

(No Model.)

2 Sheets—Sheet 1.

E. E. RIES.
TELEPHONE SWITCH.

No. 567,794.

Patented Sept. 15, 1896.

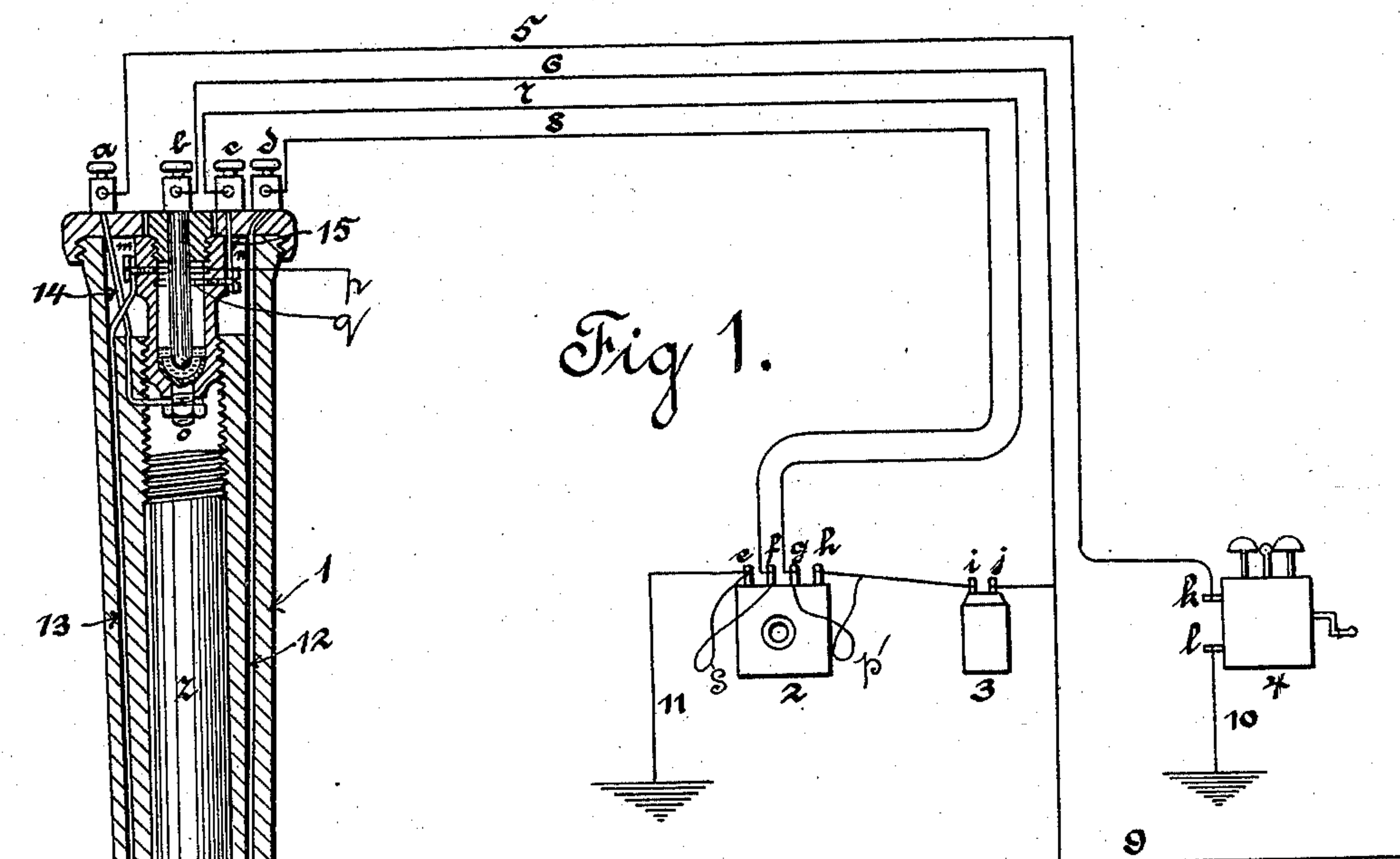


Fig 2.

