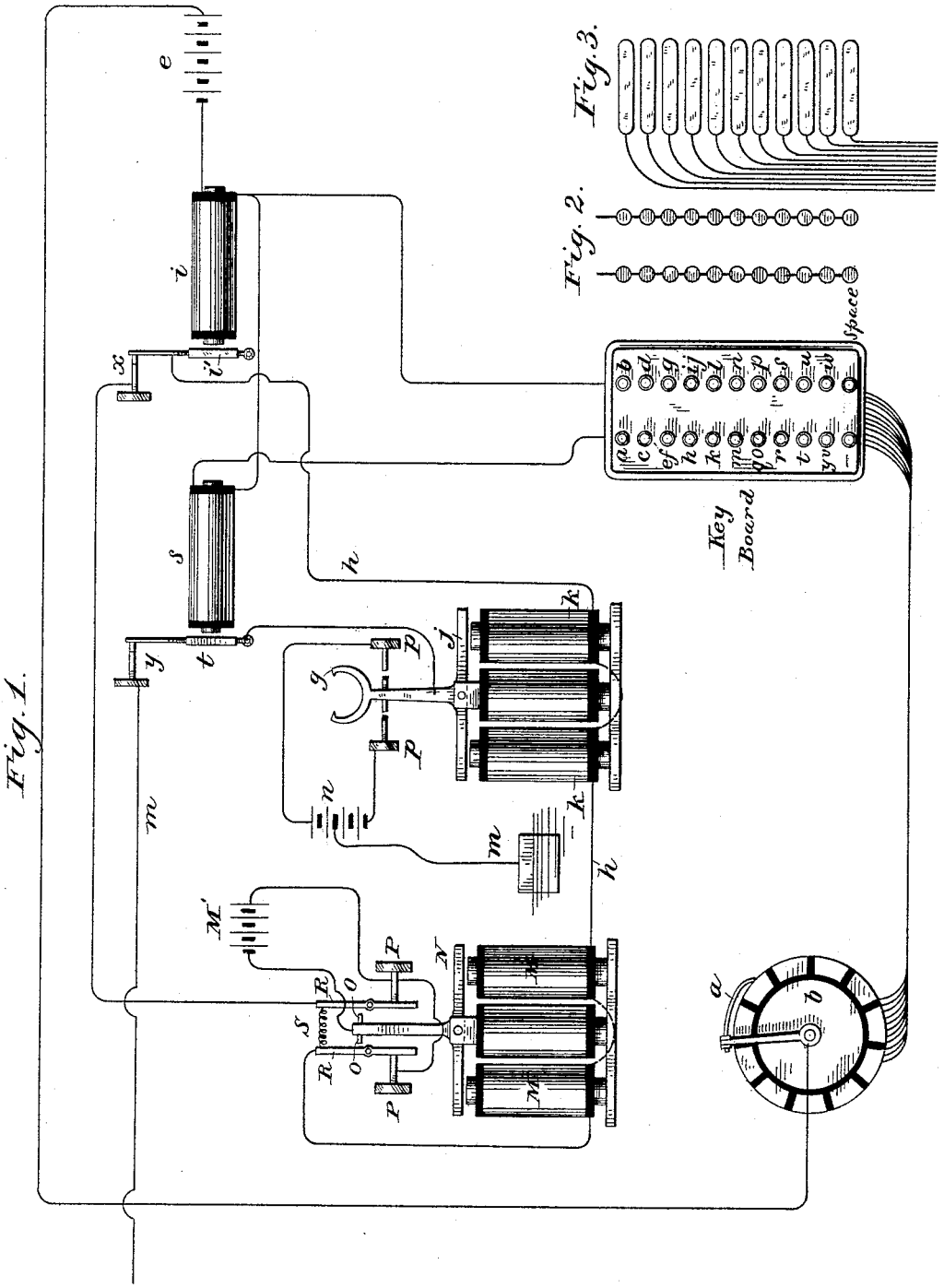
(No Model.) 3 Sheets—Sheet 1.

E. J. MALLETT.

PRINTING TELEGRAPH.

No. 384,320. Patented June 12, 1888.



Witnesses:
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H. F. Riley.

