connects the composing and printing machines, and also connects one with the positive and the other with the negative pole of a battery or other suitable and known generator of electricity or galvanism. These wires or rods *m* and *n* are inserted in the metallic binding-screws *o* and *p*, which are fixed into and pass through the frame, so as to have a small projection on the inside. To these projections are attached two metallic springs, *q* and *r*, one end of the spring *q* bearing upon the smooth portion of the periphery of the circuit-wheel and one end of the spring *r* bearing upon the cogs cut upon the periphery of the outer portion of the said wheel. This wheel is designed to turn toward the spring *q* and from the spring *r*, so that it may meet with no obstruction from the end of the spring *r* making fast to the said cogs. As the said circuit-wheel revolves the spring *r* will slide over the ends of the cogs, and also pass over or through the spaces between them, and thus the circuit of conductors will be broken by the spring *r* passing over or through a space and closed by its sliding over a cog, the end of the spring *q* in the meantime remaining constantly in contact with the smooth portion of the periphery of said wheel. Each one of these cogs and spaces corresponds with one of the pins in the key-shaft and with one of the finger-keys. The cogs and spaces are therefore represented in the drawings by the same characters as are the said finger-keys and pins. Fig. 10 of Sheet II of the drawings exhibits an end elevation of said circuit-wheel and key-shaft.

The position of the finger-keys in the frame is shown by Fig. 2 of Sheet I of the drawings. The keys are hung upon a small rod, which passes through them at one end, and on which they may play up and down. These keys may be made of any convenient material, but I construct them of wood with ivory tops, and on the under side of them there is a metallic spring, with a catch or cog to make fast to the pins in the key-shaft. Fig. 8 of Sheet II of the drawings represents a side elevation of one of these keys. The spring is to raise the key after it has been pressed down by the finger.

The use of the governor above mentioned is to equalize the motion of the machinery, preventing its running with too great velocity, and also to continue the motion of the other parts of the composing-machine when the key-shaft has been stopped by the pressing down of one of the finger-keys, so that said shaft will resume its motion more readily on being liberated by the raising of the key. This governor is caused to revolve by means of the cog-wheel *h*, as above described, and when the key-shaft is stopped the governor, by the momentum which it has acquired, continues to run and to carry the machinery by causing the friction-wheel *j* to slide round under the friction-wheel *k*, so that when the finger-key is permitted to rise and the catch or cog on the under side of it slips off from the pin in the shaft, the other machinery being still in motion, the shaft will resume its motion more readily than it otherwise would. I will now explain the connected operation of this part of my machine.

I have before stated that each key has a pin in the key-shaft and either a space or a cog on the circuit-wheel with which it corresponds and to which it belongs. I have also stated that this part of said magnetic letter-printing telegraph is to be stationed at the place from which intelligence is to be communicated, and it is to be used for breaking and closing the circuit of conductors, and continuing the same either broken or closed the necessary time for any given letter or the dot to be printed or the blank space to be formed by the said printing part of the machinery to be stationed at the place to which communication is to be made. The manner of producing this effect is as follows: First, it may be observed, from what has been stated, that when the key-shaft, and conse-

quently the circuit-wheel, are put into motion by the agency of the weight attached to the cord *b*, as described, the circuit of conductors will be broken and closed in rapid succession—that is, it will be broken whenever the spring *r* passes through a space between the cogs and closed whenever it slides over the end of a cog. While this process continues by the uninterrupted revolution of said shaft and wheel no printing will be done, for reasons hereinafter explained, and the effect thus far will be only to adjust the type-wheel in the printing part of the machinery and to bring it into the proper position for the printing to take place, as will be hereinafter described. When, however, a letter or other character is to be printed, it is necessary that the motion of said shaft and circuit-wheel should be arrested, allowing said circuit to remain either broken or closed till the desired letter is printed, and this is done by merely pressing down a finger-key. For example, if desirable to print, say, the letter A, the finger-key A must be pressed down. This catches the pin A in the shaft, arresting the motion of the shaft and of the circuit-wheel at the same time that the spring *r* will be on the cog A, and the circuit of the conductors will thus be closed, and, being closed, a current of electricity or galvanism will pass through the circuit, causing the letter A to be printed at the place to which the message is to be communicated. If desirable to print the letter B, then the finger-key B should be pressed down, which, catching the pin B, will stop the motion of the shaft and wheel while the spring *r* is in the space B of said circuit-wheel, and the circuit of conductors being thus broken, the current of electricity or galvanism will cease, causing the letter B to be printed. In like manner any other letter or the dot or the blank space may be formed by merely pressing down the key marked with such letter, dot, or left blank, a like effect being produced upon the printing-machine by either breaking or closing the circuit, all of which will be understood by the examination of the parts hereinafter explained and described.