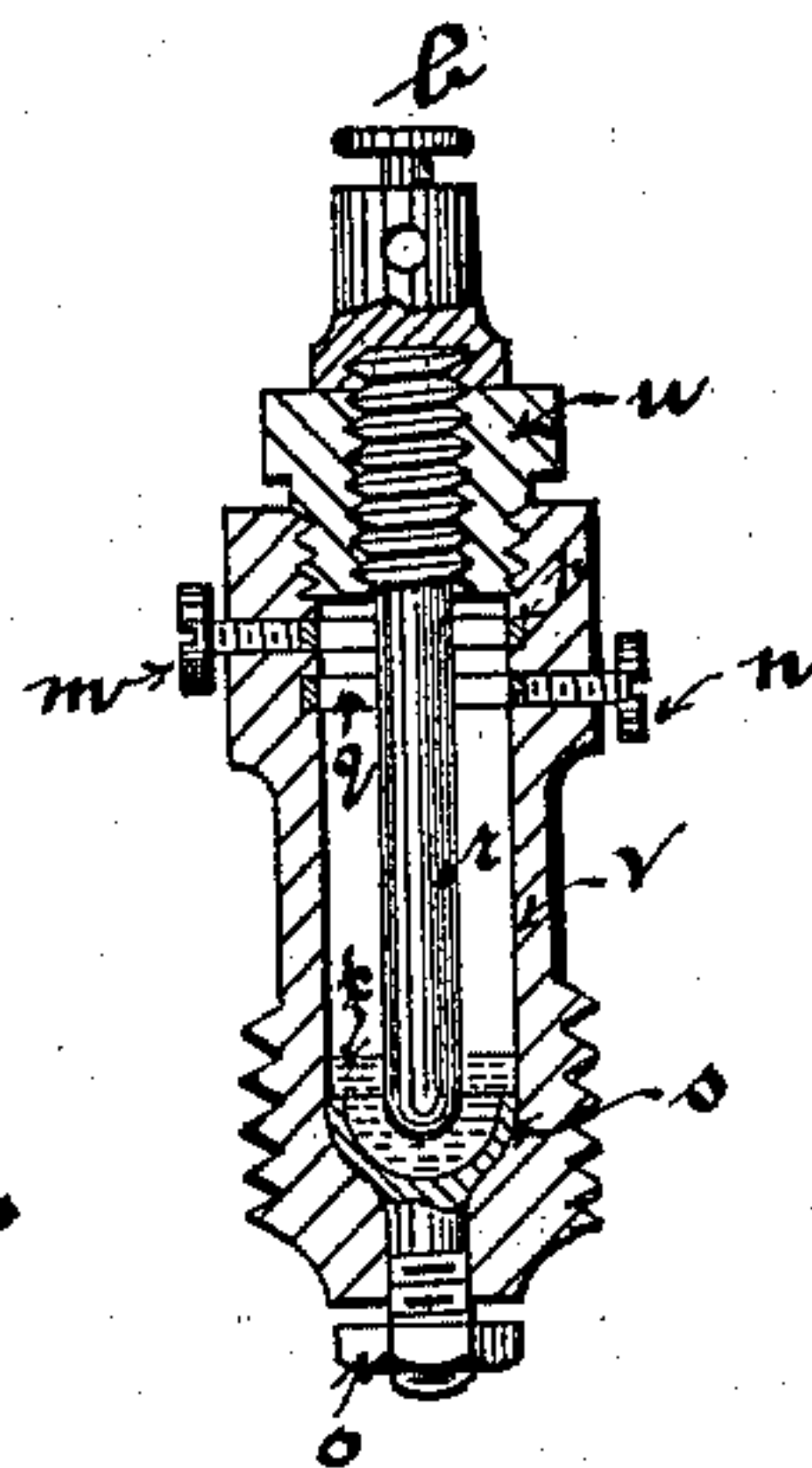


Fig 3.

