4 Sheets--Sheet 1.

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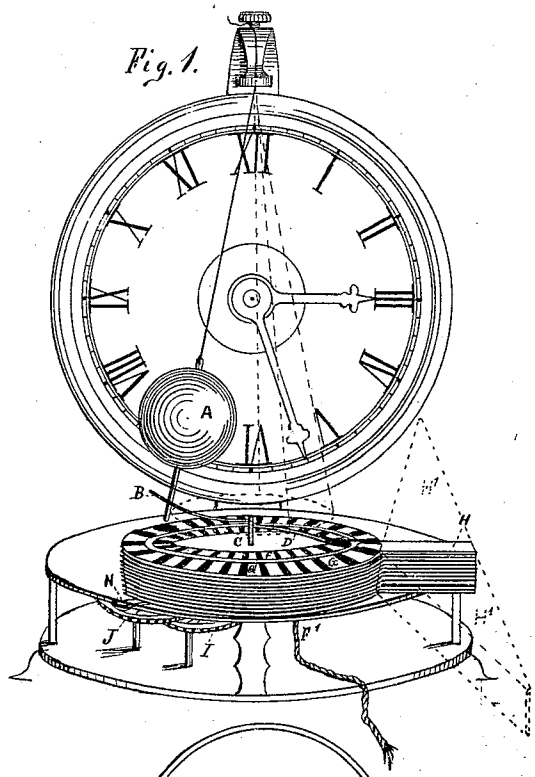
Printing-Telegraphs.

No. 136,369. Patented March 4, 1873.

Fig. 1.



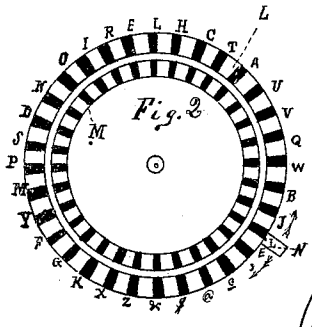


Fig. 2.

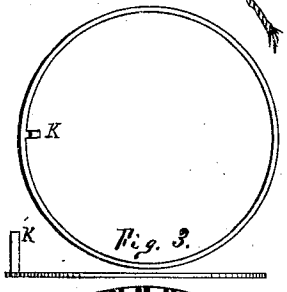


Fig. 3.

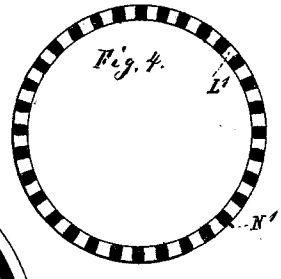


Fig. 4.

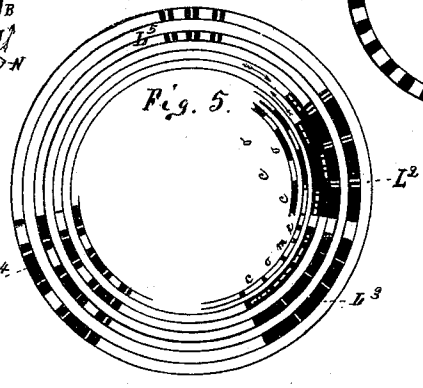


Fig. 5.

Witnesses.

Geo. E. Brown.
M. Church

Inventor.

Merritt Gally.