Inventor:
Edward J. Mallett.
by Marcellus Bailey,
his attorney.

N. PETERS. Photo-Lithographer, Washington, D. C.

(No Model.) 3 Sheets—Sheet 2.

E. J. MALLETT.

PRINTING TELEGRAPH.

No. 384,320. Patented June 12, 1888.

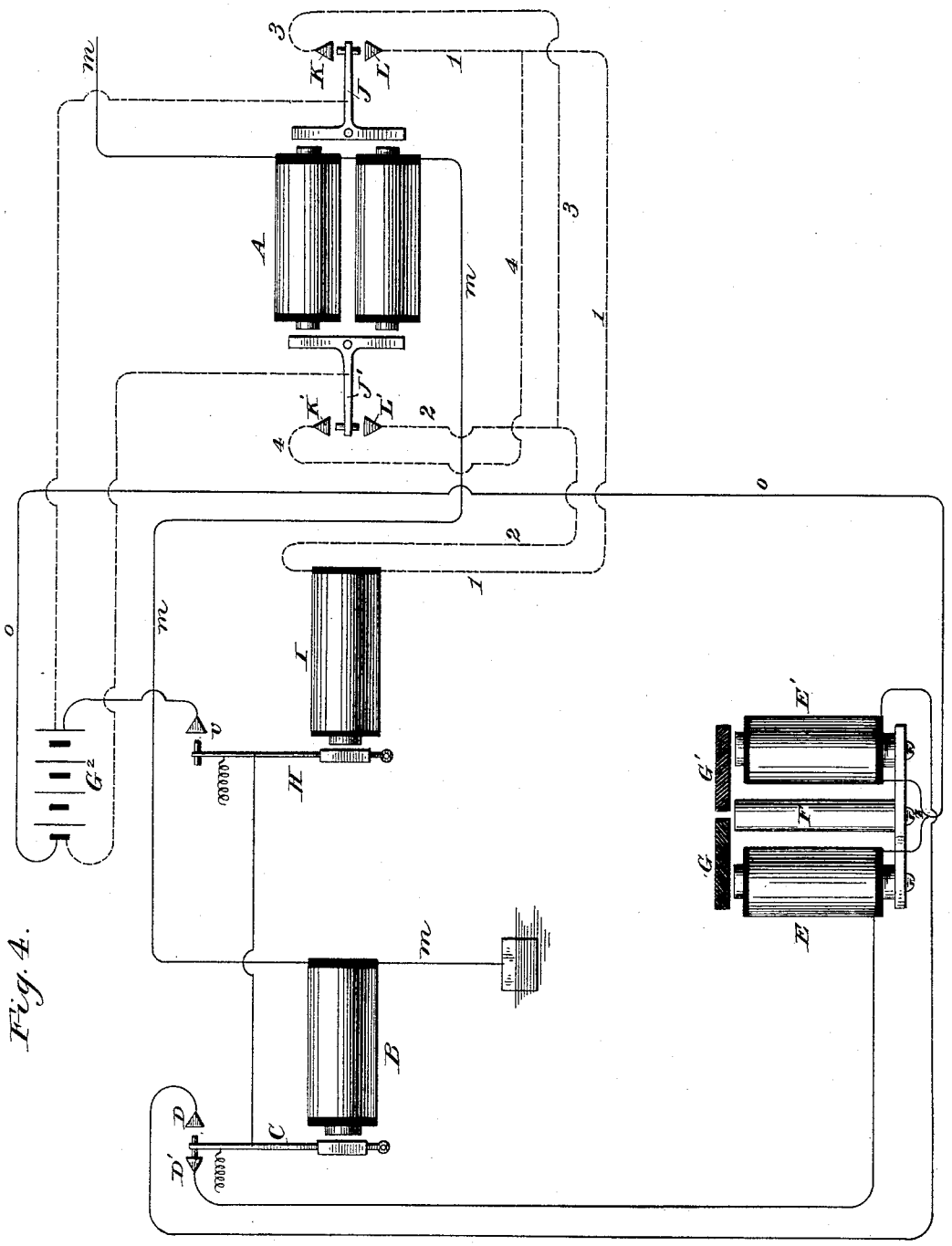

Fig. 4.

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(No Model.) 3 Sheets—Sheet 3.