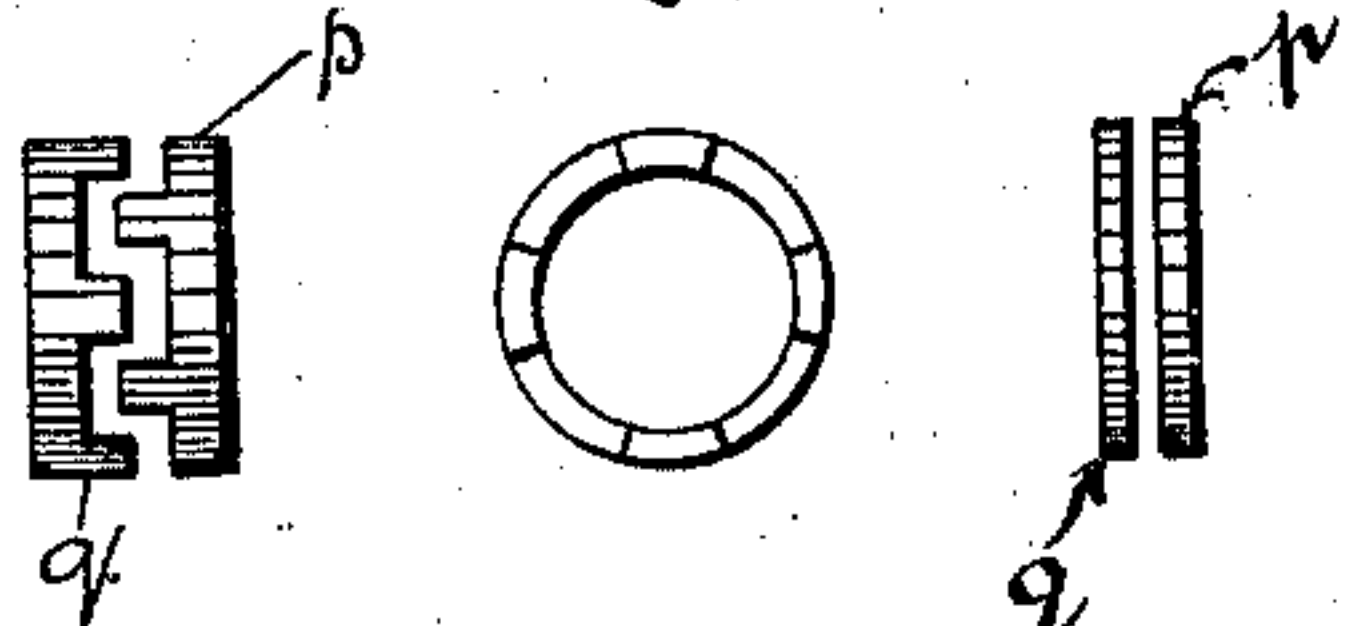
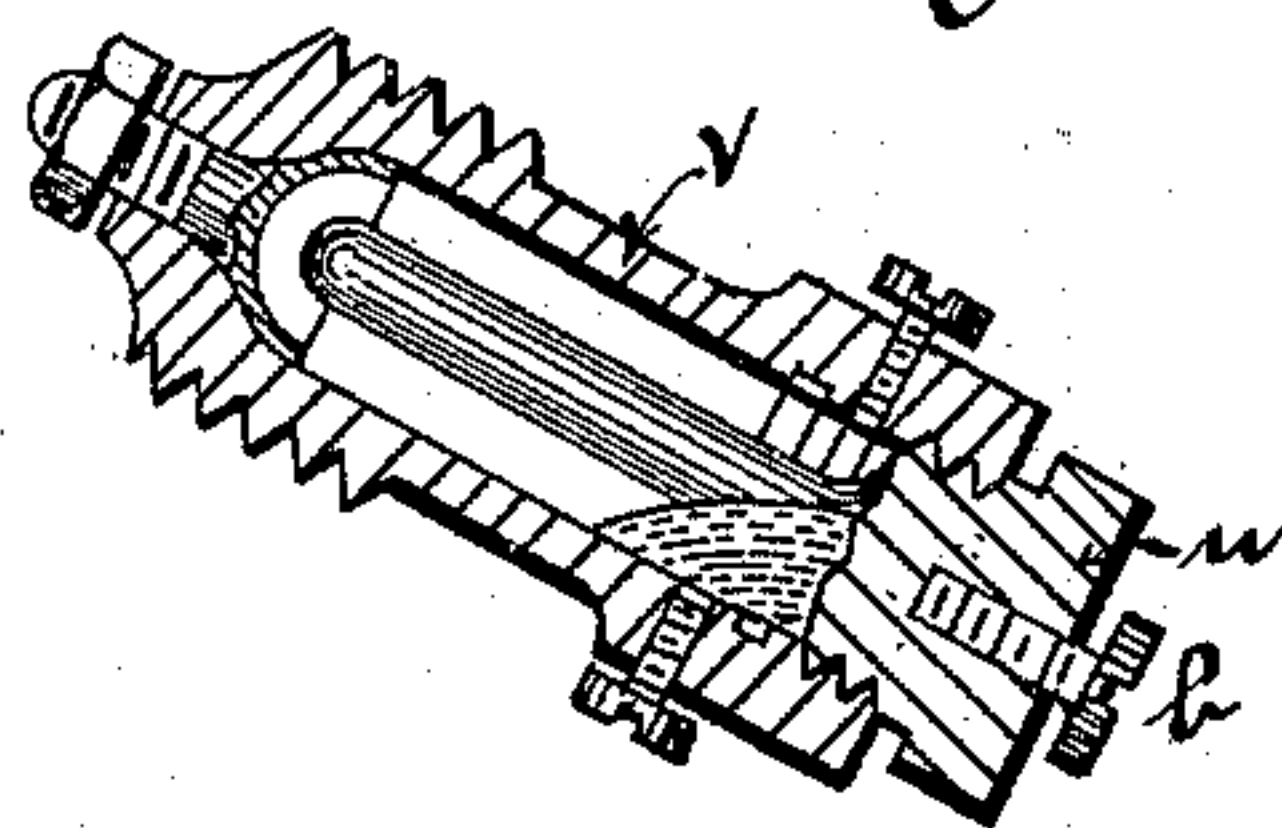


Fig 4.



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TELEPHONE SWITCH.

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Fig 4.