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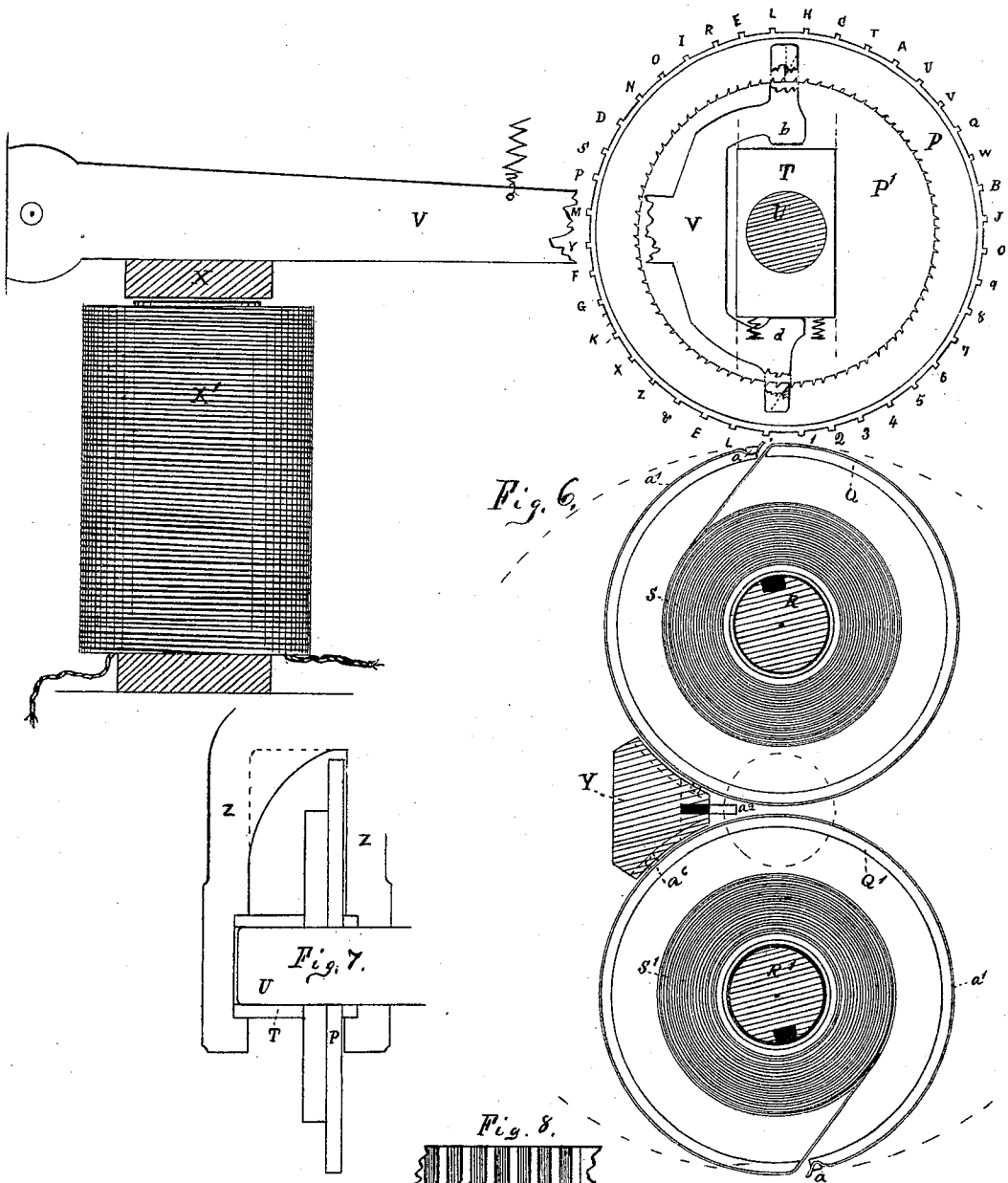

Fig. 6.

Fig. 7.

Fig. 8.

Witnesses

Geo. E. Brown.

M. Church

Inventor,

Merritt Gally

AM. PHOTO-LITHOGRAPHIC CO. N.Y. (OSBORNE'S PROCESS)

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Fig. 10.

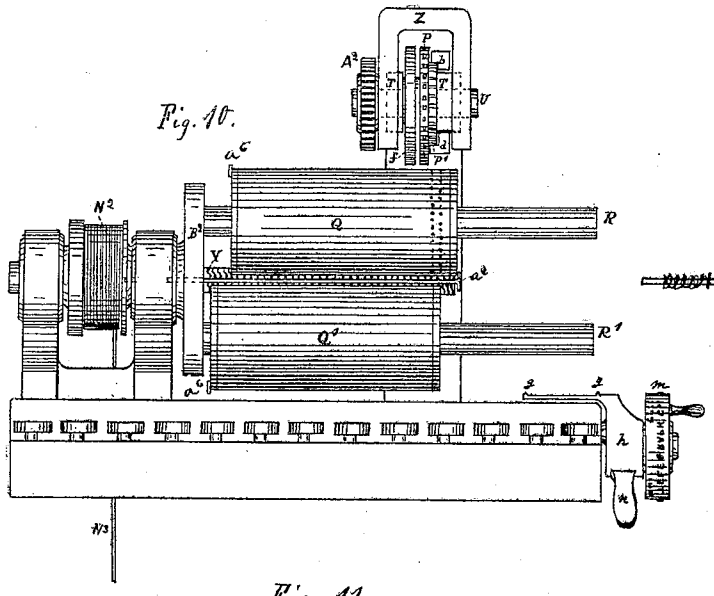


Fig. 9.

