2 Sheets--Sheet 1.

M. GALLY.

Printing-Telegraphs.

No. 148,946. Patented March 24, 1874.

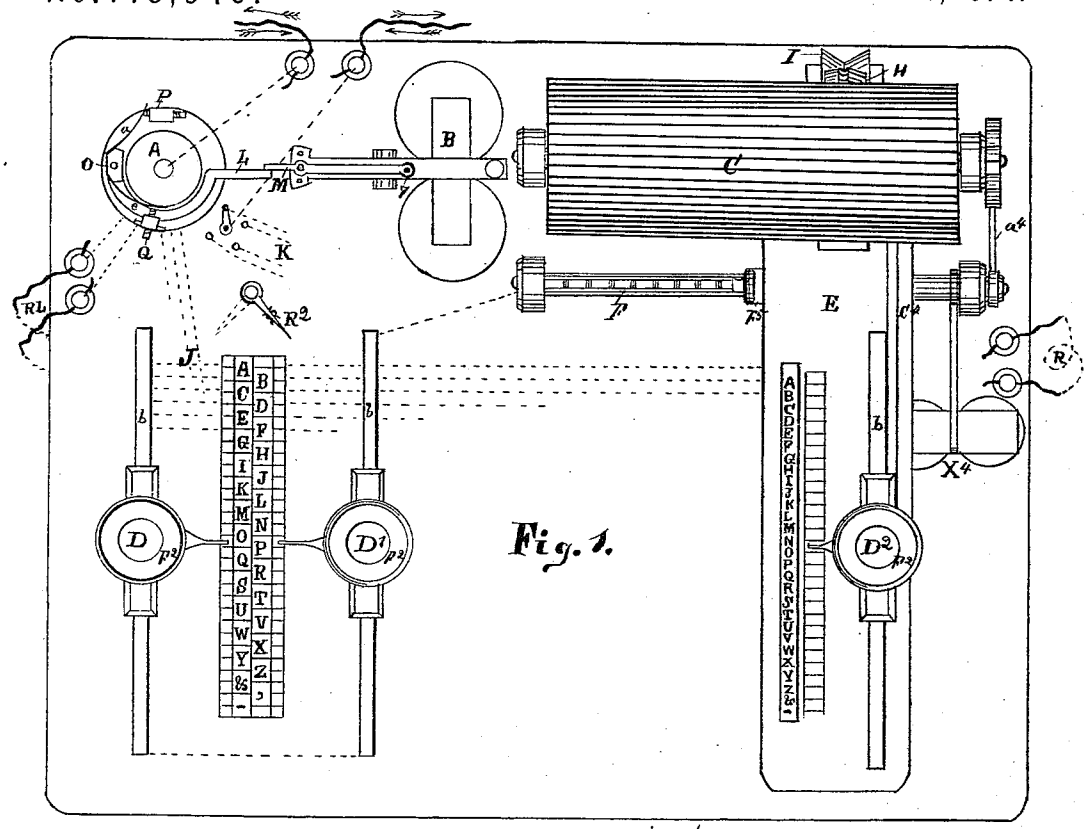

Fig. 1.

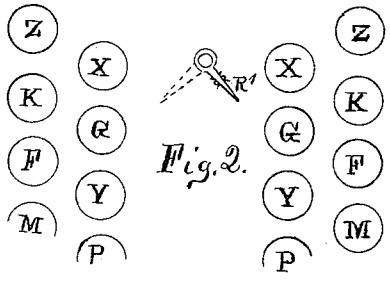

Fig. 2.

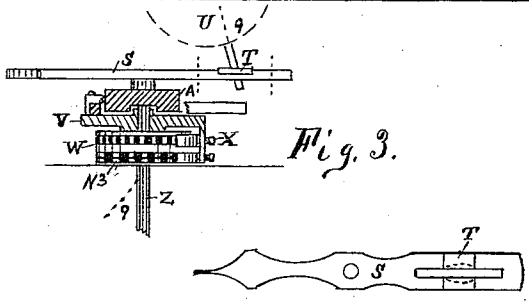

Fig. 3.

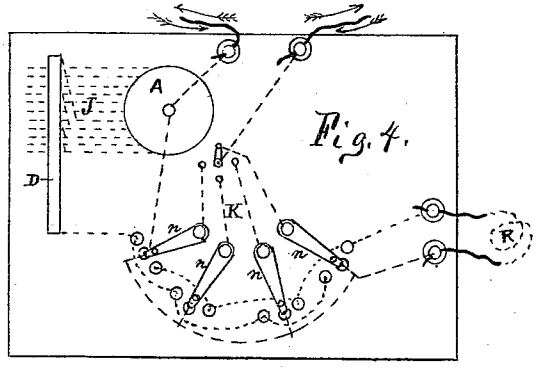

Fig. 4.