I will now proceed to describe that part of the said magnetic letter-printing telegraph to be stationed at the place to which intelligence is to be transmitted, and which, for convenience of distinction, I have denominated the "printing-machine."

A front elevation of said printing-machine is exhibited by Fig. 3 of Sheet I of the drawings, and which, for further convenience of distinction, I subdivide into parts 1 and 2, as indicated in the drawings. Fig. 4 of said sheet exhibits an end elevation of part 1 detached from part 2. This machine consists of the basis or bottom D, made of wood of any convenient thickness, and supported by legs *a a*, of any convenient length. Upon this basis, on each side of the working machinery, is to be erected a metallic frame-work or case, suitable for bearings for the different axles to run in and to sustain the machinery. This frame-work has been omitted in the two last-mentioned figures because no particular form of it is necessary, and if represented it would obscure the parts of the machinery more important to be exhibited. *f* of part 1 of the printing-machine is an axle or shaft hung in the frame. On this shaft, at or near its center, is fixed an escapement with two arms, the angular part being fixed to the shaft, as shown by the drawings. A front elevation of this escapement is shown by Fig. 7 of Sheet II of the drawings. This escapement is carried or caused to vibrate as I shall now describe, the machinery in part 2, Fig. 3 of Sheet I of the drawings, being employed for this purpose.

e is a connecting-rod, with one end connected to one arm of the escapement by means of a pin, on which it may easily work, the other end thereof being loosely attached to an eccentric upon the shaft *a* of said part 2 of Fig. 3. Fig. 5 of Sheet III of the drawings presents a full-sized plan of said shaft and eccentric with the connecting-rod attached, and also of the two arms *c* and *b*, one end of each of which is attached to the shaft near said eccentric, the other or outer ends of said arms being bent at right angles, as shown by the drawings. These arms may be made of small wire.

d is an arm attached to and extending out from an axle hung in the frame. Fig. 4 of the last-mentioned sheet of the drawings exhibits a full-sized plan of this arm and axle, and Fig. 3 is a full-sized elevation of the same.

f and *g* are small pins or detents inserted in the arm *d*. The pin *g* is intended to catch the bent ends of the arms *c* and *b* as the shaft into which said arms are fixed revolves. The pin *f* plays in a slot or hole formed in the end of the rod *h*.

i i i i i are helical cords of insulated wire, wound in the usual manner and to considerable thickness, and so as to form a small orifice or hole at or near the center of the mass of said coils sufficient to admit therein a small magnet. These coils of wire are arranged in pairs. Fig. 2 of said Sheet III of the drawings exhibits a full-sized end elevation of one pair of said coils of wire with a magnet placed in them.

j is a permanent movable magnet, made of a small steel rod bent in two places at right angles, or it may be bent in the form of a horse-shoe-magnet, with the two legs or ends straight and passing loosely into the opening or holes formed, as aforesaid, in the said coils of wire, as shown in part 2 of said Fig. 3 of Sheet I, and as also shown by Fig. 1 of Sheet III of the drawings; but I do not wish to be understood as confining myself to any particular number or size of said magnets or said coils. The number and size indicated by the drawings have been used for practical purposes; but other numbers and other sizes may be used.

h is a small metallic bar or rod attached to and connecting the tops of said magnets by joints, and with the end *k* firmly attached to

the frame. The part of this rod near the end *k* which is attached to the frame should be made so as to act as a spring, so that the other end of said rod, together with said magnets, may easily play up and down.

l is a weight attached to a cord which winds round a drum or barrel hung upon an axle, and arranged with a ratchet-wheel in the ordinary and well-known manner for conveniently winding up the weight when the same shall have run down. The cog-wheel *m* is upon the same axle upon which the drum is hung, and works into a pinion, and carries the wheel and axle *n*. The cog-wheel *n* works into a pinion and carries the wheel and axle *o*. The cog-wheel *o* works into the pinion *r* on one end of said shaft *a*, as shown by Fig. 5, Sheet III, before described, and thus said shaft *a* is caused to revolve by the power of the weight. Said wheels and pinions are to be so adapted in size as to give sufficient velocity to the shaft, Fig. 1 of Sheet III being one-third of the size, which will answer a good purpose.