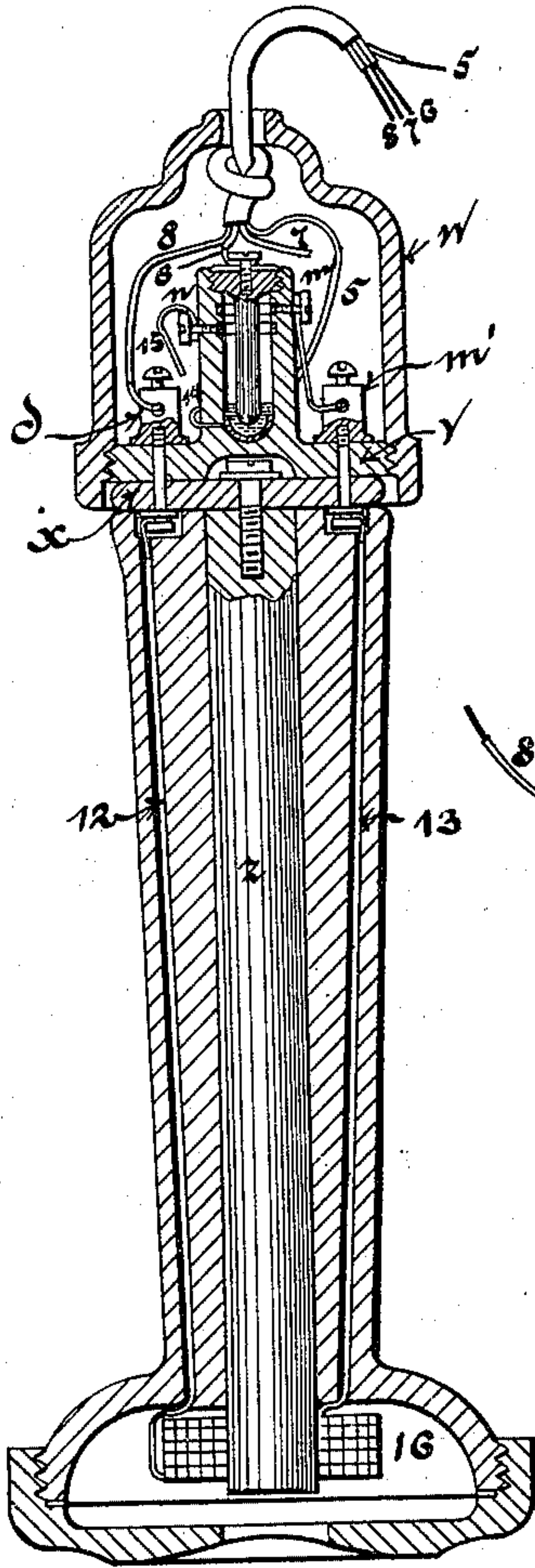


Fig 5.