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M. GALLY.

Printing-Telegraphs.

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Fig. 5.

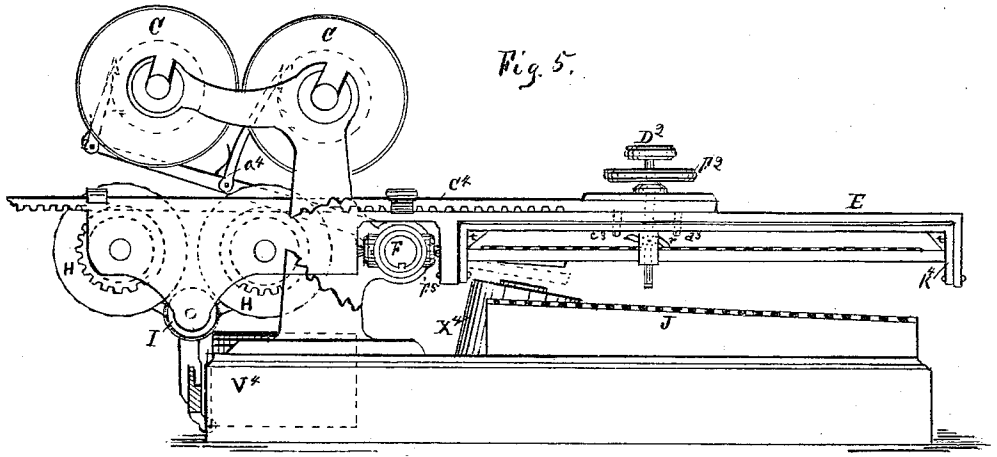


Fig. 6.

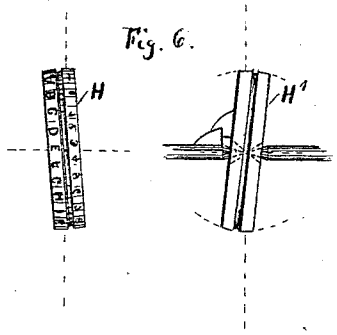


Fig. 7.

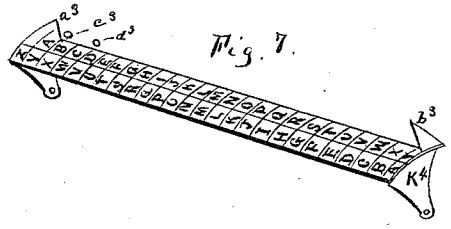


Fig. 9.

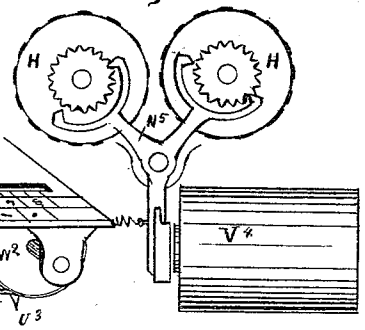


Fig. 10.

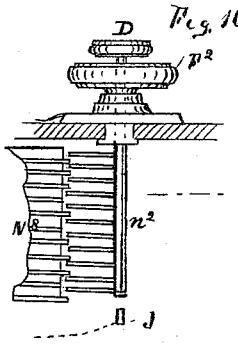
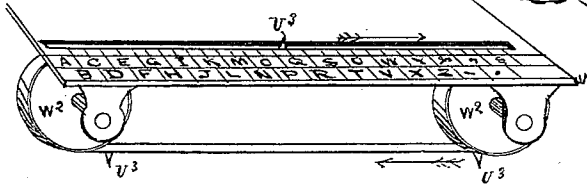
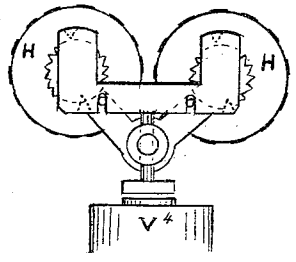


Fig. 8.





WITNESSES.

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John Hay.

INVENTOR.

Merritt Gally.

UNITED STATES PATENT OFFICE.

MERRITT GALLY, OF ROCHESTER, NEW YORK.

IMPROVEMENT IN PRINTING-TELEGRAPHS.