E. J. MALLETT.

PRINTING TELEGRAPH.

No. 384,320. Patented June 12, 1888.

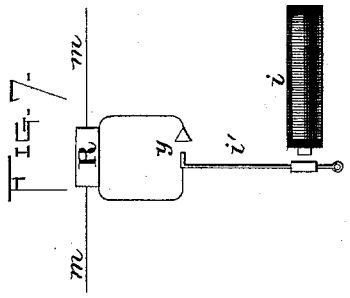

FIG. 7.

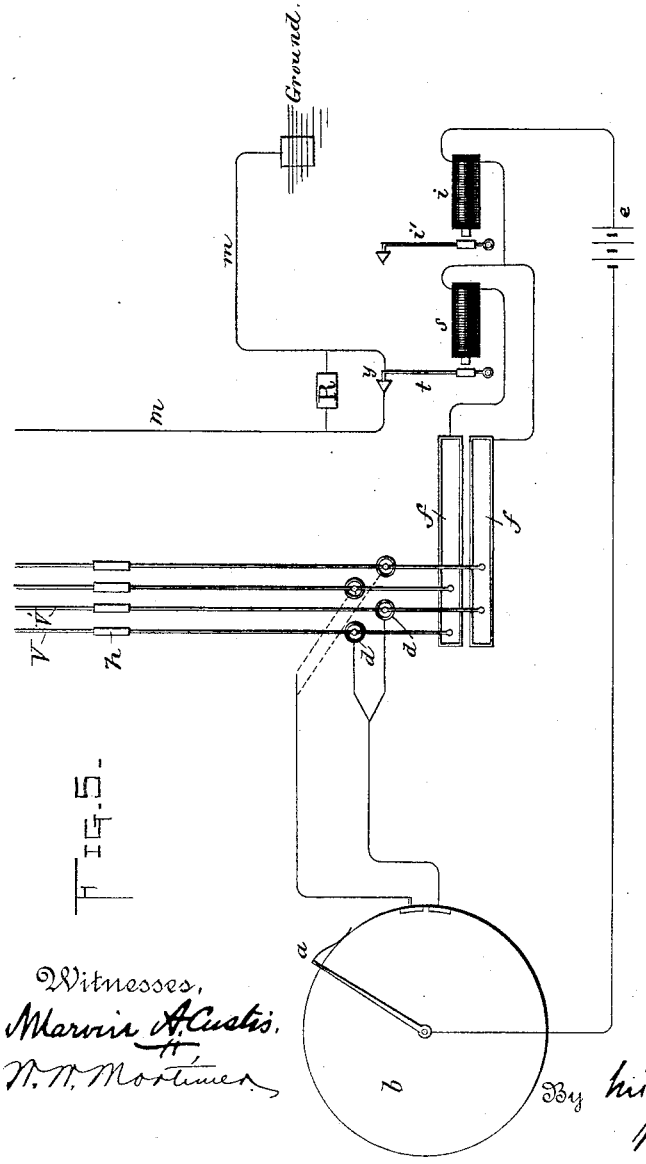

FIG. 5.

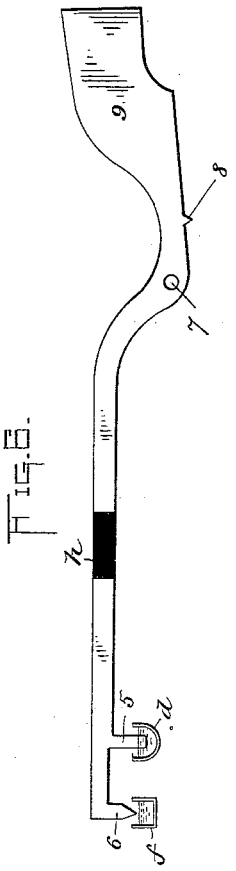

FIG. 6.

Witnesses,
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Inventor,
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UNITED STATES PATENT OFFICE.

EDWARD J. MALLETT, OF BAY SIDE, NEW YORK.

PRINTING-TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 384,320, dated June 12, 1888.

Application filed February 26, 1887. Serial No. 228,970. (No model.)