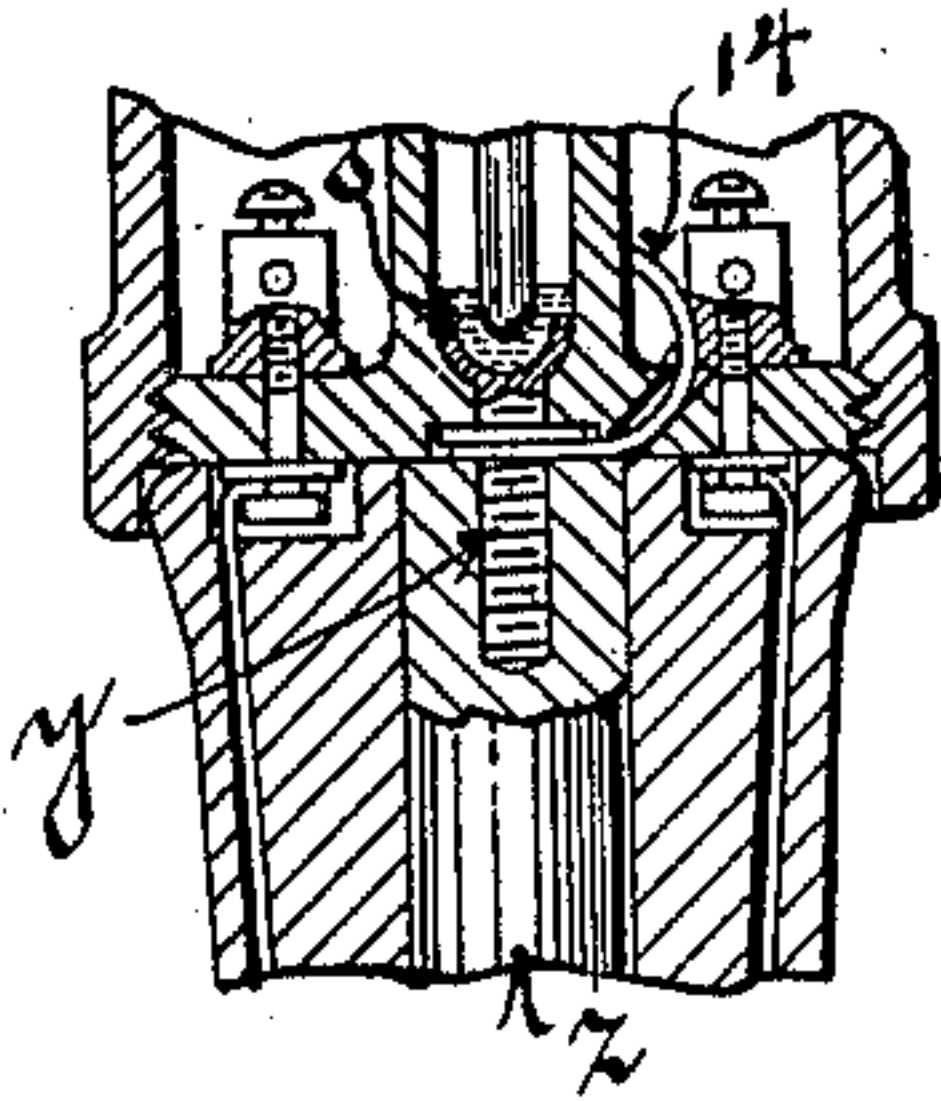


Fig 6.

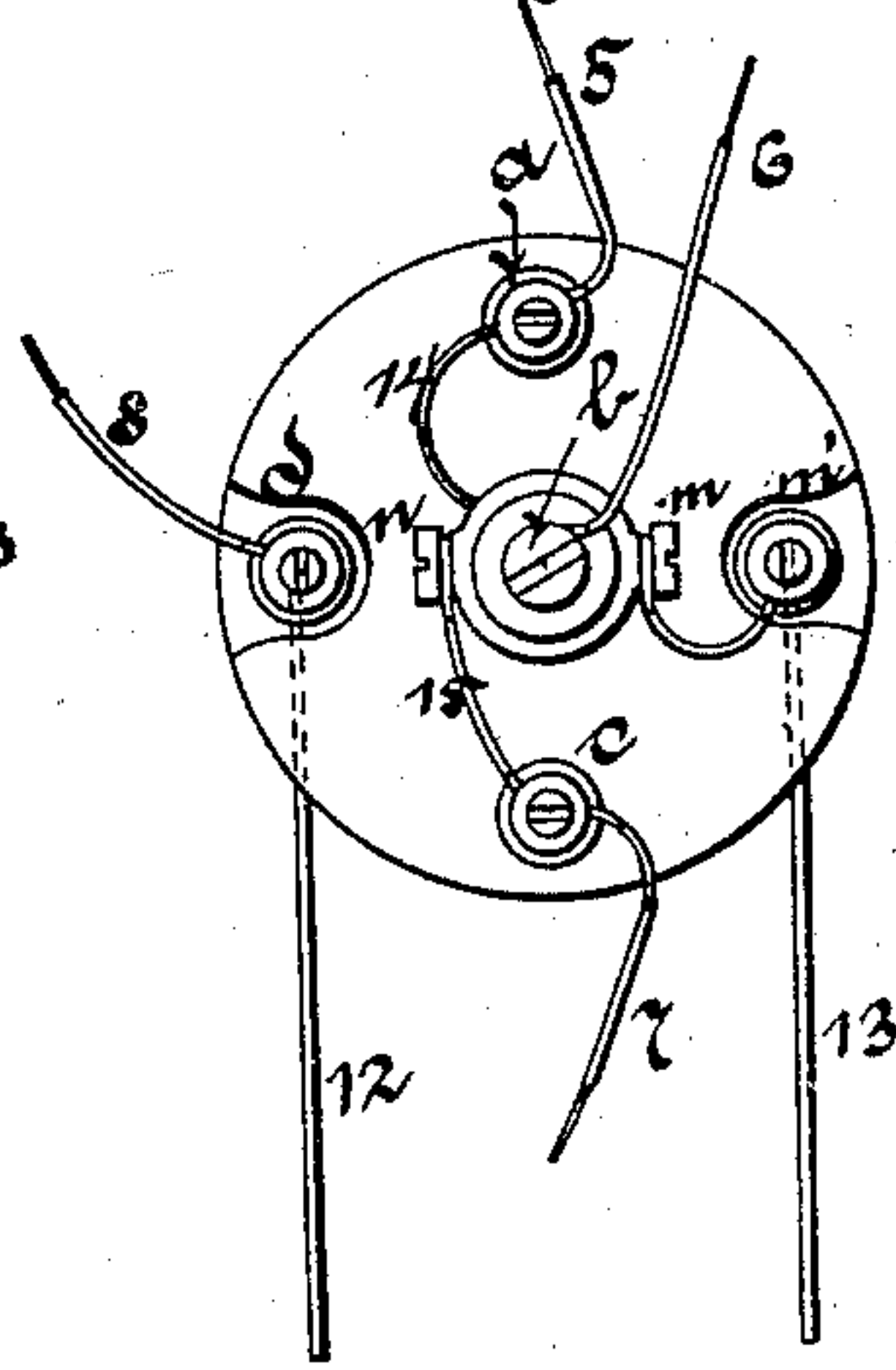
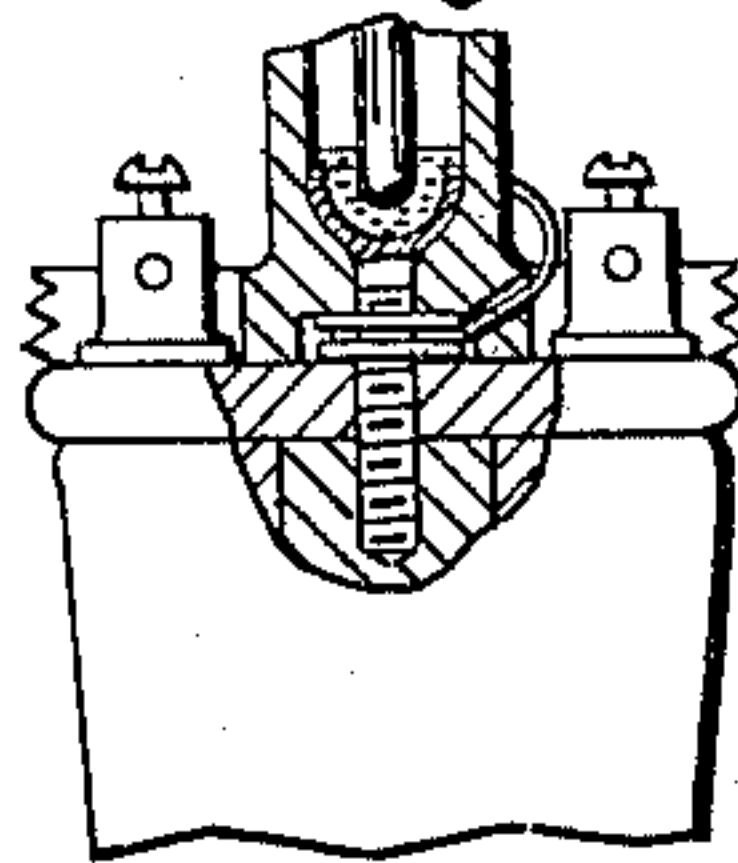