Specification forming part of Letters Patent No. **148,946**, dated March 24, 1874; application filed February 23, 1874.

To all whom it may concern:

Be it known that I, MERRITT GALLY, of Rochester, in Monroe county and State of New York, have invented certain new and useful Improvements in Telegraphic Apparatus; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings and to the letters of reference marked thereon.

Figure 1 is a plan of the manipulator, showing the sliding key, double-key movement for continuous manipulation, type-writing copying device, time-correcting device, and partial view of circuit for multiplex transmission. Fig. 2 shows the plan of double-key movement as applied to groups of keys representing single letters. Fig. 3 is a sectional view of the time-correcting device. Fig. 4 is a plan of circuit for multiplex transmission. Fig. 5 is a side view of the manipulator; also, showing the same modified to be used either as transmitter or receiver. Fig. 6 shows the construction of type-wheel. Fig. 7 is a perspective view of the reversible index. Fig. 8 shows the index for receiver. Fig. 9 is a side view of device for giving like movement to two type-wheels, for securing more than one copy of the received message. Fig. 10 is a view of the sliding key, with transverse section of slideway, the key furnished with connectors for producing either the Morse alphabet or printed characters.

I. Some of the difficulties experienced in the use of the dial-telegraph have been the weariness occasioned by the movement of the winch-key of the manipulator, caused not only by the constant circular movement of the hand, but its cramped positions in attempting to avoid covering the index from sight upon certain portions of the dial; also, the difficulty of constantly following the pointer or winch by the eye in their circular motion, causing not only a tiresome circular movement of the eye, but also of the entire head.

In the combined dial and printing telegraph, with dial for eye and hammer-key for hand, nearly as great difficulties arise, as the eye is not relieved, and, although the movement of the hand is improved, the operator's attention is divided between two distinct and different objects, which is difficult and tiresome.

In order to avoid the difficulties mentioned, and also to secure a simple key and index, which may be used in connection with any of the different systems of telegraphing, I furnish the manipulator with a sliding key, D D^1 D^2, Fig. 1; more fully shown in Figs. 5 and 10. The key is made to slide forward and back to any letter of the index by a short and easy fore-arm movement. The index has a very short range, is in direct line with the eye, and may be entirely viewed at a glance. Either of the keys D or D^1, Fig. 1, is used with the entire index (as will be hereinafter fully explained) for continuous manipulation, the object of placing the index in two lines being to separate the letters for more distinct vision.

The construction of the slide may be variously modified. That shown in the drawings is a simple slot, *b*, in the key-board, in which the body of the key is moved.

The construction of the key (shown in Figs. 5 and 10) makes the manipulator adapted to any of the common systems of telegraphing, and may be used for any or all, as the case may demand, and still require only a single stroke of the finger-key to produce a letter, either by sound, record, or print. Through the body of the key F^2, Fig. 5, which forms part of the slide, is a movable stem and finger-piece, D^2. This finger-piece may be depressed, and is returned by a spring, as is usually applied to keys. To the body of the key, under the slide, is pivoted a double circuit-connector, *r*, one end of which makes the connection with the several conductors in line below it in its forward movement, and acting, also, as a stop-pawl, to prevent a backward motion until the forward traverse is completed. The connector *r* is reversed upon its pivot by striking the inclined cam *t*, when a reversed movement of the slide is allowed. The manipulator is thus applied to the common dial-receiver. The index, however, is required to be reversed on the backward movement of the slide. For this purpose I make a double index, the indexes being in reverse order, as shown in Fig. 7 detached. A side view of the same is shown in working position, represented by K, Fig. 5. The double index K rocks upon pivots, as shown, the reversed alphabets alternately showing through an opening in the body of the key-board, the pins c^3 d^3 alternately striking the cams a^3 b^3,

and thus rocking the index upon its pivots. A common dial-receiver may now be read by simply stopping the key at the required letter of the manipulating index. Under the stem of the key is a line of conductors, J, for giving, by a depression of the finger-piece, a stronger pulsation, if required, at the letter for a printing-receiver, or for throwing in pulsations bebetween those of the conductor *r*.

If the instruments are operated automatically by synchronous movements, the line of conductors J may be used alone, indicating to such instruments by their position the character to be recorded.

I also place upon the stem of the finger-piece D^2 a number of spring-connectors. (Shown in detail at n^2, Fig. 10.) These connectors are made to connect with groups of the conductors N^8 in the track of the slide corresponding to the combination of dots required to form Morse letters corresponding to the letters of the index.

