(No Model.)

2 Sheets—Sheet 1.

E. P. TRAYER & G. H. KUGLER.

TELEPHONE SYSTEM.

No. 377,788. Patented Feb. 14, 1888.

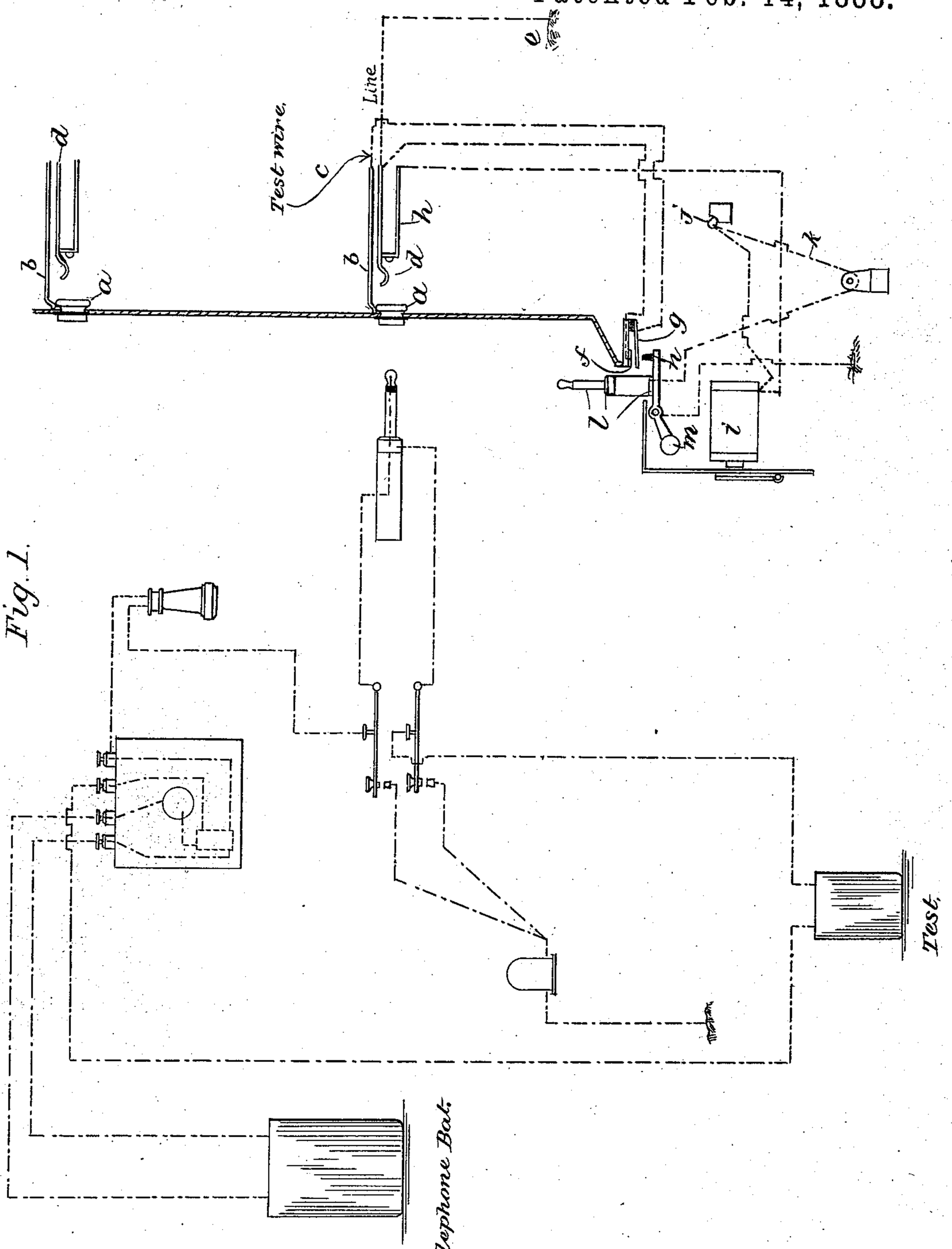

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

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TELEPHONE SYSTEM.