I will next explain the operation of the machinery thus described, the object of which is to give the proper motion to the escapement, as above stated. This is as follows: The weight *l*, by means of the series of wheels and pinions connected as above described, gives motion to the shaft *a*, on which is fixed the eccentric to which the connecting-rod *e* is attached, as above described; and if the motion of said shaft were not interrupted it would revolve with great rapidity as long as said weight should be kept wound up; and inasmuch as the connecting-rod *e* is attached to the eccentric placed upon said shaft, said connecting-rod will be once projected forward and once drawn back at each revolution of said shaft. This motion of the connecting-rod causes the escapement to vibrate.

The manner of regulating the motion of the shaft *a* by an application of the electric or galvanic force and by breaking and closing the circuit is as follows: *p* and *q* are continuations of the wire forming the coils before described. One is the positive and the other the negative pole forming part of the circuit. When the circuit is closed and a current of electricity or galvanism passes through or along said wire, the small magnets (which easily play up and down in the holes left in or near the center of said coils) are drawn down, together with the rod *h*, to which they are attached, and when the circuit is broken and the current of electricity or galvanism ceases to pass, the rod *h*, which is worked in the form of a spring at one end, as described, rises by force of this spring, carrying with it said magnets, and thus this rod will play up and down as often as the circuit of conductors is broken and closed, or as often as a current of electricity passes and ceases to pass along or through the wire forming said coils. When said rod is drawn down it carries with it the end of the arm *d* by means of the pin *f* in said arm, which passes through the slot or hole in the end of said rod, and when said rod is elevated it also carries the end of said arm with it. This motion, it will be observed, changes the position of the pin *g*, causing it to rise and fall as said magnets and said rod and the end of said arm rise and fall. The cogs or bent ends of the arm *c* and *b* each in turn come in contact with the pin *g* at every revolution of the shaft *a*. The arm *c* is longer than the arm *b*, so that the bent end of the arm *c* will come into contact with the pin *g* when the magnets are drawn down, and the pin *g* is therefore at its greatest distance from the shaft *a* or from the center of motion of the arms *c* and *g*.

The arm *b* must be of such length that its bent end will catch to the pin *g* when the magnets and rod *h* are raised, and the pin *g* is therefore nearest to the shaft *a* or to the center of motion of the said arms *c* and *b*. The bent ends of said arms strike said pin in a horizontal position, the side of the bent end of the arm coming in contact with the side of the pin, so that one is parallel to the other, and so that the pin may easily slip below or be raised above the bent ends of said arms. When, therefore, the magnets are drawn down, carrying with them the rod *h* and the end of the arm, the pin is carried down, and the bent end of the short arm *b*, with which it was in contact, is thereby liberated, and the shaft and eccentric perform half of one revolution, and the connecting-rod *e* will be drawn back, and the bent end of the long arm *c* will then make fast to the pin *g* and stop the motion of the shaft, which will remain so until the magnets, the rod *h*, and the end of the arm *d* are elevated, and said pin *g* will be raised; and, liberating the bent end of the long arm *c*, the shaft *a* and the eccentric to which said connecting-rod is attached will again revolve half round, projecting said connecting-rod forward, and thus the motion given to the connecting-rod *e* by the weight *l*, as hereinbefore described, is regulated by an application of the power of electricity or galvanism.

