(No Model.) 3 Sheets—Sheet 1.

A. B. MACKLIN.

AUTOMATIC ELECTRIC SIGNAL TRANSMITTER.

No. 584,384. Patented June 15, 1897.

Fig. 1.

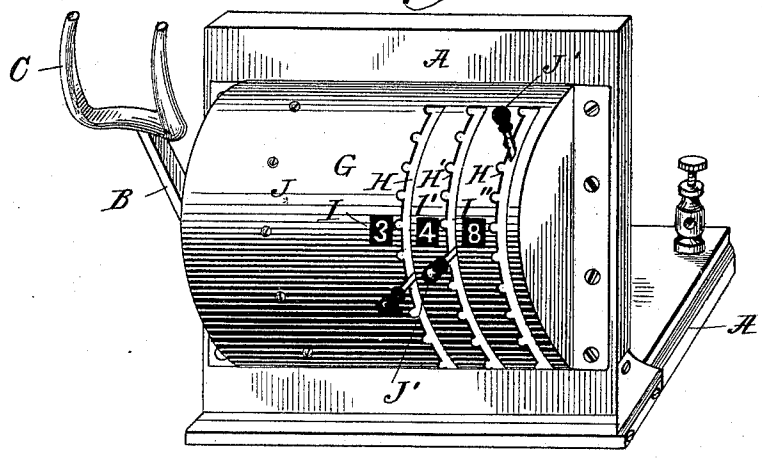


Fig. 7.

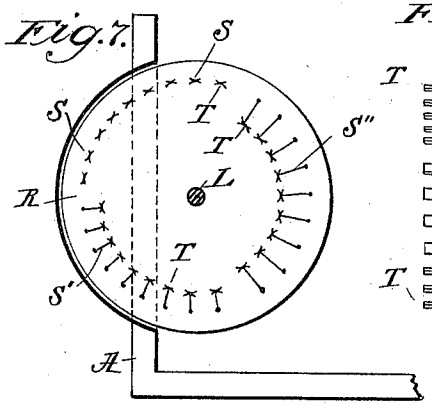


Fig. 8

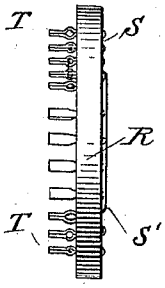


Fig. 9.

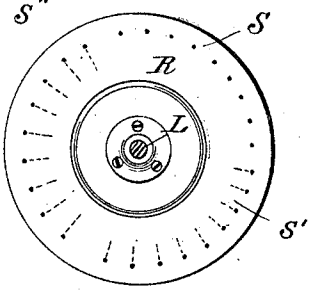


Fig 10

Fig 11.

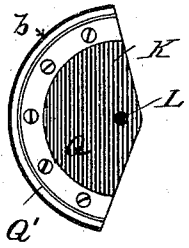


Fig. 12

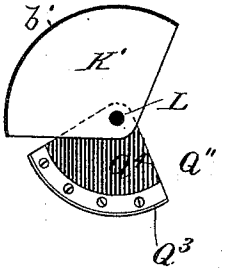
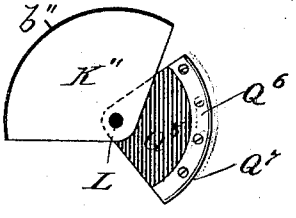


Fig. 13.



WITNESSES

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A. Bodine Morrison

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(No Model.) 3 Sheets—Sheet 2.

A. B. MACKLIN.

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Fig. 2.