Fig 8.



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UNITED STATES PATENT OFFICE.

ELIAS E. RIES, OF BALTIMORE, MARYLAND.

TELEPHONE-SWITCH.

SPECIFICATION forming part of Letters Patent No. 567,794, dated September 15, 1896.

Application filed June 26, 1896. Serial No. 597,000. (No model.)

To all whom it may concern:

Be it known that I, ELIAS E. RIES, a citizen of the United States, and a resident of Baltimore city, in the State of Maryland, have
5 invented certain new and useful Improvements in Telephone-Switches, of which the following is a specification.

My invention relates to telephone and other switches in which the switching device consists of a number of contacts and a globule of mercury contained in a suitable case, which
10 flows from end to end of the case as the position of the switch or of the receiver containing it is altered and closes one or the other circuit, according to its position.

In the drawings, in which I have shown my invention as applied to a telephone-receiver and the circuits used in connection therewith, Figure 1 is a diagrammatic view of the circuits of a telephone, showing generator, call-bell and lines, transmitter and battery, and a receiver in vertical section, containing the automatic switching device, also in vertical section. Fig. 2 is an enlarged detail view, in
20 vertical section, of the switching device shown in Fig. 1, with some modifications of detail. Fig. 3 is an edge elevation and interior side elevation of conducting-rings. The figure also shows a modified form. Fig. 4 is a vertical section of a telephone-receiver having a switching device mounted upon its upper end. The construction of this device differs somewhat in detail, but is the same in principle as that shown in Figs. 1 and 2. Fig. 5
30 is a vertical section of a portion of the telephone-receiver and switching device, showing certain details of construction. Fig. 6 is a plan view of the top of the receiver, showing the wire connections. Fig. 7 is a vertical section of the switching device in an inverted position. Fig. 8 is an elevation of a portion of a telephone-receiver, part being in section, showing the connection of the switching device with the receiver and magnet.

Referring to Fig. 1, 1 is a telephone-receiver of the ordinary form. 2 is a transmitter, 3 a battery connected with the same, and 4 a generator and bell. The generator and bell are connected on one side by the
45 wire 5 to the post *a* of the receiver. The wire 6 is the line-wire, marked 9 at a point where it goes to line. The wire 6 is con-