The arrangement and machinery above described will be sufficient and operate successfully unless the distance between the composing-machine and printing-machine be very great. When this distance is very great it may be found necessary to add the power of a less-extended and separate current of electricity or galvanism to increase the electric or galvanic force acting upon said magnets. This may be done by having an additional apparatus to operate in connection with that above described, and which is shown by part 3 of Fig. 1 of Sheet III of the drawings, being represented in connection with part 2, already described. This consists of a set of coils and magnets connected by a rod at the top, similar to those already described in part 2.

s is the rod connecting the magnets, one end of which is to be connected with the wire forming a part of an electric or galvanic circuit. The poles of this additional apparatus or said part 3 are *u* and *t*, and these poles should be

connected in the circuit extending to and connecting with the composing-machine, and when used in connection with part 2 aforesaid may, for distinction, be denominated the "first circuit," and the circuit in which part 2 is connected, for the same reason, may be called the "second circuit." When these two parts are used together the poles of the second circuit will be *q* and *v*. The second circuit may extend only a short distance from the printing-machine and be broken and closed by the first circuit—that is, the breaking and closing the first circuit also breaks and closes the second circuit, as follows: When the first circuit is closed and the magnets in this circuit and the rod *s* connecting them are drawn down, the end of said rod *s* comes in contact with the wire or pole *p* and closes the second circuit. When the first circuit is broken the rod *s*, forming a spring at one end, will rise, thereby breaking the second circuit.

The rod *s* should be a good conductor of electricity, and thus when the first circuit is closed the second is closed also, and when the first circuit is broken the second is broken also, and therefore breaking and closing the first circuit by means of the composing-machine before described is, in effect, breaking and closing both circuits, and as a very small force is necessary to break and close the second circuit, the first circuit will afford sufficient electric force to break and close the second at great distances, in the manner described, and if the distance should be so great as to require it there may be duplicates of part 3 at intermediate places. The poles *v* and *q* of the second circuit may be connected with a battery or other known generator of electricity or galvanism placed at a short distance therefrom, and in the same or an adjoining room in which the printing-machine is placed, if desired, and in this way the disadvantage of the loss of the electric or galvanic force from the distance between the composing and the printing machines is obviated, and the power of a battery or other generator of electricity or galvanism placed at a short distance from the magnets in the second circuit is brought to bear thereon.

In the foregoing description of my said magnetic letter-printing telegraph I have spoken of circuits of electric or galvanic conductors. By this I intend to be understood as meaning any well-known arrangement or means of causing a current of electricity or galvanism to pass through or along a conductor or conductors extending from the composing to the printing machine and through or along said coils of wire and rod *s*, as described.

Having now explained the means and manner of giving motion to the escapement, I will proceed with further explanation of part 1 of the printing-machine.

A is a wheel fixed to an axle hung in the frame parallel to the shaft *f*, which wheel may be about six inches in diameter and one-eighth of an inch thick. On the periphery of this wheel are twenty-eight protuberances, formed by scallops in the said periphery, as shown by the drawings, Fig. 1 of Sheet II representing a side elevation of said wheel and its axle, and Fig. 2 of the same sheet a cut-section of the wheel and its axle. On the end of each of twenty-six of these protuberances is a type of a letter embracing the twenty-six letters of the English alphabet, on the end of one of the remaining two is a type of the period or dot, and the remaining one represents a blank, being a little shorter than the others. These letters, dot, and blank correspond respectively with the letters, dot, and blank on the finger-keys above described. This wheel I call the "type-wheel."

Fixed in one side of the type-wheel (and for convenience of distinction, say, the front side) are fourteen small metallic pins, which project about one-quarter of an inch from the periphery of the wheel.

The arms of the escapement above described extend along the front of the type-wheel, so that the catches in said arms make fast to these pins, the escapement being so adjusted that the pins will not take into both catches at the same time, but so that when one pin is liberated from the catch in one arm by a vibration of the escapement another will be caught in the catch of the other arm thereof. The escapement being caused to vibrate by the motion of the connecting-rod *e* to which it is attached, as above described, and the type-wheel being caused to revolve by a separate and distinct power, as will be hereinafter described; the result is that the pins are caught alternately by the arms of the escapement, and the motion of the type-wheel is thus interrupted and regulated.

The type-wheel is caused to revolve by the power of the weight attached to the cord *g* passing through the basis D and winding round the barrel *h*, fixed upon an axle hung in the frame, and having a ratchet with the necessary fixtures arranged in the ordinary and well-known way for winding up the weight, and also a cog-wheel which works into the pinion *i*, with a cog-wheel at the opposite end of the axle of said pinion which works into the pinion *j* and revolves the type-wheel.