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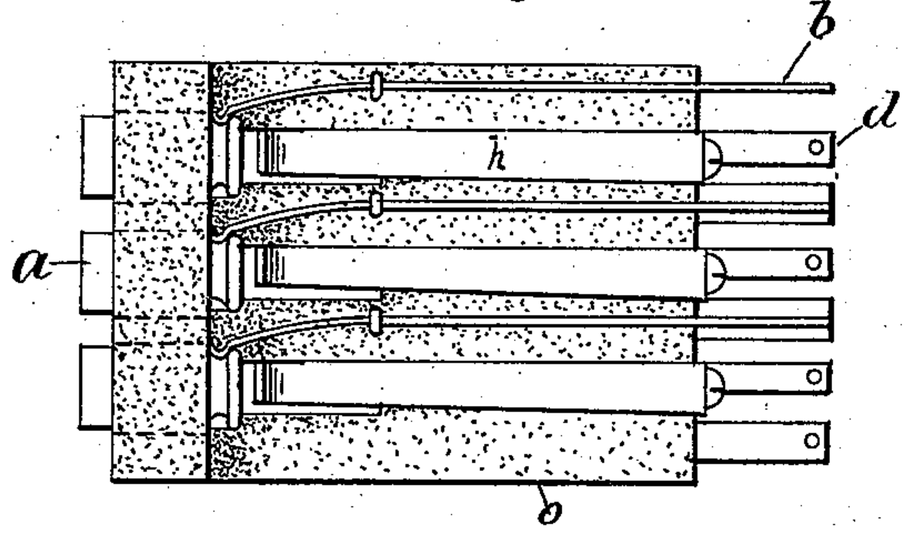
Fig. 2.



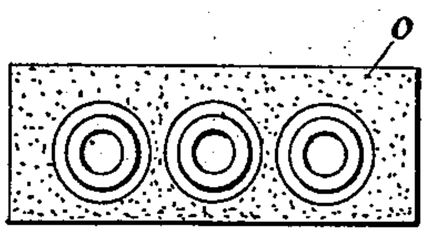


Fig. 5.

Fig. 3.

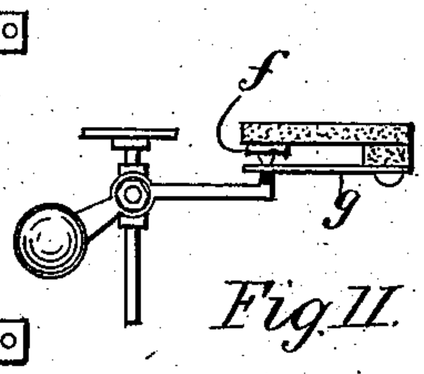
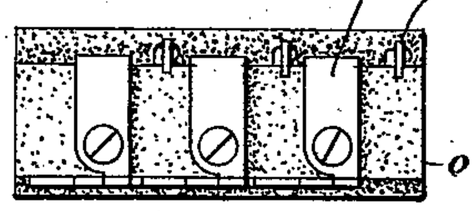


Fig. 11.

Fig. 6.