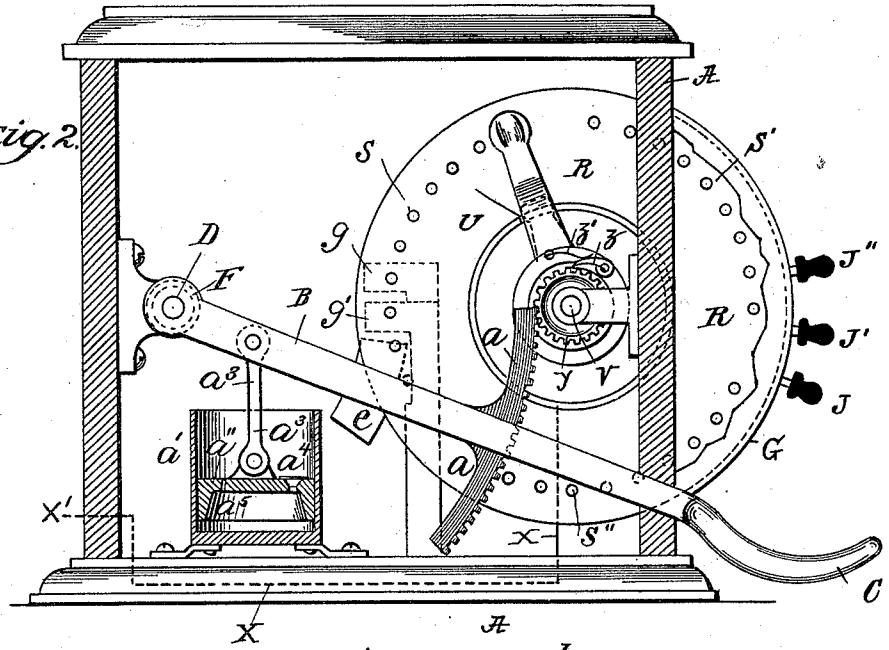

Fig. 3

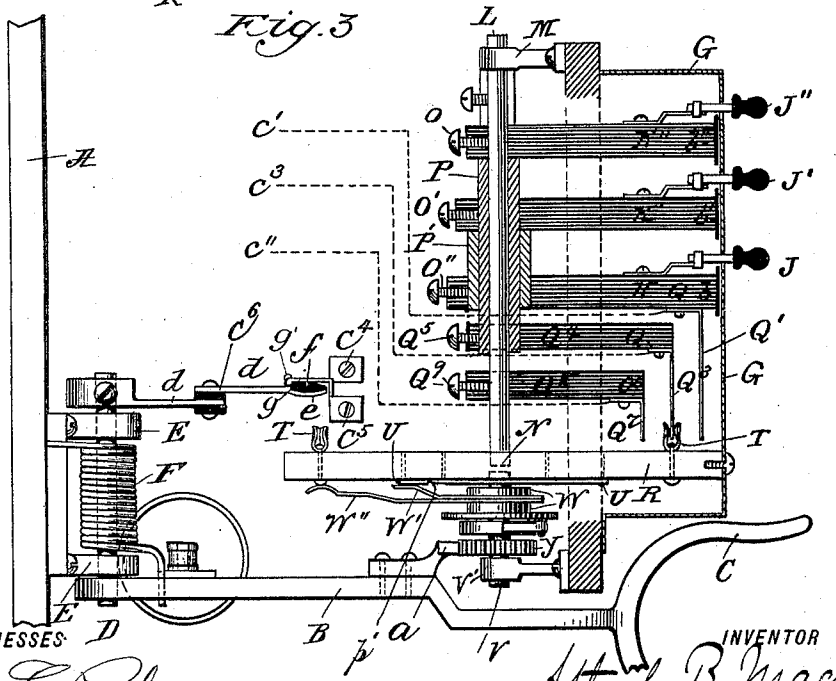

Fig. 14.

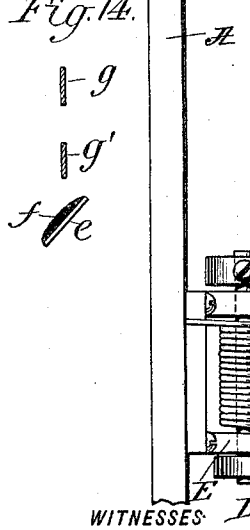

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Fig. 4.