I have now described how the type-wheel is caused to revolve and the manner in which its motion is interrupted and regulated by the escapement; and in order to better understand the object, application, and effect of the other parts of the printing-machine, it may be of use to notice here what would be the motion of the parts already described if put into operation without any additions being made thereto.

If the weight attached to the cord *g*, causing the type-wheel to revolve, be wound up and the circuit of conductors be broken and closed in rapid succession by the revolution of the key-shaft and circuit-wheel, the arms of the escapement will vibrate, and the type-wheel will revolve by a regular hitching motion as fast as permitted by the vibrations of the es-

capement, and the escapement will play with sufficient velocity to give the type-wheel about sixty revolutions in a minute. If in the meantime the key-shaft be stopped, causing the circuit to remain broken or closed, the type-wheel would be held in one position by the escapement, and the whole operation would cease until the key-shaft had again resumed its process of breaking and closing the circuit. It is therefore obvious that other fixtures are necessary to cause the machine to print, and these are as follows:

B is a cylinder or drum, which I call the "paper-cylinder." The axle upon which this cylinder is placed is hung in two small metallic posts or arms about three inches in length, the lower ends of these posts or arms being firmly attached to an axle hung in the frame, and with which they vibrate, carrying said cylinder to and from the type-wheel.

m m are small metallic rods connecting by a joint with the upper ends of the posts *l l*. These rods are more distinctly exhibited by Figs. 5 and 7 of Sheet I of the drawings, being the plan and elevation of said rods and the parts to which they are connected, the angles being formed in the rods to accommodate the space between them to the length and movement of the paper-cylinder. The axle of the cylinder is to run in the tops of the posts, and is held down by the pressure of the springs *o o*. The ends of these connecting-rods *m m* are connected to eccentrics on the shaft *n* by loose bands passing round said eccentrics, so that when the shaft *n* revolves, as I shall hereinafter describe, the connecting-rods *m m*, and consequently the paper-cylinder B, are projected forward and drawn back by said eccentrics, the paper-cylinder being hung on the posts or arms to which the rods are attached, and said posts or arms turning on the axle to which they are attached, as before described.

The paper on which the letter is to be printed may be wound round the cylinder B. This paper-cylinder must be hung at such a distance from the type-wheel that each revolution of the eccentric-shaft *n* will bring the paper wound round the paper-cylinder in contact with one of the type. Also, to cause the paper-cylinder to revolve so as to move each letter forward that another may be printed by the side of it, there are two catches, *q* and *p*, Figs. 3, 5, 6, and 7 of Sheet I of the drawings, which extend the length of the cylinder and work in the notches formed in the edge of one end of the said paper-cylinder, said edge extending a little above the paper and answering the purpose of a ratchet-wheel.

The catch *q* is attached to the side of the frame by the pins or screws at *q' q'*, forming an axis on which it turns.

Under the catches are springs by which they are sustained and kept in the notches. The catch *p* is permanently attached to the posts or arms on which the paper-cylinder is hung, so that it moves with the paper-cylinder in its motion to and from the type-wheel. The catch *p* also works in the notches in the end of the cylinder. The effect of these catches in causing the cylinder to revolve is as follows: When the cylinder is moved back from the type-wheel the catch *q* takes into the said notches and turns the cylinder far enough to move the last letter printed out of the way of the next to be printed, and as the catch *p* retains its position it prevents the cylinder from turning back, and thus the cylinder is turned forward sufficiently far for the letters to clear each other each time that it is projected forward by the eccentric-shaft *n*, as before described.

A screw is cut upon one end of the paper-cylinder axle, and also in the groove on the end of the post in which it runs, by means of which the cylinder will be moved endwise as it revolves, and the letters will thereby be printed in a helix round the cylinder. When it has thus moved the length of it, it is to be lifted out of the grooves in the posts and set back, so as to commence the printing again at the other end of the cylinder; or the paper-cylinder may be arranged with the ends of its axle plain, so as not to move endwise, in which case the paper round the cylinder must run off as the cylinder revolves, and in such case, as the cylinder would not move endwise, and as less space would therefore be necessary for the cylinder between the connecting-rods *m m*, said rods may be made without the angles. Figs. 9 and 10 of Sheet I show an arrangement of this kind.