nected to the binding-post *b* of the receiver. Wire 7 is connected to one side of the primary coil of the transmitter and is connected to the
55 binding-post *c* of the receiver. Wire 8 is connected to the secondary coil of the transmitter and is also connected to the binding-post *d* of the receiver. 10 is the ground-wire from the generator and bell. 11 is the ground-
60 wire from the secondary out of the receiver. *e f g h* are the binding-posts of the transmitter, the first two connected with the secondary coil, the latter two connected with the primary coil. *i j* are the binding-posts of the
65 battery, from one of which, *i*, the battery is connected to the binding-post *h* of the primary coil of the transmitter. The binding-post *j* of the battery is connected to line. The binding-post *d* of the receiver is con-
70 nected by wire 12 to the coil 16 of the telephone-receiver, and the return-wire 13 is connected to the binding-post *m* on the switching device. (Shown in enlarged side elevation and edge elevation in Fig. 3.) The binding-
75 post *m* is connected to the ring *p* in the switching device. The rings *q* and *p* are shown in side elevation and face elevation in Fig. 3. That figure shows two forms of ring, one having extended edges which interlock
80 and are designed for the more perfect contact of the mercury between them and the other form being simply plain rings. The ring *q* is connected with binding-post *n* by the wire 15, with the binding-post *c* by the wire 7 on
85 one side of the primary of the transmitter at the post *g*.

Fig. 2 is a vertical section of the contact device shown in Fig. 1, somewhat enlarged. It is also slightly different in mechanical construction. *v* is a case or thimble made of
90 non-conducting material, preferably vulcanite, threaded on its exterior at the bottom, so as to be screwed into the bore of the receiver-handle 1. This thread is of the same pitch
95 as that of the magnet *z*, also screwed into the handle. The thimble *v* is hollow on the interior and into its bottom is fitted a cup *s*, provided with a threaded stem which protrudes through a hole in the bottom of the
100 thimble and has upon it a nut *o*, which together with the end of the thimble *v* forms a binding-post. Upon this binding-post is secured the wire 14, which at its other end is secured

to the binding-post *a*, which binding-post is connected with wire 5, which connects with the call-bell generator. *u* is a plug, also of vulcanite or metal, threaded and screwed into the mouth of the thimble *v* to close it. Into the plug *u* is screwed an iron rod *r*, which protrudes through the plug, and upon its upper end is screwed the binding-post *v*. The length and thickness of the rod *r* are so adjusted relative to the size of the interior of the thimble *v* that it is at all times in contact with the mercury *t* whatever the position or inclination of the receiver may be. The rings *q* and *p* are set on the interior of the thimble below the plug *u*. *t* is the mercury by means of which the circuits are closed. The devices shown in Figs. 1 and 2 are in such a position that the ringer 4 is on the line, that is to say, wire 5 connected to binding-post *a*, wire 14, binding-post *o*, cup *s*, mercury *t* is in contact with the iron pin *r*, binding-post *b*, wire 6, and line 9. When, therefore, the apparatus is in this position, a signal may be sent out on the line or received from the line without affecting the transmitter or receiver, both of which are out of circuit, in consequence of the fact that the mercury within the thimble is not in contact with the rings *q* and *p*.

Fig. 7 shows the reverse position, which is that generally assumed in listening. The receiver has been inverted sufficiently to permit the mercury *t* to flow into the other end of the thimble and to close the rings *p* and *q*. The magneto and bell will thus be cut out and the primary and secondary of the transmitter cut in, the circuits being wire 9 6, post *b*, rings *p* and *q*, wire 13, coil 16, wire 12, post *d*, wire 8, secondary wire 11 to ground and ring *q*, wire 15, post *c*, wire 7, primary battery 3, wire 6, rod *r*, to close the circuit.

Figs. 4, 5, 6, and 8 show a modified form of structure which has more or less advantage for convenience and economy of construction. In Fig. 4 the device is shown as applied to an ordinary receiver without alterations, except that the bolts to which the binding-posts *d* and *m'* are screwed are taken out and longer ones inserted which are sufficiently long to pass through the base of the thimble *v*. In this form the thimble is made with a circular base having a thread cut upon its exterior. This thread permits a cup *n* to be secured over the whole device, so as to inclose and protect it, together with the terminal posts and connections. The connections are all the same as in the other device. In this figure, by way of modification, I have shown the rod *r* and the threaded plug or stopper *u*, Fig. 2, as well as the binding-post *b* of Fig. 1, as being formed integral of a single iron piece, which is the preferred and a more simple and convenient form. Fig. 5 shows a similar construction except that the screw by which the magnet *z* is held in place is made integral with the cups and the wire 14, which is connected to the cup, is simply looped around that screw and clamped in place when the

same is screwed down. Figs. 6 and 8 show a slightly - modified form, in which the post-flange of the thimble *v* is cut away, as shown in plan in Fig. 6, so as to admit the ordinary binding-posts of the receiver to be inserted in this indentation. To apply this structure to an ordinary telephone, it is only necessary to unscrew the tap by which the cover is held in place by the magnet, put the thimble on the top of the receiver, and screw the cup *s* into the bottom of the thimble, through the cover *x*, and into the magnet. The terminal of the wire 14 having been properly adjusted before the screw upon it is inserted, this form will permit this switch apparatus to be applied to any ordinary receiver without the slightest alterations. I prefer to make my rings *q* and *p*, rod *r*, and cup *s* of soft iron, so as to get very perfect contact between the mercury and their surfaces. I find from experience that the addition of a little graphite to the mercury, sufficient to just form a light film or coating over the surface of the globule, is an advantage in increasing the efficacy of the electrical contact. Although I prefer the use of mercury as the moving conductor, I have obtained excellent results from the employment of small-sized lead shot or globules and other finely-divided conducting matter, and I therefore do not limit myself to the employment of mercury alone for this purpose.