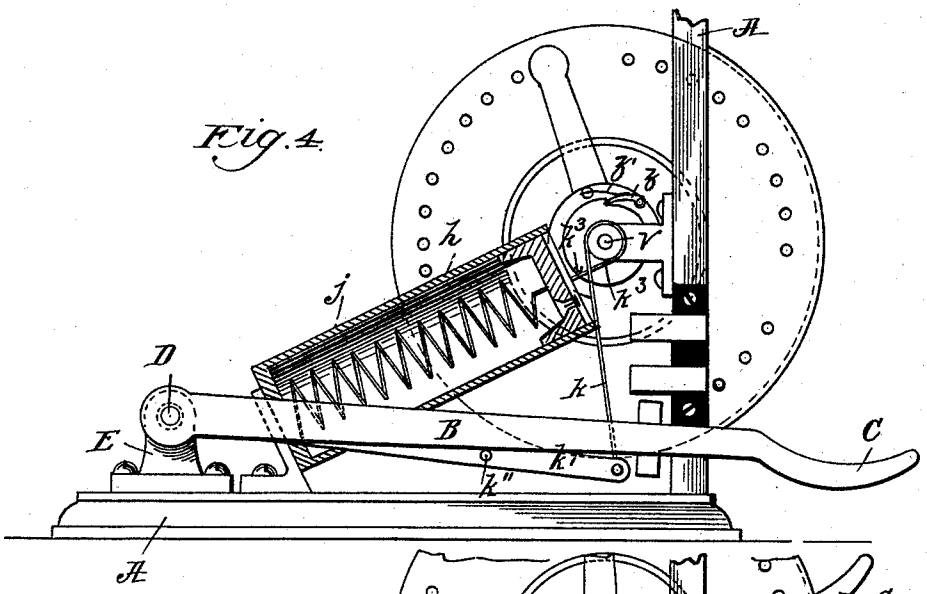


Fig. 5.

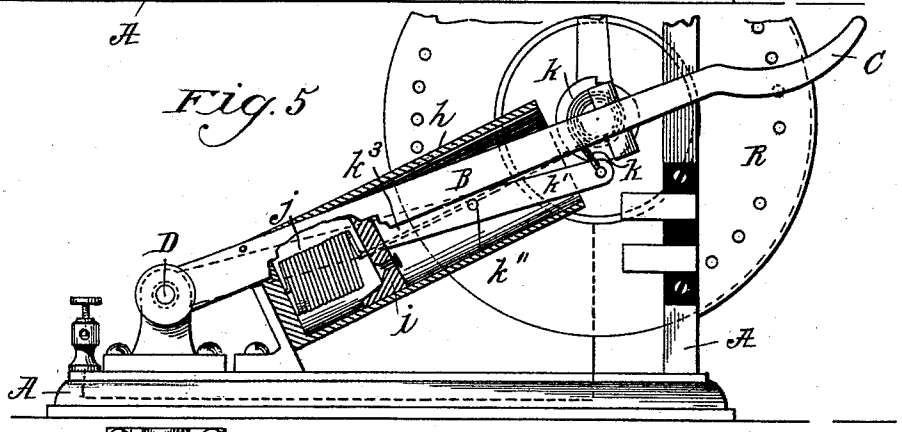
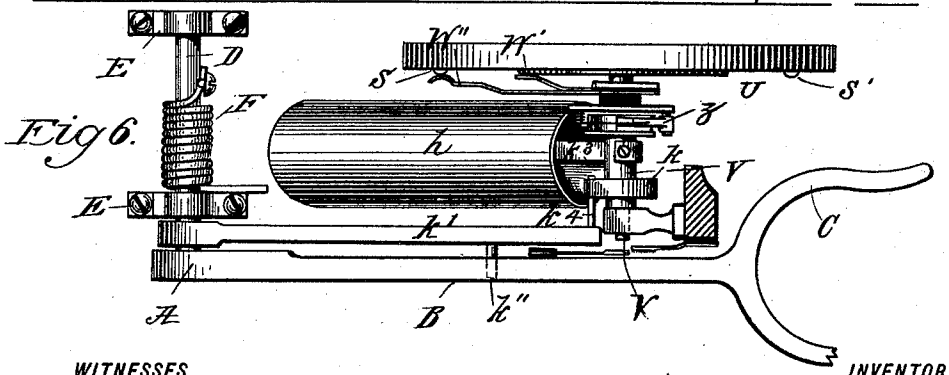


Fig 6.



WITNESSES

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UNITED STATES PATENT OFFICE.

ATHOL B. MACKLIN, OF NEW YORK, N. Y.

AUTOMATIC ELECTRIC SIGNAL-TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 584,384, dated June 15, 1897.

Application filed August 7, 1896. Serial No. 601,947. (No model.)

To all whom it may concern.

Be it known that I, ATHOL B. MACKLIN, a citizen of the Dominion of Canada, and a resident of New York, in the county of New York and State of New York, have invented a certain new and useful Automatic Electric Signal-Transmitter, of which the following is a specification.