The material most convenient to be used for the printing, instead of ink, is plumbago, with which the type may be supplied by the small wheel or roller *r*, hung in the frame over the type-wheel. The roller *r* is so hung that it will revolve by the friction of the surface of the roller coming into contact with the type. The plumbago may be pulverized and placed in a groove cut in the periphery of said roller and covered by a suitable substance. Woolen cloth answers a good purpose. The plumbago will work through the cloth sufficiently to supply the type coming into contact with the cloth.

I will now explain the manner in which the shaft *n*, having the eccentrics to which the rods *m m* are attached, is caused to revolve, then, also, how its revolutions are regulated.

The power causing the revolutions of said shaft is a weight attached to the end of the cord *k*, which cord is wound round a barrel or drum, having a ratchet-wheel and cog-wheel arranged for the convenience of winding up the weight by means of a crank, similarly to the like fixtures connected with the weight attached to the cord *g*, as above described. Fig. 4 of Sheet II exhibits a cut-section of each of these barrels, ratchet-wheels, cog-wheels, and the axles on which they are hung. The cog-wheel attached to the axle of the barrel *s* works in and carries the pinion and axle *t*. The cog-wheel *g* on the opposite end of this axle works

into a pinion attached to the said shaft *n*, and thus the shaft *n* is caused to revolve by said series of wheels and pinions, which should be so adapted as to gain velocity. If, now, no regulator or obstruction were interposed, the shaft *n* would revolve constantly and with great velocity until the weight attached to the end of the cord *k* had run down, and would carry the paper-cylinder to and from the type-wheel at each revolution; but in order to print any given letter it is necessary that the shaft *n* should only revolve when the type of the letter desired to be printed is brought opposite the paper-cylinder by the type-wheel—that is, it should revolve only when the type-wheel has been stopped by pressing down one of the finger-keys marked with the given character, as above described. To accomplish this I use the following contrivance:

u is a lever with the larger end attached to the frame by an axle, forming a fulcrum, on which it works, the other being the small bent end of the lever playing up and down by the side of the periphery of the type-wheel, and on the side of the type-wheel opposite to that on which the escapement before described works. In the side of the type-wheel on which said lever works, and about half an inch from the periphery of said wheel, are inserted twenty-eight small round metallic pins. These pins correspond in number with the protuberances on the wheel, and are placed on radial lines drawn from the center of said wheel to the types. The position of these pins is represented by the small quadrants and circles in Fig. 1 of Sheet II of the drawings. It must be understood, however, that these round pins are on the side of the wheel opposite to that which is represented by said last-mentioned figure, the quadrants on the side of the wheel exhibited representing the pins and the form of the same, upon which the escapement works, as before described. *a* and *b* of Fig. 2, Sheet II, show the form of one of the escapement-pins and one of the round pins detached from the wheel. The small end of said lever has a straight surface of about three-eighths of an inch in length, so as to rest on said round pins. This small end of the lever is bent in the manner shown by the figure, so that it may fall, when required, between said pins.

The metallic rod *z* is attached to said lever by means of a screw or pin, forming a joint on which it works. The lower end of this rod is connected with a hydraulic regulator, *c*, so constructed and arranged that the rod *z* and the lever *u*, to which it is attached, may rise rapidly, but will not fall or pass downward to any extent only when the type-wheel is fully stopped.

The construction and operation of the hydraulic regulator I shall hereinafter explain.

In the side of said lever is fixed the pin *v*, about one-quarter of an inch in length.

Firmly fixed upon the shaft *n*, above described, is a thin metallic wheel, E, of an eccentric form, and shown by Figs. 11 and 12, Sheet I of the drawings. The pin *v* in the lever is designed to slide on the periphery of this wheel as the wheel revolves, for the purpose of changing the position of the lever *u*. The wide part of this wheel—that is, the part of the circumference farthest from the center of its motion—is made thicker than the other part of the wheel—say three-eighths of an inch thick. In this thick part of said wheel are formed two catches or shoulders, *w* and *x*, which successively take the pin *v* as it slides upon the periphery of the wheel, thereby stopping the motion of the wheel. These catches or shoulders are about half an inch apart, *x* being rather farther from the center of motion of the wheel than *w*, so that when the wheel revolves the pin *v* will first take into the catch or shoulder *w*, and on being liberated from that will next take into the shoulder *x*. The shoulder *w* is so formed that the pin *v* is to be liberated from it by being raised; but the shoulder *x* consists of a small projection of the thick part of the wheel, having a space worked out under it, so that when the pin *v* takes into it it can only be liberated by falling below and passing out on the under side of the catch or shoulder.