It will be apparent that by means of my invention a simple, cheap, practicable, and convenient means for automatically changing the circuit connections of a telephone-line in accordance to the requirements of the service is provided. A single globule of mercury running within a closed tube in contact with a central rod, according to the inclination of the receiver in the position of signaling or listening, is by my invention substituted for the more complicated exterior lever and telephone hook-switches now in general use, which have the disadvantage of requiring the removal of the receiver from the ear should it become necessary, as often occurs, to repeat a call or signal while conversation is going on.

Although I have herein shown my invention applied more particularly to a telephone-receiver, I desire it understood that the same is applicable as well to other portions of telephonic and other apparatus for electric signaling and communication, as well as to numerous other switching purposes, and I therefore do not desire to limit myself to its specific application for telephonic work, as herein shown.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a telephone or other circuit-closing switch, a non-conducting tube or thimble closed at its lower end by a metallic cup and having its mouth or upper end closed by a removable plug carrying an interiorly-projecting metallic terminal pin extending to a point below the upper edge of the metallic cup, one

or more stationary terminal contacts or rings disposed about the upper portion of the terminal pin but insulated therefrom, and a movable conductor within the tube or thimble adapted to bridge the space between the pin and cup in one position of the switch and that between the pin and upper contact or contacts in the other position of the switch, substantially as described.

2. In a telephone system, the combination with the telephone-receiver, of an automatic switch or circuit-changing device comprising a non-conducting tube or thimble having a terminal cup and terminal rings at opposite extremities, a metallic conducting-pin projecting into said thimble in line with the longitudinal axis thereof and arranged to be connected to the line-wire, and a movable conductor, such as mercury, within the tube or thimble, adapted to establish connection between the pin and cup when the receiver is in its normal or calling position, and to break this connection and to establish contact between the pin and the rings when the receiver is held in position for conversation or listening.

3. In a telephone system, the combination, with the receiver and its circuit connections, of an automatic gravity-switch consisting of a fixed tube or thimble secured to or forming part of the body of the receiver in line with its longitudinal axis and carrying upper and lower stationary terminal contacts, a removable plug for said tube or thimble carrying a single contact-terminal adapted to project into said thimble in operative proximity to the said stationary contacts when the tube or thimble is closed by said plug, and a movable conductor within the thimble adapted to make and break electrical connection between the removable terminal and the upper and lower stationary terminals, respectively, in accordance with the manipulation of the receiver in the acts of listening and signaling or its position while in service.

4. In combination with a telephone-receiver, an automatic gravity-switch apparatus forming part of the same or independently secured thereto, and comprising a cylindrical chamber of hard rubber or other insulating material containing one or more fixed contact rings or terminals at or near its opposite inner ends, a threaded plug for closing the mouth of the chamber and having a terminal screw and contact-pin, the latter adapted to

enter the chamber to a point near its lower end, a movable conductor, such as mercury or its equivalent, confined within the chamber, and circuit connections, substantially as shown, between the said switch-contacts and the receiving, transmitting and signaling apparatus in connection with which said receiver and switch is used, substantially as described.

5. An automatic gravity-switch device for telephone-receivers, the same consisting of a combined base-piece and thimble of hard rubber or other insulating material, said base-piece being adapted to fit and be secured to the terminal-post end of a telephone-receiver, and said thimble projecting rearwardly or outwardly therefrom and containing the switching apparatus, supplemental binding-posts attached to the switch device and electrical connections between the switch-terminals and the main and supplemental binding-posts, substantially as described.

6. In combination with a telephone-receiver, an automatic switch having a slotted base or support adapted to straddle the binding-posts of the receiver, means, substantially as shown, for securing the base to said receiver, a switching-chamber and a movable conductor within the same adapted to be operated by gravity, supplemental binding-posts on the switch base or support, and a protective cover or hood for the various binding-posts removably secured to the said switch-base and having an opening for the passage of the conducting-cord, substantially as described.

7. In combination with a telephone-receiver, an automatic gravity-switch apparatus forming part of the same or independently secured thereto, a series of binding-posts attached to said receiver or switch or both, and forming the exterior connections for the receiver and switch-terminals, a protective cover or hood for inclosing and covering said binding-posts, means, substantially as shown for removably securing said hood to the telephone-receiver or switch apparatus, and an opening or sleeve in said hood to permit the passage of the conductor or conducting-cord, substantially as described.

Signed at Baltimore city, in the State of Maryland, this 25th day of June, A. D. 1896.

ELIAS E. RIES.

Witnesses:

JOHN L. HEBB,
M. G. STEUART.