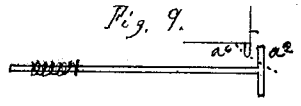
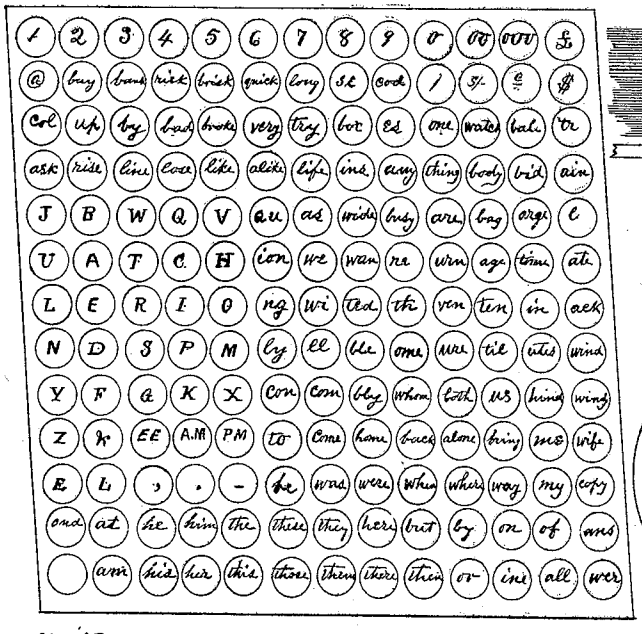


Fig. 11.



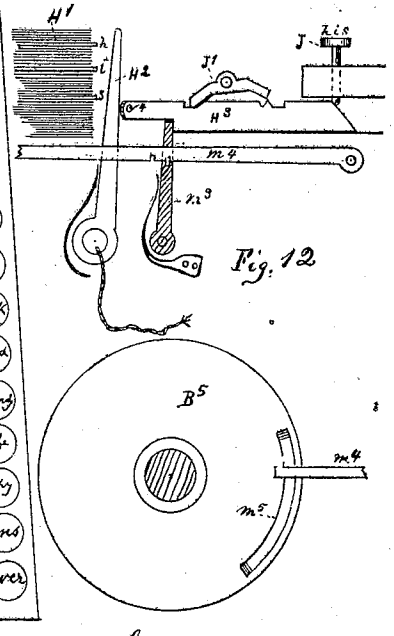


Fig. 12

Witnesses.

Geo. E. Brown.
M. Church

Inventor.

Merritt Gally.

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M. GALLY.