My invention relates to automatic call devices for use in connection with telephone systems using an automatic switch or equivalent device at the central office, whereby operators thereat are dispensed with, the arrangement of the system being such that the subscribers make direct connection one with the other without the intervention of a third party.

I have described my invention as an "automatic electric signal-transmitter" because it is adapted to use for purposes other than telephone, and I do not limit myself to such use because with obvious modifications it is, as above stated, adapted to various other electrical uses, and I shall not herein describe or illustrate the electromagnet mechanism—to wit, the switch at the central office or other junction devices—because they are now well understood in this art, and also they form no special part of my invention, which resides in the improvements at the transmitting end of the system.

Heretofore in automatic transmitting systems a keyboard has been used to transmit the electrical impulses necessary to operate the automatic switch at the central office, one key usually representing hundreds, the manipulation of which sends impulses over the hundreds-wire, another key representing the tens, and still another key representing the units, each of these keys having suitable electrical connection with their appropriate wires, although in the system to which it is intended to apply this apparatus but two wires are or may be used to manipulate the central switch, the wire for the hundreds and units being the same and the tens-wire being independent, in addition to which a battery lead-wire is employed to conduct the current to the switch. Consequently heretofore a person desiring to call, say, "348" under the present system will press the hundreds key or button three times, then the tens-key four times, and then the units-key eight times, which acts will send, respectively, three electrical impulses over the hundreds-wire, four impulses over the tens-wire, and eight impulses over the units-wire, causing the appropriate magnets in the automatic central switch to respond accordingly.

It will be readily seen that great opportunity for error in sending the call exists in the system just described because of various reasons, particularly inaccuracy in count on the part of the operator; also uncertainty in the physical act of depressing the button; also failure to properly distinguish between the hundreds, the tens, and the units transmitted.

The object of this invention is to do away entirely with all possibility of error or imperfection in operation by reason of the construction and arrangement of the apparatus whereby the calling of any number within its limits is automatic and absolutely certain and at the same time provide an indicator showing to the parties sending the calls the number which they have called.

Referring to the drawings hereof, Figure 1 illustrates an elevation in perspective of the instrument as seen partially from the front. Fig. 2 illustrates a side elevation, the end of the casing toward the observer being removed. Fig. 3 illustrates a plan view, portions of the casing being removed and certain parts shifted from normal positions for the sake of clearness in the illustration. Fig. 4 illustrates a side view, partly in section and with the casing partially removed, of a modified construction. Fig. 5 illustrates a view substantially the same as that shown in Fig. 4, excepting that the hook-arm, upon which the receiver is hung ordinarily, is in its elevated instead of depressed position. Fig. 6 illustrates a plan view of that which is shown in Figs. 4 and 5. Fig. 7 illustrates a detail of the stationary contact-disk seen in side view. Fig. 8 illustrates an edge view of the contact-disk shown in Fig. 7. Fig. 9 illustrates a view of the contact-disk shown in Figs. 7 and 8 on the reverse side to that shown in Fig. 7. Fig. 10 illustrates the numbered face or edge of the contact-segments. Fig. 11 illustrates a side view of the hundreds contact-segment. Fig. 12 illustrates a side view of the tens contact-segment.

Fig. 13 illustrates a side view of the units contact-segment.

A illustrates portions of a case or box, of any suitable construction, which contains the apparatus.

B is the receiver-arm, having the usual hook C upon its end. It is mounted upon a shaft D, Fig. 2, which turns in bearings E E, and is provided with an elevating-spring F.

G is the outer case, in which are notched slots H H′ H″, opposite each of which is an opening I I′ I″.

J J′ J″ are levers which pass through the index-plate G and on the interior of the apparatus engage with contact-segments K K′ K″, respectively. (See Fig. 3.) These segments are severally mounted upon a shaft L, which is supported at one end in a suitable bearing M and at the other end at the center of the fixed contact-plate, as at N. The segment K″ is made fast upon the shaft L by means of a set-nut O. The segment K′ is fast to a sleeve P, which turns loosely upon the shaft L, the segment being fastened to the sleeve by a set-screw O′. The segment K is attached by set-screw O″ to another tubular section P′, which fits loosely over the other tubular section P, so that each of these segments can have movement independent of the other.

Q is a contact-plate attached to the contact-segment K and having the flange Q′, which is circular in form.