To all whom it may concern:

Be it known that I, EDWARD J. MALLETT, of Bay Side, Long Island, in the State of New York, have invented certain new and useful Improvements in Systems for Operating Printing-Telegraphs, of which the following is a specification.

This invention has mainly to do with operating the receiving-instruments, or instruments at the receiving-stations, in a printing-telegraph system; and it contemplates the use in the receiving-instrument of two type-wheels, two press-pallets—one for each wheel—and an independent magnet for each of said pallets, the condition of the line at the time reversals are stopped thereon determining which one of the two magnets shall be called into operation, and consequently which type-wheel shall be printed from.

In carrying out my present invention I avail myself of the system of circuits which is described and claimed in my application for Letters Patent filed April 30, 1886, Serial No. 200,644—that is to say, a system in which are employed a working or main circuit and a pole-changer therein, a scape-fork circuit, an automatic pole-changer and escapement operating or controlling devices included therein, and a trailer-circuit and trailer included therein, these elements being so combined that the completion of the trailer-circuit shall effect the simultaneous stoppage of the pole-changer in the main or working circuit, the trailer, the automatic pole-changer, and the escapement operating or controlling devices. To these devices I now superadd an electro-magnetic circuit-breaker for the main circuit, the electro-magnet of which circuit-breaker is included in the trailer-circuit, and is excited or not according to the position of the transmitting devices at the time reversals are interrupted in said trailer-circuit.

The transmitting-keys (which are in the trailer-circuit) are arranged in two sets or rows. When the trailer-circuit is completed through any one of the keys of one set, the magnet of the main-line-circuit breaker will be included in the circuit, and being thus energized will break the main-line circuit. When, on the other hand, the trailer-circuit is completed through any one of the other set of keys, the connections are such that the main-line circuit breaking magnet will be shunted or cut out, and consequently will be inactive. Thus when reversals are interrupted the main-line circuit will be broken or closed according to which set of transmitting-keys is being operated; in other words, the two sets of keys merely serve to determine whether the main line shall be open or closed at the time reversals cease to be thrown upon it. If, now, on the receiving-instrument there are two type-wheels abreast, one engraved with the characters represented by one set of transmitting-keys and the other with the characters represented by the other set of transmitting-keys, and if there be two press-pallets—one for each wheel—then it only remains to so arrange matters that the one press-pallet shall come up when the reversals are stopped with the line-current broken, and that the other shall come up when the reversals are stopped with the line closed. The system of circuits by which this result is attained will be described in connection with the other features of my invention first above referred to.

To enable those skilled in the art to better understand the nature of my invention, I shall now proceed to describe with more particularity the manner in which it is or may be carried into effect, by reference to the accompanying drawings, in which—

Figure 1 is a diagram illustrative of the three circuits—the trailer-circuit, the scape-fork circuit, and the main-line or working circuit and the devices included therein. The details of construction of these devices are omitted. Fig. 2 is a diagrammatic representation of the two sets or rows of keys. Fig. 3 is a like representation of the two rows or sets of stationary contacts for said keys. Fig. 4 is a diagrammatic representation of the circuits and instruments included therein at the receiving-station. Figs. 5, 6, and 7 represent, for the most part diagrammatically, modifications which will be hereinafter more particularly referred to.

In the system which I employ there is made use of at the transmitting-station a stationary segment-wheel, the segments of which are each electrically connected with its appropriate key or keys, and a revolving trailer-arm driven by some suitable motor and traveling over the face of the segments, said arm being con-

trolled in its movements by an escapement mechanism, the stoppage of which causes the stoppage of the trailer-arm.

In Fig. 1 of the drawings the revolving trailer-arm is shown at *a* and the segment wheel or disk at *b*. The shaft of the trailer is rotated by power, as usual, and on the shaft is a scape-wheel which is controlled by a scape-fork, *g*. The devices referred to in the last preceding sentence, with the exception of the scape-fork, are not shown, being well known, and the scape-fork itself is shown typically and to such extent only as needed to illustrate the circuit-connections of its actuating mechanism.

The circuit in which the trailer-arm and segment-wheel are included I term the "trailer-circuit," said circuit being from battery *e* to the trailer-arm *a*, the segment-disk *b*, the key-board, hereinafter described, back to battery.