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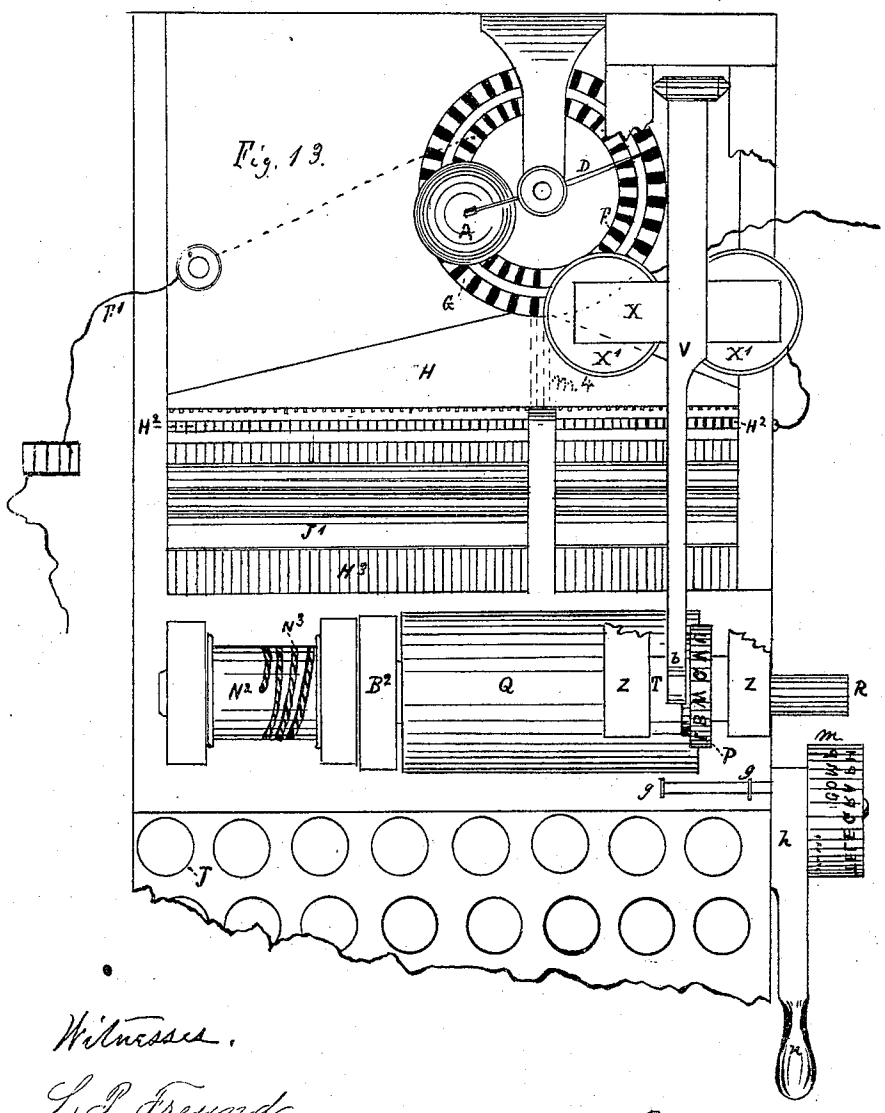
Fig. 13.



Witnesses.

L. P. Freund.

Wm. G. Henderson

Merritt Gally,

Inventor.

AM. PHOTO-LITHOGRAPHIC CO. N.Y. (OSBORNE'S PROCESS)

UNITED STATES PATENT OFFICE.

MERRITT GALLY, OF ROCHESTER, NEW YORK.

IMPROVEMENT IN PRINTING-TELEGRAPHS.

Specification forming part of Letters Patent No. **136,369**, dated March 4, 1873.

To all whom it may concern:

Be it known that I, MERRITT GALLY, of Rochester, in the county of Monroe and State of New York, have made a new and useful invention pertaining to the Art of Telegraphy; and I do hereby declare that the following is a full and accurate description thereof, reference being had to the accompanying drawing and to the letters of reference marked thereon.

The object of my invention is, first, to shorten the process of telegraphing, and thus reduce the labor of the operator and increase the speed of operation; secondly, to secure nicely-printed telegrams by the use of simple and durable instruments. My invention consists, first, in a new and useful unison device; secondly, in the use of single keys, each representing a number of separate letters or characters, to be brought into use by a single stroke of the key; thirdly, in the use of a conducting-pile, forming a new and useful repeating circuit-closer; fourthly, in the use of a pulsating device in connection with the main line, for governing a number of transmitting or receiving instruments, the transmitting impulses of the transmitters occupying the intervals between the pulsations of the governor; fifthly, in the combination of more than two operating instruments with a single telegraphic line, simultaneously employed without conflict of their messages; sixthly, in the use of a type-wheel with a reciprocating journal-bearing; seventhly, in the use of a paper-holding cylinder, having its line of printing around its circumference, and a longitudinal movement for placing the position of the lines; eighthly, in the use of a paper-holding cylinder, containing, internally, the paper to be supplied to the outside; ninthly, in the combination of a number of paper-holders, together with a motor, which brings one after the other into printing position, so that the printing of the instrument may be continued upon one while the message is being removed from another; tenthly, in making the type-wheels of two or more instruments on a telegraphic line to differ relatively in position as respects the material impressed, so that the electric impulse causing the impression of a letter in one instrument will not cause the other to print, but that the printing may be carried on in the different instruments by means of different impulses; eleventhly, in the connection, with a telegraphic instrument or type-writer, of an independent form with heading or other frequently-recurring portion of the work to be impressed upon the printed material when required; twelfthly, in the use of a paper-creaser or marker in connection with a telegraphic instrument or type-writer; thirteenthly, in the combination, with a printing-telegraph instrument, of a sounding device, which may be operated simultaneously with the printing device; fourteenthly, in a type-wheel having a number of ciphers, which may be used singly or in numbers during a single revolution of the type-wheel; fifteenthly, in the use of an adjustable circuit-closer.