By a depression of the finger-piece, at any given letter, connection is made with its group of conductors, and the entire letter is thus transmitted by a single pressure. I use in connection therewith devices for holding the key fixed in position during its proper time of transmission, and preventing its being depressed at an improper time; but, being substantially similar to those of my former patents, do not require full description in this connection.

II. In using a receiver in connection with a motor, a stop usually occurs before each entire revolution of the instrument, in order to allow the operator to have struck the key of his manipulator to indicate the letter to be received; otherwise the first letters of the series in each succeeding revolution would either be lost or imperfectly manipulated.

In a former patent I describe a division of the series of characters, the parts to be alternately manipulated to avoid delay. Although giving much more time for the manipulation, and avoiding the stops, this plan restricts certain characters to certain times for manipulation.

I wish now to allow the operator all the time to perform his manipulations without confusion, thus enabling him to greatly increase the speed of his instruments. For this purpose I use a pair of single keys, or two sets of keys, when the keys are arranged in groups indicating different letters. Each key of the pair, as D D′, Fig. 1, works in connection with the entire index. The keys may alternate in their action with alternating revolutions of the instrument, and be operated alternately by single hand, or with right hand and left hand at pleasure. Sounder, printer, or recorder may be used as receiver.

The operation is as follows: For example, a printing-receiver is being used. During a single turn of the type-wheel, while it is recording the character indicated by the position of the key D of the manipulator, the key D′ is brought into position for the next revolution of the wheel, and vice versa. The motor of the manipulator connects alternately the keys at succeeding revolutions with the transmitting circuit. The pointer R^2 vibrates between the two keys, and indicates alternately which may be manipulated. Thus the operator may have all the time in which to move one or the other key for the next desired letter.

Fig. 2 shows an application of the same invention to sets of keys, the two sets being partially shown with like characters. By striking a number of keys of either group in the order they occur on the type-wheel, and being always able to work the keys of one or the other group, great speed may be attained and a large amount of matter transmitted.

III. It is often of great importance to preserve a copy of a message as actually transmitted, not only at the office where the message is received, but also at the office from which it is sent, whether it is transmitted for sounder, dial, or printer. For this purpose I furnish the sliding key with a printing-copier, as shown in Figs. 1 and 5, which preserves a printed copy or copies of the message, whatever may be the character of the transmission. In Fig. 5 the copier is shown double for preserving two copies from a single manipulation. It may be still further multiplied, as will be seen from its construction.

The cylinders C receive the paper upon which the impressions are to be made, and are turned by the pawls a^4, the line of printing being around their circumference. The body of the slideway E forms a lever, the fulcrum of which is the rock-shaft F. The type-wheels H H turn in bearings in the lever on the opposite side of the fulcrum from the slide, as shown. The type-wheels are furnished with spur-wheels which mesh into the rack C^4. This is attached to the sliding key F^2, and, as the key is slid back or forth, the letter of the index to which it is moved corresponds with the character of the type-wheels projected toward the paper-cylinders. As the finger-piece of the key D^2 is depressed the supporting-lever is also depressed, and the type-wheels are brought in contact with the paper.

I have already patented a paper-cylinder having its line of printing around its circumference, and a longitudinal movement for placing the position of the lines. The cylinders C C may be thus operated, either mechanically or by means of a magnet and escapement, as most desirable. In the drawings, however, I show the cylinders as having no longitudinal movement. In order to place the position of each succeeding line the printing mechanism is moved the distance of the width of a line upon the rock-shaft F, the binding-spring F^5 being moved a notch to the right or left for each entire line until the copy is complete. This I do either by hand, or by means of a magnetic movement, the turning of the paper-cylinder at the end of each line automatically connecting an electric circuit for that purpose, or if any portion of the

line is to be left blank the circuit is closed at the desired point by hand. The movement is not for printing lines longitudinally upon the cylinder with a movement after each impression with a necessary traverse and return of the printer the entire length of the cylinder for each line. Such mechanisms are already in use, and their defects, causing loss of time and extensive movements, are apparent without comment. With the mechanism shown in the drawings, one traverse of the printer the length of the cylinder completes an entire page without any return movements.

IV. Fig. 6 shows an improved type-wheel furnished with two lines of characters, either of which may be used at will upon the same printing-line. The type-wheel H has two faces, inclined in respect to each other, the line of the faces being both tangent to a circle struck from the center of the wheel, the plane of the circle being at right angles to the line of the wheel-shaft. By making the wheel vibrate slightly from side to side upon its centers, as shown at H^1, either line of types may be brought into printing position upon a common printing-line. Thus a large number of characters (letters numerals, &c.) may be placed upon a small wheel, which may be made to shift from line to line by a single impulse.