The wheel and the lever *u*, with the pin *v*, will then operate together thus: As the wheel E revolves with the shaft on which it is fixed, the pin *v* (supposing it to start from that part of the wheel nearest to the center of motion) will slide round upon the periphery of the wheel, the lever being gradually raised thereby until the pin *v* comes in contact with the shoulder *w*, which will stop the motion of the eccentric wheel and its shaft. The wheel and shaft will then remain stationary until the lever *u* be raised so as to lift the pin *v* out of the catch *w*, and this will be done by the first round pin in the type-wheel which may pass the end of the lever, the round pins in the type-wheel striking the end of the lever at *y* as the type-wheel revolves, throwing the pin *v* out of the shoulder *w*. On this being done the said eccentric wheel and shaft will revolve the distance between the two shoulders *w* and *x*, and the pin *v* will then take into the shoulder *x* and the motion of the wheel and shaft will again be stopped. As above stated, the pin can only be extricated from the shoulder *x* by falling below it and passing out on the under side; but this it cannot do while the type-wheel is in motion, for as the lever is prevented from falling suddenly by the hydraulic regulator, and as the pins successively come into contact with the small end of lever *y*, the lever is kept up and the pin *v* in the shoulder *x* until the type-wheel be stopped. When the type-wheel is stopped the small bent end of the lever gradually falls between two of the said round pins. The pin *v* at the same time falls below the shoulder *x* and upon the circumference of the eccentric wheel nearest its center of motion, and the wheel and shaft *n*

revolves and the pin *v* again takes into the shoulder *w*, as before, and thus the shaft *n* is caused to revolve when the type-wheel is stopped and to bring the paper-cylinder in contact with a type.

Fig. 13 of Sheet I of the drawings exhibits a cut-section of the hydraulic regulator used to regulate the motion of the lever *u*, above described. It consists of the exterior glass vessel, *a*, which should be made water-tight, and when in operation nearly filled with water or other suitable liquid. Within this glass vessel, and fixed to the bottom thereof, is an apparatus constructed to act on the principle of the forcing-pump, and is to be entirely immersed in the water contained by the glass vessel. It consists of the small cylindrical vessel *b b*, with holes in the sides, through which water may pass. At the top it has the small projection *c c*, with a screw cut in its outer edge, and on which is screwed water-tight the upper part of the apparatus *d d*.

e is a metallic guide extending across the upper end of the cylinder *b b*. In this guide works the spindle of a spindle-valve, *f*, which valve is circular and fits air-tight on the shoulder *c c*.

g is a hollow piston or plunger working through the top of the valve-chamber *d d*. To the top of this piston or plunger is attached the piston-rod *z*, which extends out through the neck of said glass vessel.

The piston or plunger may be solid or hollow; but it is better to have it hollow in order that it may be light.

The sides of the valve-chamber *d d* converge toward the top. The piston or plunger should work loosely in the top of the valve-chamber *d d*, leaving a space between the two sufficient for water to pass in small quantities.

The operation of this hydraulic regulator is as follows: When the piston or plunger *g* is raised by the lever *u*, attached to the piston-rod, as described, a vacuum is formed, the water passing through the holes in the side of the cylinder *b b* raises the valve *f*, and the chamber *d d* is filled with water. When the piston or plunger descends the water which it displaces passes between said plunger and the sides of the chamber *d d*, in which it works, and as this space is small, admitting the water only in small quantities, the plunger must descend very slowly, but, having no resistance to overcome except the weight of the plunger, it can ascend rapidly, which is important to regulate the motion of the lever *u*, as above described.