Figures of the Drawing.

In the figures of the drawing, Figure 1 is a perspective view of a conducting-pile and a revolving pendulum. Fig. 2 is a plan of the upper face of the pile, together with the internal ring. Fig. 3 is a plan and edge view of one of the lower rings of the conducting-pile with its conducting-bar. Figs. 4 and 5 are diagrams for illustration. Fig. 6 is an end view of the paper-holding cylinders, type-wheel, magnets, &c. Fig. 7 is a plan of the type-wheel and its reciprocating journal-bearing. Fig. 8 is a face view of the device for securing the proper position of the lines upon the paper. Fig. 9 is a view of the device for securing change of position of the paper-holding cylinders. Fig. 10 is a front view of the operating-cylinders, type-wheels, &c., diminished in size. Fig. 11 is a plan of the key-board. Fig. 12 is a view of the key-operating mechanism.

General Description.

I am aware that pendulums having simply a vibratory movement have been used in connection with telegraphic instruments with an attempt to secure unison thereby, but they have been comparatively inoperative, especially where very rapid pulsations have been required. In their results they have been deficient for many reasons, prominent among which are the facts that their vibrations have been comparatively slow, and their speed different in different portions of their arc of vibration. The latter of these defects I partial-

ly overcame by constructing upon the arc a number of conducting-faces varying in distance from each other in proportion to the variation of movement; and, when necessary, varying also in breadth of face; but the results not being fully satisfactory I brought into use the revolving-pendulum. The movement of such a pendulum remains equal in speed at all points in the circle of its motion. On such a circle a great number of conducting-surfaces may be placed; and, as the pendulum can be revolved very rapidly, great accuracy can be attained in producing rapid-timed impulses.

In the machine represented in the drawing I use the revolving pendulum in connection with a conducting-pile of peculiar construction, although it may be used with good results with other kinds of repeating conductors. The conducting-pile is shown in Fig. 1, represented by F G G. This pile is placed under the revolving pendulum, and is made up of a number of rings or plates, each having a conducting-bar, K, Fig. 3. The rings mentioned are first piled with intervening non-conducting substance, and then covered with a ring or plate made up of a number of conducting and non-conducting sections. Within the pile is a solid ring, F. This ring may have an entire conducting-face, but to avoid any possibility of mixing impulses it is divided into as many conducting and non-conducting faces and intervals as the upper plate of the pile. Connected with the conducting-pile described is another pile of conducting-plates of equal number, represented by H. With this pile of plates the operating-keys make the circuit connections; therefore, the plates must equal in number the characters of the type-wheel, and these plates must connect with as many rings of the first-described pile, and as many conducting-bars, K, must each connect with one of the conducting-sections of the upper plate the conducting-pile. There may be a greater number of the conducting-sections, as will be hereinafter explained, for the purpose of adjustment. Upon the shaft C, which revolves with the pendulum A, is a metallic circuit-connector, D. The gear of shaft C may connect with the type-wheel where any two instruments are kept in unison by the device described, and in such case no escapement will be required; but a greater number may be kept in unison by the attachment of the revolving pendulum, if desired, without an escapement. For example, let a number of printing-instruments having the revolving pendulums attached be connected to a telegraphic line. Let a key, representing a particular letter of the type-wheels, be agreed upon, by which the several machines are to be tested as to unison. Now, as we have said previously, the key will close the circuit with the instrument at one of its divisions by connecting the circuit-wire with one of the plates of pile H. As there is also another division of the circuit between the circular conducting-pile and the internal solid ring, this division will be connected when the revolving circuit-closer connects a conducting-face of the internal ring with a conducting-face of the circular pile corresponding with the plate of pile H which has been made to connect with the circuit-wire by the working of the key. The internal ring of the circular pile is attatched to the circuit-wire, which is shown in Fig. 1. The other parts of the circuit-wire connecting with the pivot of the connector in Fig. 12, the ends of both parts of the wire mentioned forming a connection with the main line, completes the circuit. Now, if the pendulums of the several instruments be set in motion, and the standard key of each instrument be depressed, if only a single impulse passes through the circuit at each revolution of the pendulum, the several instruments will be in unison; but if no impulse passes, or a number at each revolution of the pendulum, the instruments will not be in unison. To adjust the instruments to unison the circular pile is made to turn upon its axis by means of the handle N. This will affect only the positions of the conducting-faces of the circular pile in respect to the revolving circuit-connector without affecting the relation of the plates of pile H and the conducting-surfaces of the circular pile, because the rings of the circular pile form at their circumference a continuous unchangeable connection with the corresponding plates of pile H.