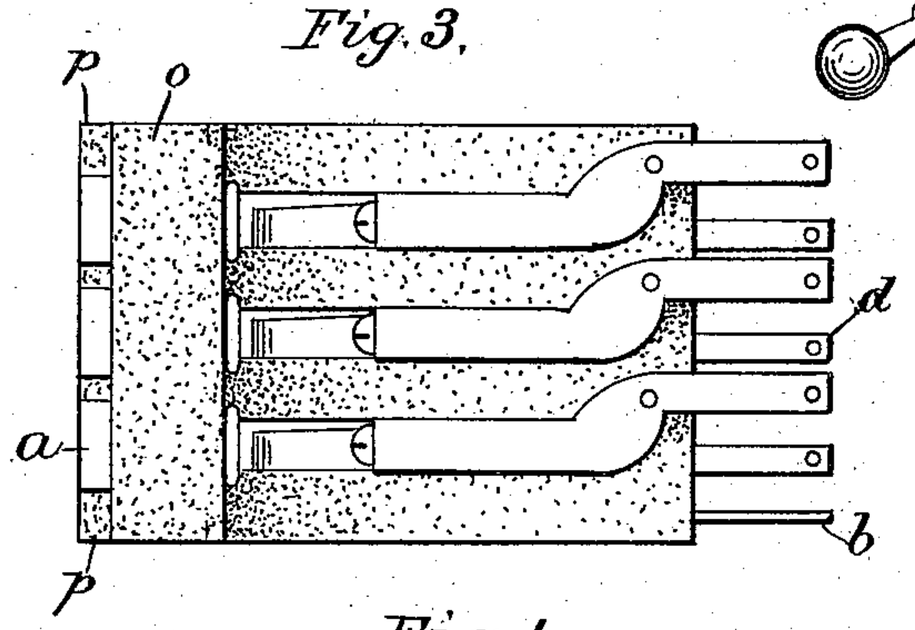


Fig. 4.

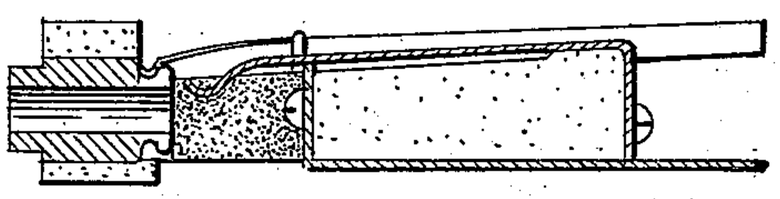


Fig. 7.

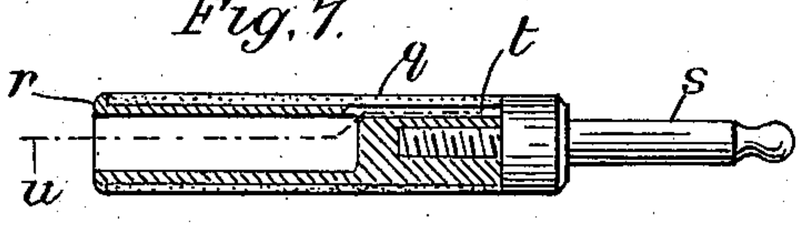


Fig. 8.

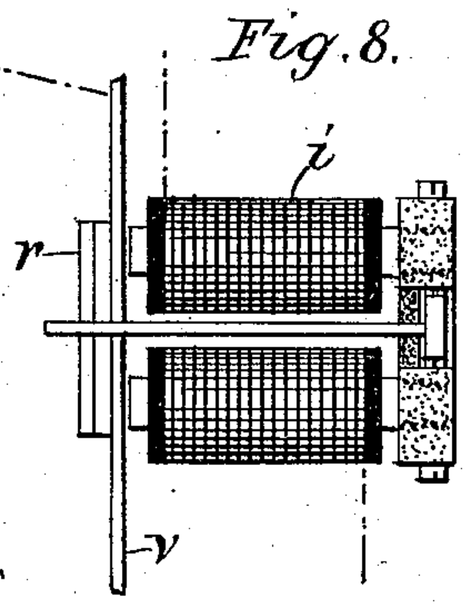


Fig. 9.