The scape-fork *g* is oscillated by any suitable electro-magnetic devices, typified in this instance by a polarized relay, of which *k* are the magnets, and *j* is the armature carrying the scape-fork. The magnets *k* are in a circuit, *h*, which I have termed, for convenience' sake, the "scape-fork circuit," which is made and broken at *x* by the armature *i'* of an electro magnet, *i*, in the trailer-circuit. The closing of the trailer-circuit energizes this magnet, which, by attracting its armature, breaks the scape-fork circuit *h*, thus bringing to rest the devices included in this last-named circuit. The circuit *h* includes also an automatic pole-changer, by means of which the rapid reversals necessary to vibrate the scape-fork are thrown upon this circuit. This automatic pole-changer is constructed and arranged to operate as described in my application, Serial No. 183,264, filed November 19, 1885, having an electro-magnet, M, and inductively-magnetized armature N, provided with contacts O, to operate upon centrally-pivoted arms or levers R, the upper ends of which are connected by a spring, S, and the lower ends of which are intended to operate against fixed contacts P, the magnets and contact-points being in the same circuit. The arrangement is such that when the armature-lever, through one of its contacts, breaks the contact between one of the pivoted arms or levers R and its stationary contact P, contact will be made and assured between the opposite arm R and its contact P.

One pole of the battery M' is connected to the armature-tongue N. The other pole of the battery is connected to both of the fixed contacts P, the arrangement and connections being such that when the circuit *h* is closed at *x* the armature will be vibrated rapidly, thus causing the completion of the circuit alternately through opposite contact-points, and consequently throwing rapid reversals upon said circuit *h*.

The working or main-line circuit is lettered *m*, grounded, as shown, and supplied from any battery or other generator of electricity. The pole-changer, which sends reversals over this circuit, is represented as making part of the scape-fork, there being, for convenience of illustration, a split battery, *n*, in the said circuit, having its poles connected to fixed contacts *p* and its middle electrode connected to ground.

Thus far the system in its circuits and instrumentalities contained in said circuits does not materially differ in its organization and mode of operation from that described and claimed in my application, Serial No. 200,644, filed April 30, 1886, and hereinbefore referred to, except as to the arrangement of the key-board, already adverted to, and also as to the introduction at the transmitting-station of the electro-magnetic circuit-breaker into the main-line or working circuit, which will be now described.

Included in the trailer-circuit is a neutral magnet, *s*, whose armature-lever *t* controls at *y* circuit-making contact-points in the main-line or working circuit *m*. So long as the trailer-circuit is open the magnet will be inactive, the armature will rest against its back stop, and the main circuit will be closed. When, however, the trailer-circuit is closed, then the magnet *s*, unless it at that time be shunted or cut out, will be caused to attract its armature and break the main circuit. Thus when the trailer-circuit is closed the main line will be open or closed, according as the magnet *s* at the time is cut out or not. An arrangement by which the action of magnet *s* may be thus controlled upon closing of the trailer-circuit is represented in Figs. 1, 2, and 3.

The keys which typify the characters are arranged in two rows, as seen. In each row all of the keys are electrically connected. The stationary contacts for these keys are arranged, like the keys, in two rows; but, unlike the keys in each row, each contact is insulated from the other, while each contact in one row is electrically connected to the corresponding contact in the opposite row, there being thus virtually eleven stationary twin contacts, insulated the one from the other, and each large enough to operate in connection with two adjacent keys of opposite rows.

The segment disk or wheel *b* has eleven corresponding insulated segments electrically connected each to its appropriate stationary twin contact.

The circuit-connections are as follows: From — pole of battery *e* through magnet *i* to the common electrical connection of the right-hand row of keys. A branch wire leads also through magnet *s* to the left-hand row of keys; thence by way of the eleven stationary insulated twin contacts to the segment-disk *b*, each contact being connected to its appropriate segment on said disk; thence from the trailer-arm back to + pole of battery *e*. The result of this arrangement is as follows: If any key in the left-hand row be depressed, the circuit, as soon as the trailer reaches the segment connected with

the contacted key, will be completed through the magnet *i;* thence by way of the branch wire to the magnet *s;* thence to and through the contacted key, and so on. The magnet *i*, being energized, will break the scape-fork circuit, and the magnet *s*, being likewise energized, will break the main line *m*. On the other hand, by depressing any one of the right-hand row of keys, the magnet *s* will not be brought into circuit, but the current will pass directly from magnet *i* to the contacted key in the right-hand row, thence to the appropriate segment on the segment-disk, and so on. Under these conditions the magnet *i* will open the scape-fork circuit, as before; but the magnet *s* will be cut out and inert, thus leaving the main line closed.