To increase the speed of operation, I use single keys representing a number of separate letters of the type-wheel, which may be printed during a single revolution of the type-wheel and by a single stroke of the key. This is accomplished by making the key circuit-connector of such keys connect with a number of the plates of pile H, corresponding with an equal number of the letters of the type-wheel in passing once around its circumference, or following each other in a number of very rapid revolutions. In the latter case with more than one revolution of the wheel only the manipulating process would be shortened. In order to secure the desired result with a single revolution of the type-wheel, and to secure a large number of such keys representing many frequently-recurring words, syllables, and combinations, I first arrange the letters of the type-wheel out of an alphabetic order, and in such a way as to be able to spell as many words, syllables, and combinations with the letters while passing in one direction around the type-wheel. In order to further facilitate the manipulation of the keys I place them in classified groups. The key movement is, in most respects, similar to that described in my patent of July, 1872, No. 129,725. I will therefore state only the manner of connecting it with the instruments herein described. The key J of Fig. 12 represents one of the keys of the key-board, Fig. 11. The number of circuit-closers H^2 is equal to the number of keys of the key-board, Fig. 11. The circuit-

closers H^2 form as many connections, or, in other words, connect with as many of the plates of pile H^1 as they each represent letters upon the type-wheel. The narrow edge of the circuit-closer of each closer is driven forward by its key to connect with projecting points from as many of the plates as are required to produce the print of the number of letters represented by the key. The key J, Fig. 12, operates upon three such points by means of its connector, this key representing three letters, which spell the word "his." Other keys representing other frequently-recurring words are arranged in similar manner, connecting with their respective plates. The pile of plates represented in Fig. 12, as H^1, is a cross-sectional view, and is the pile H of Fig. 1. The electric impulses which are passed through the circuit are conveyed to the electro-magnet *x* and bring down the lever of the armature V. The type-wheel P is hung in reciprocating journal-bearings T, which are acted upon by the lever of the armature, bringing the type-wheel down in connection with the paper as the impulses pass the circuit.

The escapement-wheel P′ is not necessary to the action of the instruments as thus far described, as the type-wheels are revolved and kept in unison by means of their revolving pendulums and motors.

In order to secure sufficient time for the operator to depress a key and secure his connections, I make the returning-shifter m^3, Fig. 12, which returns the bars H^3 to place, in two parts—one part to act upon the bars of the keys which indicate the numerals and the other part upon the bars representing the letters. As the letters and numerals are in separate groups on the face of the type-wheel the keys of the letters may be depressed during the time in which the numerals are passing a given point, and the keys of the numerals may be depressed while the letters are passing a given point. The cam-wheel B^5 revolves horizontally under the latch-lever m^4 and lifts it, relieving the shifter and allowing the depression of the keys connecting with the shifter while the lifting-cam m^5 is passing under the lever-latch m^4. The lifting-cam occupies that portion of the circumference of the cam-wheel which corresponds to the part of the face of the type-wheel occupied by the letters or numerals, as the case may be. The cam-wheel revolves at equal speed with the type-wheel. Thus it will be seen that two cams will be necessary, and also two lever-latches connecting with the shifters of their respective set of keys.