In using such type-wheels in the copier, Fig. 5, I vibrate the wheels from face to face by means of cross-centers in the journal-bearing at F. These cross-centers, as shown, allow the lever E to be rocked slightly from side to side, thus bringing either face of the type-wheels into line. When not employed as transmitter, the copier may be used for general type-writing, or for copying sound-messages, as received. It is also used as printing-receiver, actuated by the type-wheel magnet V^4 and printing-magnet X^4, producing two copies of the received message.

When using the instrument, not only as receiver, but also as transmitter, mechanical force is not required for printing depression, as the manipulating-key will close the circuit to the printing-magnet, and thus produce the impression. The printing-magnet X^4 may also be retained in the instrument when used merely as a type-writer, the key closing a local circuit for operating the magnet. The same or additional local circuit may be used for moving the paper-cylinder or printing mechanism at the end of each line, as the case may be.

In the use of any or all the devices of the instrument I do not wish to limit myself to telegraphic purposes, but to extend their use to all instruments, either for telegraphing or general type-writing.

The double type-wheel motor is shown in Fig. 9, the single armature being supplied with two actuating levers or arms, each propelling its wheel, as shown. Fig. 8 shows a receiving-index, in plane, for reading at sight. The receiving-motor turns the wheels W^2 W^2. These wheels carry a belt, upon which are the points U^3 U^3 U^3, which successively traverse the slot at the side of the index, stopping at the letters to be read.

V. The correcting device (for correcting the time of the movements of the instrument in order that a number may be operated synchronously) is shown in Figs. 1 and 3. A fixed hub, A, is attached to the motor-shaft, under which is a loose wheel, V. Pivoted to the disk of the wheel V, at O, is a lever, extending around the hub A to M, on the opposite side of wheel. Attached to the wheel V is the circuit friction-spring X, which either acts as a circuit-connector for the circular circuit-closer W or as a friction-propeller for type-wheel, as the case may be. Attached to the lever L, near its pivot O, is the spring *a*, which is set by means of the set-screw P. A friction-presser, *e*, attached to lever L, is made to press more or less against the hub A by the tension of the spring *a*. A set-screw, Q, is brought near to presser *e*, but not in contact. The object of the device described is to allow correction of time of the wheel V without affecting the speed of hub A, and operates as follows: The friction X is set by its screw sufficiently tense to accomplish its work. The set-screw P is then turned until the action of spring A causes the presser *e* to bind more strongly upon the hub A than the spring X upon its bearing. It will be seen that the revolution of the hub A will now carry with it the wheel V. If, however, the lever L is stopped by the magnet-lever at M, the wheel V will be stopped for the time, and, as the lever L has greater leverage upon the presser *e* than the spring *a*, the hub A will be relieved and continue its revolutions. To prevent an acceleration of the speed of the hub A, by thus relieving it of its working friction, I set the set-screw Q so that the presser *e* can be only partially relieved. I set this screw so that the remaining friction of the presser *e* will be exactly equal to that of the friction X, from which the hub A is relieved by stopping the wheel V. Thus the wheel V may be stopped and again started at any time without in the least degree affecting the speed of the motor-hub A, and the time of the circuit-closer or type-wheel be corrected. If the hub A is revolved in connection with a heavy pendulum or fly-wheel, the mechanism may be modified by making the wheel V fast to the shaft Z, and the hub A loose. In such case the stopping of the lever L will relieve the hub A, and the momentum of the pendulum or fly-wheel will carry it forward for the correction, and, as soon as the lever is set free again the mechanism will move with its usual resistance. The device, as described, forms a friction-balance escapement for preserving to the motor its usual resistance while correcting instruments as to unison.

VI. In Fig. 3 two lines of conductors are shown in the circuit-closer, represented by W and N^3. The line N^3 is double, and by its spring, which is insulated from the spring X, connections are made for a local circuit, R L,

Fig. 1. This circuit connects with the magnet which propels the type-wheel or other indicator of the receiver, and is always mechanically in unison with the main-line circuit-closer W X, although otherwise independent of it. The conductors N^3 may correspond in position upon the curve with the conductors W, or may fall between them, as the case may demand. The conductors W are for transmitting the pulsations through the main line, which are to be recorded by the receiver, and, if the receiver be a printer, they affect the impression-magnet.