It will be remarked by reference to the diagram that alternate letters of the alphabet are in opposite rows of keys, and that the number of letter-keys is reduced to twenty, this being occasioned by the use of compromise letters, *f* standing for either *e* or *f*, *j* standing for either *i* or *j*, *q* standing for either *o* or *q*, *v* standing for either *v* or *y*. *s* is always used for *z*, and *x* is always printed *ks*. In this way there are but eleven keys (ten letter-keys and one "space-key") in each row. The two type-wheels of the receiving-instrument should be correspondingly made.

Returning now to the system which I have just described, by reference to Fig. 1 it will be seen that when the trailer-circuit is closed the main circuit will be left open or closed, according to which row of keys is used to complete the trailer-circuit. This feature I avail of at the receiving-station in the following way, reference being had to Fig. 4 of the drawings. The main line *m*, entering the receiving-station, passes through the magnets of a polarized relay, A, and of a neutral relay B, and thence to ground. The armature of the neutral relay B is spring-retracted, and has a tongue, C, armed with contact-points which meet one or the other of the fixed contacts or stops D′ D, the said tongue, so long as reversals are thrown upon the main circuit, resting against the back stop, D′. E E′ are the two press-magnets affixed to a common yoke, to which is also affixed the central or intermediate core, F. G G′ are typical of the two independent press-pallets of the printing receiving-instrument. Each pallet operates in connection with its appropriate helix E or E′ and the central core, F, which is common to the two.

I have not deemed it necessary to represent more of the printing-instrument than that which I have shown in this figure, said instrument in its preferred form containing features of novelty which I have made the subject of Letters Patent of even date herewith. It will of course be understood that there are two type-wheels—one for each pallet—one wheel carrying the characters of the keys of the right-hand row in Fig. 1, and the other the characters of the left-hand row of said keys.

In practice I organize and arrange the parts of the printing-instrument in such manner that the two wheels shall shift together, being caused to shift so that the selected one of them shall come over the printing-pad. The pad is operated by the movement of either one of the press-pallets, and the shifting of the wheels in one direction or the other is accomplished through the instrumentality of the press-pallets. It is not necessary for me, however, to go into the details of this organization, because, as above stated, I have made it the subject of Letters Patent of even date herewith. It is sufficient to say that the magnets E E′ are included in a circuit, *o*, (which I will term the "printing-circuit,") which, starting say from — pole of battery G^2, passes to the press-magnets, branching at a point, *z*, one branch passing through magnet E′ to front stop, D, the other branch passing through magnet E to back stop, D′; thence the circuit continues through one or the other of the stops and the tongue C to + pole of battery G. Under this arrangement it will be seen that when the reversals cease with the main line *m* closed magnet B will attract its armature and the printing-circuit will be closed through the front contact, D, thus energizing press-magnet E′, and consequently causing its press-pallet to operate. On the other hand, when the reversals cease with the main line open, the printing-circuit will be through the back stop, D′, thus bringing into play the press-pallet of magnet E. Obviously under this arrangement some means must be employed to prevent either of the press-magnets from being in circuit while reversals are being thrown upon the main line. One convenient means for the purpose is shown in the drawings, whereby the printing-circuit is maintained open except at such times as printing is to be done.

The printing-circuit is interrupted at the point *v* by the spring-retracted armature-tongue H of a small neutral relay, whose magnet I is in a branch circuit from battery G^2, in which branch circuit are also included the contacts of the polarized relay A, by means of which reversals are sent through the neutral relay I, so long as reversals are upon the main line. Under these conditions the magnet I is inert and the tongue H is held away from its fixed contact, through which the printing-circuit is completed at *v*. As soon, however, as reversals cease in the main line the polarized relay A comes to rest, completing the branch circuit through one or the other of its sets of contacts, and affording a prolonged current of one polarity sufficient to energize magnet I, which consequently attracts its armature, and thus closes the circuit at *v*.