Q″ is another similar contact-segment for the flange Q^3, also circular in form, but having less radius than the segment Q′, for reasons to be explained. The contact-plate Q″ is attached to a segmentary-shaped block of insulating material Q^4, which is fastened in any suitable manner, as by a set-screw Q^5, to the section of tube P.

Q^6 is another contact-segment having likewise its flange Q^7, which has still less radius than either of the others. It is fastened to a segmentary-shaped block or piece Q^8, which is likewise attached to the shaft L by set-screw Q^9.

In Fig. 3 the segments and contact-flanges above described are, for the purposes of greater clearness in illustration, shown in an unusual position. They will ordinarily be arranged relative to each other more as shown in Figs. 11, 12, and 13.

R is the contact-disk, heretofore referred to. It is of insulating material and has arranged about its periphery upon its outside a series of contact-points S S′ S″. These are arranged in groups of nine, each group being separated by a distance two or three times as great as that which separates the individual contacts. (See particularly Figs. 2 and 7.) On the inside of the plate R these contacts terminate at different points radially—that is to say, the contacts S are shown having the greatest radius, those marked S′ the next, and those marked S″ having the least (see Fig. 7)—and on the inside of the contact-plate there are arranged certain spring-contacts, which I call "contact-clips," (shown at T T, Fig. 3,) and they are arranged in groups of nine, corresponding to the contacts on the outer surface of the contact-disk, and are so arranged as that the several contact-flanges Q^7, Q^8, and Q′ shall properly engage with more or less of them, depending upon their respective adjustments. In Fig. 3 the contact-flange Q^8 is shown as in engagement with one of the contact-clips T. On the front or outer side of the contact-disk R a ring of metal U is suitably attached, and from this ring a metallic wire or conductor X (see Fig. 2) is run, connecting with a binding-post, as at X′. This is the battery-wire, which conducts the current to the apparatus.

V is a shaft journaled at one end in a support V′ and at the other end journaled in the center of the contact-disk R, and upon it is arranged an insulating-hub W, which may be made in two parts, between which are clamped the spring-fingers W′ and W″. They are pressed against each other between the halves of the hub, so that the current passes from one to the other, and the finger W′ engages with the conducting-ring U, and the other longer contact-finger W″ engages in its circular course with the contact-points S, S′, and S″ (see Fig. 2) in the contact-disk R. A detent p' (see Fig. 3) engages with the spring contact-finger W′ and thus prevents accidental reverse or backward turning. On the shaft V is also placed a pinion Y, (see Figs. 2 and 3,) with which engages a pawl Z, actuated by a spring Z′. The pinion is loose upon the shaft V.

a (see Fig. 2) is a rack which is fastened, as shown, to the hook-arm B.

a' is an atmospheric dash-pot comprising a closed cylinder and a piston a'', connected by link a^3 with the hook-arm B. A valve a^4 admits air into the dash-pot, and a little opening a^5 may be made in the piston or cylinder, if desired, to allow exit for the air, if necessary. Ordinarily, however, leakage will be sufficient.

On the periphery of each of the segments K, K′, and K″ there is arranged a metallic plate, (shown at b, b', and b'', respectively,) upon the front of which are arranged figures, as shown in Fig. 10, and the arrangement is such that these several plates register with the openings l l' l'' in the front of the outer case. (See Fig. 1.)

The switch-releasing mechanism is as follows: It being only necessary to send an impulse over the units-wire and an impulse over the tens-wire, which releases the mechanism of the switch in a manner now well understood, therefore, having reference to Fig. 3, (and it being understood that c' and c'' connect with the same wire, they being, respectively, the hundreds and the units wires, which, as above stated, are operated

in circuit over the same wire, and c^3 being the tens-wire,) the two wires c' and c'' being connected to a terminal c^4, the wire c^3 being connected to a terminal c^5, the battery-wire being connected at c^6, then the switch may be released by the employment of a lever d, fast upon the shaft D, the end of which is provided with a transverse plate e, (see Fig. 2,) which is set at an angle relative to the lever d, and one side of it is covered with insulating material f. In its movement up and down this plate presses against spring contact-fingers $g\,g'$, they being continuations, respectively, of the terminals c^4 and c^5, and are set normally one above the other, and they are so arranged relative to the inclined plate e that on the upward movement of the latter its insulated side makes contact with the spring-fingers, and they are pressed laterally out of its way until it attains a position above them, they being sprung back again into their normal position, and on the downward movement of the inclined plate its lower edge, which projects laterally beyond the fingers, engages with them, so that the naked side of the plate rubs in succession over them, thus transmitting current. In other words, on the upward movement the inclination of the plate e presents its insulated side to the contact-fingers, and on the downward movement the said inclination presents the naked or non-insulated side. Devices of this character are so well known that further description is unnecessary.