After the machine is arranged as above described all that is necessary to cause it to print is for the person attending the composing part to press down the finger-key marked with the letter or character which he may desire to print. This being done, the type-wheel will stop when the type of the same letter or character is opposite to the paper-cylinder, and, the type-wheel so stopping, the lever *u* will fall and the shaft *n* will revolve, bringing the cylinder in contact with the type, and thus the letter or character will be formed.

To transmit numbers it is to be understood between the person making and the one receiving the communication that the first ten letters of the alphabet represent the nine digits and the cipher, in the order in which they are respectively placed, and that each of these letters in the transmission of numbers is to be used for its corresponding digit or cipher, and may therefore be made to represent numbers. When these letters are so used for numbers it is to be understood that the same is to be indicated, say, by two dots, which must precede the letters, thereby giving notice to the person receiving the message that the letters following are to represent numbers and to be followed by two blank spaces, indicating that they have ceased to be used for numbers.

When a message is about to be transmitted it may be necessary for the person tending the composing-machine to give notice of the same to the person tending the printing-machine by an alarm. This is effected as follows: F of Figs. 3 and 4 of Sheet I of the drawings is a bell, and *a'* its knocker or hammer, attached to the frame by a spring at the lower end. In the side of the eccentric wheel E is a pin, *b'*, about three-quarters of an inch long, against which the rod of the knocker rests. When the eccentric wheel revolves, as described above, the hammer or knocker falls upon the bell and gives the alarm, and thus the bell will be rung and the alarm given as often as the shaft *n* revolves, or until the attention of the person tending the printing part of the machine is attracted thereto. While the machine is in process of printing the knocker may be secured from the bell by means of a bent wire or hook, which should be attached to the frame.

I have now described the mechanism and arrangement thereof sufficient to transmit intelligence from the place at which the composing-machine is stationed to the place at which the said printing-machine is stationed; but it will be important to reverse the order of such communication between the same points or places, and this may be done by having one composing-machine and one printing-machine stationed at each place or point and connected with the same circuit of conductors in like manner as described above; also, the intelligence may be communicated to and recorded at any intermediate place or places between the two most distant points or termini by having at such intermediate place or places a printing-machine like the one described above, and connected at such intermediate place or places with the circuit of conductors in like manner as the printing-machine is connected with the said circuit of conductors at the most distant place or termini, as described.

I do not wish to be understood in these specifications as confining myself to any particular size or form or materials in the construction of the parts before described, unless it would change the general feature of said part or parts. Neither do I wish to be understood that I confine myself to any particular number of the letters of the alphabet, or to any particular alphabet. In all cases where the type of any other characters are to be used the finger-keys are to be designated by the same characters.

What I claim as my own invention, and not previously known, in the above-described magnetic letter-printing telegraph is—

1. The manner in which I arrange and combine the finger-keys, a key-shaft, and a circuit-wheel, respectively, for the purpose and substantially as herein described.

2. The combination of the escapement with the type-wheel by means of pins in the side of said type-wheel, corresponding in number with half the number of letters and other characters which the type-wheel is constructed to form, and the above combination and arrangement of the escapement and type wheel in combination with magnets, as herein described, and for the purpose herein stated.

3. The combination of the type-wheel with the lever *u* by means of pins fixed in the side of said type-wheel equal in number to the number of letters and other characters formed, (and by "other characters" I mean as well the blank spot as the letters and dot,) for the purpose of regulating the motion of the shaft *n* to carry the paper-cylinder to and from the type-wheel, all as described in said specification.

4. The manner of combining E on the shaft *n* with the lever *u* by means of the pin *v* and projections *w* and *x* on said wheel.

5. The combination of the lever *u* with the hydraulic regulator, to produce the effect herein pointed out, and in the manner herein described.

6. The manner of producing and regulating the several motions of the paper-cylinder by the combined action of the several parts, respectively, as herein described, viz: the hydraulic regulator, the wheel E, the lever *u*, the type-wheel, the eccentric-shaft *n*, and the rods *m* and *m* connected therewith, the ratchets or catches *q* and *p*, and the posts *l* and *l*, as herein described, also the manner of applying the plumbago to blacken the type, as herein described.

7. The combination of the composing apparatus with the magnets, for the purposes specified.

ROYAL E. HOUSE.

Witnesses:
M. M. VAIL,
GEO. GIFFORD.