The connections of the branch circuit, which includes the magnet of the neutral relay and the contacts of the polarized relay, are as follows: One pole of the battery G^2 is connected to the tongue J of the vibratory polarized armature at one end of the magnets A. The

other pole is connected to the tongue J′ of the vibratory polarized armature at the opposite end of said magnets. Each tongue plays between a pair of stationary contacts—J between K and L, and J′ between K′ and L′. From the contact L wire 1 leads to magnet I; thence the return-wire 2 leads to stop L′. Stop K is connected by wire 3 with wire 2, and stop K′ by wire 4 with wire 1. The winding of magnets A should be such that the polarized armatures (which vibrate synchronously) should vibrate in opposite directions—that is to say, should so move that when J contacts with K, J′ shall contact with K′, &c. Under this arrangement it will be noted that when J contacts with K the circuit starting from — pole of battery G will be through J′ K′ 4 1 I 2 3 K J back to + pole of battery. When, on the other hand, the tongues move in the opposite direction, so that J contacts with L and J′ with L′, the circuit will be from — pole of battery G^2, through J′ L′ 2 I 1 L J to + pole of battery. I have described this form of polarized relay as one convenient and suitable for the purpose I have in view. I desire it to be understood, however, that I may use other forms of such relays. I also wish it to be understood that the said polarized relay which I have just described is of my invention and has been made by me the subject of an application for Letters Patent of the United States, filed February 11, 1887, Serial No. 227,305. I also remark at this point that the particular form of polarized magnet used in the automatic pole-changer and in the polarized escapement shown in Fig. 1, consisting as it does of three magnets affixed to a common yoke, the two outer ones included in the vibrating circuit, and the middle one (which is intended to be in a permanently-closed circuit) having upon its extended core an armature inductively magnetized by its pivotal connection therewith, and arranged so as to rock from pole to pole of the exterior magnet, that this form of magnet, although of my invention, is not here claimed by me, inasmuch as I have made it the subject of a separate application for Letters Patent, filed February 17, 1887, Serial No. 227,898.

The system hereinbefore described may be used in connection with the system of automatic telegraphy embraced in my Letters Patent Nos. 343,042, 343,043, and 343,044, of June 1, 1886. In substituting the automatic transmitting-levers of my said patented system for the key-board in Fig. 1 it would only be necessary to insulate one half of the needles from the other half, the needle operated by the A dot on the transmitting-card being insulated from the needle operated by the B dot on said card, and so on. Care should be also taken that dots representing consecutive letters—for example, A, B—do not occur in one line of dots—that is to say, if A is in one line, B should be in the next line, the reason for this being that inasmuch as all the needles which meet the dots in any one line are caused to contact simultaneously, then if A and B occurred in the same line the two keys or needles representing these letters would be caused to simultaneously complete their contacts, and the result under the diplex system herein described would be that the receiving-instrument would print only B and not A. Such an arrangement is indicated for the greater part diagrammatically in Figs. 5 and 6, Fig. 6 representing a side elevation of one of the needle-levers. (Shown in plan in Fig. 5.) V V′ are two of the series of insulated needle-levers, the one representing, for instance, the letter *a* and the other the letter *b*. The levers V V′ belong to different series corresponding to the two series already described with reference to the keys, &c. Each lever (see Fig. 6) is composed of two parts insulated from each other at *h*. In front of this point it has two downwardly-projecting fingers, 5 6. In rear it has its pivot-point 7, the teat 8, upon which the dot on the card acts, and the weighted rear end, 9. Each lever of each series has its individual mercury-cup, *d*, (insulated from all of the others,) into which its longer finger, 5, constantly is submerged. These cups in pairs (corresponding to the twin stationary contacts, before described) are connected, as shown, to their appropriate segment on the disk *b*. Each series of levers has its own mercury-trough *f* common to all the levers of the series, into which such of the shorter fingers, 6, dip as belong to levers, which are operated so to do by the dots on the card. These two troughs are insulated from each other, and are in branches of the trailer-circuit, as hereinbefore explained with reference to the keys. The arrangement of parts in other respects is the same as that hereinbefore described and the mode of operation also is the same.