Having constructed the transmitting-instruments so as to secure speed and facility of operation, the next part of my invention has reference to increasing the transmitting capacity of the line. Duplicate instruments have already been employed simultaneously upon a single telegraphic line, but such a limited increase of capacity does not answer the demand; and I have therefore constructed my instruments with a view to the employment of more than two, simultaneously, upon a single line. For this purpose I leave sufficient space between the letters of the type-wheels to allow a number of impulses to pass through the magnet and depress the type-wheel during its movement without making impressions upon the paper. I set the type-wheels of several instruments on the line in such relative position, in respect to their printed material as to secure to each the printing depression by a different impulse from those causing the printing of the other type-wheels. I set the circular pile of each instrument to correspond with the relative position of its type-wheel and paper; and the number of instruments are prepared for use. If each instrument is provided with its revolving pendulum, and the several pendulums are revolving in unison, it will be seen that all the instruments may be simultaneously employed, printing successively by succeeding impulses, and that no impulses will be necessary to pass the circuit, except one for each printed letter. If, however, it is desirable to do away with the use of so many revolving pendulums, I remove them from the instruments and employ but one, with an independent battery connected with the main line. It is not necessary that this should be a strictly time-keeping instrument, but any rapid pulsator with a comparatively steady movement may be employed. I, however, use the revolving pendulum as the best means of producing a regular and rapid pulsator. In order to employ a number of instruments simultaneously with this arrangement of devices I must use the escapement-wheel P′, Fig. 6. Although the revolving pendulums are removed from the transmitting or receiving instruments, the circular piles and revolving circuit-closer are retained, together with the motor. I set the relative printing positions of the type-wheels of the several instruments as in the previous case. I make the conducting faces of the pile connected with the revolving pendulum of the main line to differ from those of the piles of the instruments as to relative position, making them to correspond with the non-conducting intervals of the instrument-piles. I make the teeth of the escapement-wheel P′ to fall between the letters, the type-wheel, and in such position as not to correspond with any of the printing-adjustments. I use only teeth enough upon the escapement to insure unison to the movements of the several wheels.

I set the pulsator of the main line in motion, and all the wheels of the different instruments are allowed to revolve; and as to their speed, are kept in unison by means of the pulsations of the main battery through the main line. Now, as the impulses caused by working the keys of the transmitters can occur only between the impulses from the main-line pulsator, it is apparent that all the several instruments may be employed on a single line without conflict of their several messages.

In diagram, Fig. 5, the smaller white spaces represent the conductors of the line-pulsator, and the larger white spaces the conductors of the instrument-pile.

In order to be able to read by ear the message which is being printed, or while a printing-transmitter is at work upon the line, I attach to the instrument an additional circular pile and divide the larger conductors, represented by the larger white spaces of the diagram, into the dots and dashes representing the several letters. I make the conducting-bar for each letter connect with the number of dots and dashes. I then attach a sounder to the pile, and the message being communicated may be read by ear, whether any of the instruments are printing or not.

The paper upon which the message is to be printed I place upon the cylinder Q, which turns with the type-wheel at such times as the types are in contact with the paper. The line of printing is thus formed around the cylinder. When a line is completed the cylinder is suddenly moved the space of a line by means of a small spur, a^6, which passes through one of the diagonal grooves of the grooved piece Y. The next line of printing is immediately begun, and so on until the face of the cylinder has been printed over.

In order that the printing may still go on uninterruptedly, I use two or more cylinders, two being represented in the drawing. The journal-bearings of these cylinders are attached to a head-piece, B^2, which may be made to turn on an axis, inverting the positions of the cylinders. A common clutch-rod, Fig. 9, is used to connect the head B^2 with the stationary frame-work. When the spur a^6, which produces the longitudinal movement of the cylinder upon which the printing is being done passes through the last diagonal groove of the grooved piece Y it comes in contact with the cross-piece a^2 of the clutch-rod and relieves the clutch. The weighted cord N^3 upon the pulley N^2 of the journal of the head B^2 instantly inverts the positions of the cylinders, and the printing goes on upon the newly-placed cylinder without interruption while the printed page is being removed from the first cylinder.

To keep the cylinders constantly supplied with paper I make them hollow, and upon the internal spindle I place a roll of paper, S, Fig. 6, the end of the paper being passed through an opening in the side of the cylinder, and, having been passed around its circumference, is clamped by a spring-clamp, *a*.