The operation of the apparatus as thus far described is as follows: The normal position of the hook-arm B is that in which it is depressed by reason of the presence upon it, in the case of its application to telephones, of the receiver. Now, therefore, to call a number the handles J J′ J″ are moved so that the desired number shows through the openings l, l', and l'' in the face of the outer case. (See Fig. 1, where the number "348" appears.) The handles J, J′, and J″ are held rigidly in position by reason of their having a slight lateral spring, which causes them to engage with the notches seen in Fig. 1 at the left-hand side of each of the slots H H′ H″, through which they move. The receiving instrument is then lifted from its hook, which releases the arm B, which by reason of the tension on it of the spring F immediately rises, carrying with it the geared segment a, the teeth of which, acting upon the pinion Y, causes it, together with the spring-fingers W′ and W″, to make one complete revolution, during which the spring-finger W′ continually rests upon the metallic ring U, receiving battery-current from it, and the other spring-finger W″ in its rotary sweep engages successively each of the contact-points S, S′, and S″ on the front face of the contact-disk R and conveying an impulse through such of said points as may be in contact, respectively, with the metallic flanges Q′, Q^3, and Q^7, which, as already explained, are in contact with more or less of the spring contact-clips T on the inner face of the contact-disk R, depending upon their adjustments, respectively. Consequently the magnets or other electromagnetic apparatus at the central office are actuated by this automatic machine precisely in the same manner as it would be actuated were the said impulses respectively transmitted by the manual act of punching a contact-button the same number of times, and an important advantage results from the fact that the contact-arms or spring-fingers W′ W″ make a complete revolution and always in the same direction—to wit, that by the construction a reversed movement is impossible, which would occasion a false signaling, leading to confusion.

I have found that a spring of sufficient tension to operate the mechanism reliably acts too rapidly under certain circumstances to enable a mechanical apparatus, like a switch or an electromagnet, to respond to such rapid impulses and perform its work properly, and for that reason I employ the atmospheric dash-pot a' to control the movements of the spring contact-fingers W′ and W″, which otherwise might be too rapid.

The operation of the dash-pot is too well-known to require explanation, except to say that upon the downward movement of the hook-arm B the valve a^4 opens and permits the free passage of the air, but on its upward movement, when retardation is necessary, the movement is controlled as may be desired. Leakage will ordinarily permit the necessary passage of the air, but, if preferred, a small orifice or adjustable needle-valve, such as seen at a^5, may be provided in the piston or other suitable part.

After the call has been made and the conversation or other desired result attained, then upon hanging the receiver again upon the hook-arm B the parts are returned to their normal position, during which the switch-releasing mechanism $d\,e\,f$ performs its function, as already described.

I call particular attention to the fact that in my transmitter the contact-fingers W′ and W″, which connect the battery with the transmitting-circuits, are so actuated that they necessarily make a complete revolution before they can again come to rest, and when at rest the finger W″ is upon insulating material. By this construction I avoid the necessity of providing means to separate the metallic parts on returning the fingers to their normal initial position.

In Figs. 4, 5, and 6 I show mechanism somewhat modified from that above referred to. All the parts in this construction of the apparatus are or may be the same as above, excepting the dash-pot and the parts which actuate the spring-fingers and release the switch. In this form the dash-pot is shown at h. It is arranged at an angle and has a

spring-actuated piston i within it, which is backed up by a spring j, and a flexible band or cord k connects with a lever k', which is pivoted upon the shaft D and is provided with a stop-pin k'', so that its movement is limited by the engagement of the pin with the under side of the arm B. Another flexible band or cord k^3 connects with the piston i. The spring j is set so that it is normally a retracting-spring, and the flexible bands, cords, or belts k^3 and k are so arranged as to coil up upon the shaft V of the arm-actuating devices, and the band k is attached to the arm k^2 by an offset-pin k^4, or in any other preferred manner.