VII. The instrument, as shown in plan, Fig. 1, may be used either for single or multiplex transmission. I have already patented a circuit-closer (A, with conductors) for single transmissions, in connection with sub-circuits K, Fig. 4, and switches for multiplex transmission. The improved features, however, are shown in the present drawings: First, the armature-lever M, Fig. 1, is made adjustable, so that it may be set to different positions, so that the conductors of the circuit-closers of the different instruments occupy different relative positions during their revolutions, and thus use different pulsations passed through the main line. The small lever M is made of spring material, and is pivoted at 7. A spur, near M, holds the spring-lever by being set in one of the holes of the body of the armature-lever, as shown. Different holes are for different adjustments. Second. Instead of using different switches for the transmitting, receiving, and line divisions of the circuit, I use a group of single switches, *n n n n*, Fig. 4, each having a group of three buttons, the first of each group setting its switch to the transmitter J, the second to the line, and the third to the receiver R. Fig. 4 is a complete plan of the multiplex line-circuit.

VIII. I have already patented a safety-circuit with centrifugal circuit-closer for cutting out the instrument from the main line in case of accident or irregularity. An improved form, however, is shown in Fig. 3. The slotted winch S for the pendulum U is furnished with a non-conducting guard, T, a portion of the conducting material of the winch being cut away at that point. The stem of the pendulum stands between the faces of the guard T when the motor is at its proper speed. If the motor be stopped or deranged in its movements, the changed speed of the pendulum will cause the stem to leave the guard, and it will then come in contact with the conducting material of the winch, which will close the main-line circuit 9 directly through the stem of the pendulum and shaft Z, and cut the instrument out, preventing derangement of other instruments on the line. When it is desirable to move the key back and forth without traversing the entire length of the index, the connector *r*, Fig. 5, must be set on a parallel with the line of conductors, and will not then act as a pawl. In such case the key must not be moved to either end of its track to connect with the cams *t t* or a^3 b^3. The index will then not be reversed. In cases where different kinds of instruments are used upon connecting-lines it has been necessary to repeat messages passing the junction, adding very much to the labor of transmission. To some printing-instruments, therefore, a common Morse key is added in order to communicate with a Morse operator. This, however, requires the printing-operator to understand the Morse system, and be able to manipulate a Morse key. Such addition therefore is of very little value. It is often desirable, too, that a person not acquainted with any system of telegraphing may be able to send a message to an operator using either printing, sounding, or dial receiver; as, for example, a railroad-conductor in case of accident. The value, therefore, of a manipulator with a simple key and index that may be made to transmit a message to either printer, sounder, or dial without the understanding of any system by the sender, is apparent. The two lines of letters of copying type-wheel for dial manipulator are in reversed order.

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

1. In a telegraphic manipulator or transmitter, the combination of an index and a reciprocating key, substantially as set forth.

2. The combination, with a reciprocating transmitter, of a reversible index, substantially as specified.

3. A transmitter having two keys or sets of keys, each key or set of keys representing the same characters as the other, and capable of being operated for alternate transmission, substantially as specified.

4. The combination, in a telegraphic transmitter, of varying groups of conductors, and a single key with a series of contact-points, the depression of the key at any letter of a provided index producing the proper contacts for causing the representation of that letter.

5. The combination, with a single key in a telegraphic transmitter, of varying groups of conductors for signal or code transmission, and additional sets of conductors for transmitting to dial or printing instruments, substantially as specified.

6. The combination, with a type-wheel, of rack and gear C^4 and a reciprocating key, substantially as set forth.

7. A printing mechanism having a movement for placing the position of the lines at the end of each line printed, instead of moving the material to be printed upon, substantially as specified.

8. The combination, with key D^2, or equivalent, having conductors for dot-and-dash alphabet, of a printing copier which is operated directly or indirectly by the transmitting manipulation, or in connection therewith, substantially as set forth.

9. A type-wheel with two parallel faces, either of which may be used by rocking the wheel from side to side upon its center of revolution, substantially as specified.

10. The combination, with a circuit-closer for transmitting or receiving through the main line, of the local circuit R L, which is thereby mechanically kept in unison with the transmitting pulsations, substantially as specified.

11. The combination of adjustable devices, whereby the stopping of any of the parts propelled by the motor secures a uniform tension upon the motor, and therefore a uniform velocity, substantially as specified.

12. The adjustable stop-lever M, or equivalent, substantially as and for the purpose specified.

13. The winch T, with conducting and non-conducting bearings for safety-circuit, substantially as specified.

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Witnesses:

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JOHN HAY.