To remove the printed paper it is only necessary the draw out the paper, unwinding the roll, and tearing off the printed part. This leaves the cylinder freshly covered. By clamping both ends of a sheet which simply covers the cylinder single sheets may be used instead of the roll.

The paper, used either in rolls or sheets, may have upon it the usual printed headings, &c.; but for printing headings or frequently-recurring portions of the work I attach to the instrument a form-wheel, *m*, which is upon a rocking bearing, and may be brought into contact with the paper upon one of the cylinders by lifting the lever *n*. Ink having been applied to the form-wheel, a single turn by means of its crank will make the impression of the form upon the paper. Two marking-spurs, *g g*, are shown projecting from the piece *h*, which may be also brought into contact with the paper while the cylinder is revolving, and thus crease or mark the paper to facilitate folding. Small wheels instead of spurs may be used.

By examining the operating-key movement of former patent referred to it will be seen that, by combining such key-movement with the transmitting instruments herein described, a number of keys representing different letters may be struck simultaneously by a simple stroke, and without holding the keys the several letters will be transmitted in their proper order, as the keys are brought back to place only after the proper work has been accomplished by each. This enables an operator to select a second combination of keys and have his fingers placed in readiness to strike them while the first set struck are accomplishing their work, thus greatly facilitating the operation of the instrument.

In the arrangement of the key-board, as shown in Fig. 11, no duplication of letters is necessary on the type-wheel except the often-recurring double letters E and L. An O might be advantageously added. For the numerals I place three ciphers upon the wheel. This allows me to make numbers with tens, hundreds, or thousands, at a single stroke.

Claims.

What I claim, and desire to secure by Letters Patent, is—

1. The combination, with a telegraphic instrument, of a revolving pendulum and its motor so that the pendulum acts as a unison device, substantially as set forth.

2. The combination, with a transmitting device, of one or more single keys, each representing a number of separate types to be brought into use by a single stroke of the key, substantially as set forth.

3. The combination of conducting piles G and H^1 and connector H^2, or equivalents, forming a repeating circuit-closer, substantially as set forth.

4. Two or more instruments connected with a single telegraphic line, the relative positions of their type-wheels, in respect to the material impressed, being made to differ, so that the electric impulse causing the impression of a letter in one of the instruments will not cause the other to print, but that the printing may be carried on in the different instruments by different impulses, substantially as specified.

5. The combination, with a telegraphic line, of a pulsating instrument for controlling a number of transmitting or receiving instru-

ments, the impulses of the transmitters or receivers occupying the intervals between the impulses of the pulsator of the line, substantially as specified.

6. The combination, with a single telegraphic line, of more than two working instruments, transmitting by different impulses and simultaneously employed, so that all may print or sound without confliction of their messages, substantially as set forth.

7. The combination, with a printing-telegraph instrument, of a sounding device, which may be operated simultaneously with the printing device, substantially as specified.

8. The combination, with a type-wheel, of a reciprocating journal-bearing so that the printing may be effected by the movement of the type-wheel itself, substantially as specified.

9. The paper-holding cylinder, constructed and revolved so that the line of printing will be around its circumference, and having a longitudinal movement for placing the positions of the lines, substantially as set forth.

10. The paper-holding cylinder, containing internally the paper to be furnished to the outside, substantially as set forth.

11. The combination of a number of paper-holders and a motor which brings each into printing position one after the other so that the printing of the instrument may be continued upon one while the message is being removed from another, substantially as specified.

12. The form-wheel *m*, or equivalent, attached to a telegraphic instrument or type-writer, substantially as specified.

13. The paper creaser or marker *g g*, or equivalent, attached to a telegraphic instrument or type-writer, substantially as and for the purpose specified.

14. The repeating circuit-closer D G, or equivalent, when made adjustable, substantially as set forth.

15. In a telegraphic instrument or type-writer, a number of operating-keys representing different letters, such keys being struck simultaneously, when combined with a device for preventing the necessity of holding the keys until the entire number of letters is produced, substantially as set forth.

MERRITT GALLY.

Witnesses:
GEO. E. BROWN,
M. CHURCH.