The operation is obvious and is substantially the same as above described. When the hook-arm B is in its normal depressed position, the spring j is under tension and the piston i is at the upper end of the cylinder of the dash-pot, because the downward movement of the arm B has unwound the band k from off the shaft V and has wound up upon that shaft the other band k^3. Now upon releasing the hook-arm B by the removal of the receiver the spring j acts to retract the piston and to unwind the band k^3, which causes a complete rotation of the shaft V, with the result of rotating the spring-contact arms W′ and W″ the same as before, the effect of the dash-pot being to retard the upward movement of the lever k'. In this case the spring F lifts the hook-arm B only and has no action on the lever k', which turns loosely upon the shaft D. Consequently the hook-arm B attains its elevated position prior to the time the lever k' attains its elevated position.

It will be evident to those who are familiar with this art that modifications may be made in the details of construction and still the essentials of my invention be employed. I therefore do not limit myself to such details.

I claim—

1. The combination of separately-movable contact devices, a fixed device permanently supplied with battery-current, and having separated series of contact-points, each series adapted to engage one of said movable devices, a receiver-arm, and a contact-arm actuated by movement of the receiver-arm, and adapted to connect the battery-current with said series of contact-points, for the purposes set forth.

2. The combination of separately-movable contact devices, a fixed device permanently supplied with battery-current, and having separated series of contact-points, each series adapted to engage one of said movable devices a receiver-arm, a contact-arm actuated by movement of the receiver-arm, and adapted to connect the battery-current with said series of contact-points, and means to control the movement of the said contact-arm, for the purposes set forth.

3. The combination of an index-plate, separately-movable contact devices, a fixed device permanently supplied with battery-current and having separated series of contact-points, each series adapted to engage one of said movable devices, a receiver-arm, and a contact-arm actuated by movement of the receiver-arm, and adapted to convey the battery-current to the said series of contact-points, for the purposes set forth.

4. The combination of an outer case having slots therein, separately-movable contact devices provided with arms which project through slots in the index-plate, a fixed device permanently supplied with battery-current, and having separated series of contact-points, each series adapted to engage one of said movable devices, a receiver-arm, and a contact-arm actuated by movement of the receiver-arm, and adapted to convey the battery-current to said series of contact-points, for the purposes set forth.

5. The combination of separately-movable contact devices, a fixed device permanently supplied with battery-current, and having separated series of contact-points, each series adapted to engage one of said movable devices, a receiver-arm, a contact-arm actuated by movement of the receiver-arm, and adapted to convey the battery-current to said series of contact-points, and means to release the switch upon return of the parts to their normal position, for the purposes set forth.

6. The combination in an automatic electric signal-transmitter, of separately-movable contact devices and a fixed device permanently supplied with battery-current, and having separated series of contact-points, each series adapted to engage one of said movable devices, for the purposes set forth.

7. The combination in an automatic electric signal-transmitter, of separately-movable contact devices, a device permanently supplied with battery-current and having separated series of contact-points, each series adapted to engage one of said movable devices, a receiver-arm, a contact-arm actuated by movement of the receiver-arm, adapted to convey the battery-current to said series of contact-points, and means to regulate the rapidity of movement of said contact-arm, for the purposes set forth.

8. The combination in an automatic electric signal-transmitter, of a stationary contact device permanently supplied with battery-current and having also separated series of contact devices, a movable contact-arm which engages with said stationary contact devices and is adapted to transmit the battery-current to the said separated series of contact devices, said arm being actuated by the release of the receiver-arm, and means interposed between the contact-arm and the receiver-arm, whereby the movable contact-arm is moved always in the same direction, for the purposes set forth.

9. The combination in an automatic electric signal-transmitter of a contact device permanently supplied with battery-current and having also separated series of contact devices, a shaft concentric with said first-named contact device, a rotary contact-arm mounted upon said shaft and adapted to feed the battery-current to said series of contact-points, a receiver-arm and means connecting the shaft and the receiver-arm whereby its movement rotates the shaft always in the same direction, for the purposes set forth.

Signed at New York, in the county of New York and State of New York, this 3d day of August, A. D. 1896.

ATHOL B. MACKLIN.

Witnesses:
PHILLIPS ABBOTT,
E. SIMPSON.