I have described the main line-circuit controller *s* at the sending-station as entirely breaking the line-current. This, however, is not essential, because a small residuum charge may sometimes with advantage be allowed to remain in the line-circuit. This residuum should not be strong enough to affect the neutral-line relay B at the receiving-station, Fig. 4, but may be just strong enough to increase the sticking power of the armature of the polarized-line relay A. If the line-current be entirely broken, the armature of this relay has to depend entirely upon the magnetism of the "field" to hold it against the proper contacts.

The slight residuum current can be retained in a variety of ways. One simple method is to introduce between the tongue of circuit-controller *s* and its contact any desired resistance in such manner (as will be well understood by electricians) that when the armature-tongue is drawn away from its contact the result will be to throw the resistance into line instead of absolutely interrupting the circuit. Such an arrangement is shown in Fig. 5, in which the circuit-controlling magnet *s* when excited

breaks the main-line circuit at *y* and throws in a resistance, R, included in a shunt around said point *y*.

Again, instead of employing the magnet *s* to either break or weaken the line-current, it may be employed to increase the line-current, as shown in Fig. 7, in which the contacts at *y* are normally open, and the main circuit normally includes a resistance, R, which is cut out when the tongue of the circuit-controlling magnet is attracted by the latter, said tongue, when thus influenced, closing at *y* the contacts, which are in a shunt around the resistance R. This method would involve the use normally of weak reversals over the line to actuate the polar relay at the receiving-station, the normal strength of the line being insufficient to cause the magnet B to attract its armature, and the magnet *s* would be employed in such way as to act to take resistance out of the line instead of putting it in, as in the instance last given.

I desire to be understood as including in my claims all these ways of varying the condition of the line-current for the purpose I have in view.

I have shown two sets of keys or their equivalent, each consisting of eleven keys. The numbe", however, may be increased or diminished without departure from the principle of my invention. Indeed, under some circumstances I may use only two keys in all, one in each set, using the word "set" as typical of any number of keys from one onward. What is essential is that the one should merely stop the pole-changer and scape-fork, and that the other should in addition cause the main-line-circuit controller to act.

Having now described my improvements and the manner in which the same are or may be carried into effect, what I claim herein as new and of my own invention is—

1. In combination with the main-line and the trailer circuit, two sets of closing-keys or their equivalent included in branches of the trailer-circuit, and a magnet in the branch circuit of one set of keys for altering the condition of the main-line circuit, substantially as and for the purposes hereinbefore set forth.

2. The combination, at the transmitting-station, of the main-line or working circuits, its circuit-breaker and pole-changer, the scape-fork circuit and automatic pole-changer and escapement operating or controlling devices included therein, the trailer-circuit and the trailer, the two sets of keys or their equivalent, and the magnet of the main-line-circuit controller included therein, said magnet being in the branch circuit of one set of keys, these elements being combined and having the mode of operation substantially as hereinbefore set forth.

3. Two sets of keys or their equivalent each set having a common electrical connection insulated from that of the other set, in combination with separately-insulated contacts therefor, one contact of one set and one contact of the other set being electrically connected to the same segment of a sunflower-wheel or segment disk, substantially as and for the purposes hereinbefore set forth.

4. The main line, the printing-circuit, the neutral relay B, having its magnet in the main line and controlling contacts in the printing-circuit, and the two press-magnets included in branches in said printing-circuit, the connections being substantially such as hereinbefore described, so that the printing-circuit will be through one or the other of said magnets, according to the condition of the main line when reversals on it cease.

5. The main line, the printing-circuit, the neutral relay B, and the two press-magnets, in combination with a neutral relay, I, a polarized relay, A, and circuit-connections, substantially as described, whereby the printing-circuit is maintained open so long as reversals continue in the main line.

6. The magnet consisting of the spools E E′ and the intermediate bare or unwound core F, affixed to a common yoke, and two independent armatures, substantially as and for the purposes hereinbefore set forth.

In testimony whereof I have hereunto set my hand this 25th day of February, A. D. 1887.

EDWARD J. MALLETT.

Witnesses:

CHARLES TAYLOR,

C. E. MYLANDER.