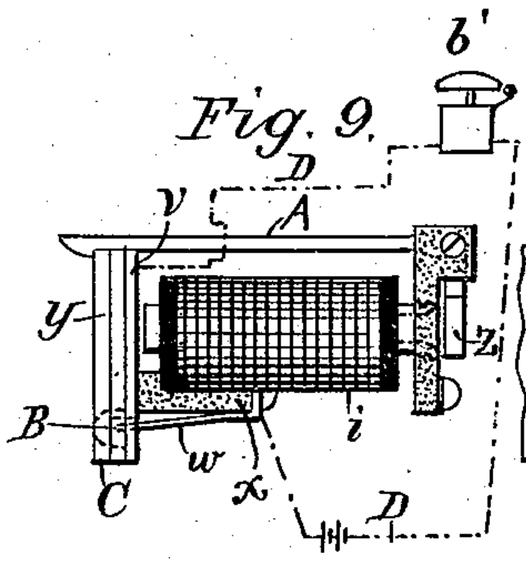
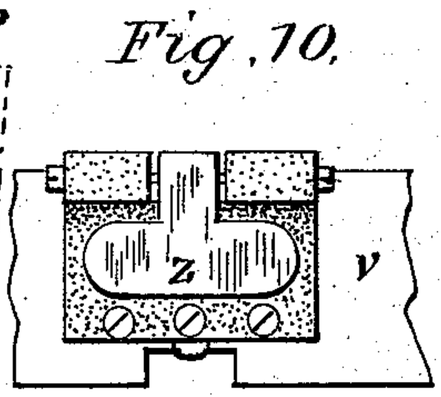


Fig. 10.



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UNITED STATES PATENT OFFICE.

EDWARD P. TRAYER AND GEORGE H. KUGLER, OF NEW YORK, N. Y.

TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 377,788, dated February 14, 1888.

Application filed March 17, 1887. Serial No. 231,237. (No model.)

To all whom it may concern:

Be it known that we, EDWARD P. TRAYER and GEORGE H. KUGLER, citizens of the United States, and residents of New York, county and State of New York, have invented certain new and useful Improvements in Telephone Systems, of which the following is a specification.

The invention relates to improvements in telephone systems whereby the number of movements of the operator is diminished and the construction of parts of the apparatus at the central station is simplified and made more efficient.

The invention is explained by reference to the accompanying drawings.

Figure 1 shows the operator's telephonic apparatus, batteries, and keys, also the operator's plug for connecting the above apparatus with any sub-station. Each operator's plug is connected in circuit exactly as shown in Fig. 1, so that it will be unnecessary to show more than one such plug. In this figure, also, at the right are shown the electrical connections between one sub-station and the subscriber's plug, annunciator, and test-wire located at the central station. Figs. 2, 3, 4, 5, and 6 are different views (Fig. 4 alone is shown in section) of three spring-jacks. Fig. 7 is a view, partly in section, of the subscriber's plug. Figs. 8, 9, and 10 are different views of the annunciator. Fig. 11 is a view, partly in section, of the apparatus or switch for throwing the test-wire in circuit.

As the invention relates to but a small part of a system well known, the description will be limited as far as possible to that small part.

The test-wire and connections are substantially the same, except in so far as our invention is concerned, as in Patents Nos. 252,756, dated January 17, 1882, 308,315, dated November 18, 1884, and 305,021, dated September 9, 1884. Each spring-jack comprises four parts—the tube *a*, the test-wire-spring terminal *b* pressing against said tube and connected to the test-wire *c*, a second spring, *d*, connected electrically both with the sub-station *e* through the "line" and with a terminal, *f*, opposite a spring-contact, *g*, which latter is connected electrically with the test-spring *b*, and a contact-strip, *h*, normally in contact with the spring *d* and in circuit with the annunciator-magnet *i*, a support, *j*, the cord *k*, and the metal portions *l* of the subscriber's plug, also in circuit with the weighted and pivoted lever *m*, having an insulated projection, *n*, the said lever being connected electrically with the ground.

From the description so far given it is evident that when the subscriber's plug is lifted from the lever electrical connection is made between the spring *g* and the contact *f*, thus throwing the line into electrical contact with the test-wire. When the subscriber's plug is placed in one of the tubes *a*, or merely brought in contact with it, the operator can tell whether the same line is already in use by some other person, because the test-wire is a "dead" wire connecting with duplicates or triplicates (not shown) of the tube *a* and spring *b*. The operator knows that some one else is using the same line if she hears a click in the telephone apparatus. The way in which this click is obtained is already well known in the art.

Our invention consists in providing an automatic test-circuit connection in combination with the subscriber's plug. By the mere lifting of this plug—that is, by one movement of the operator—it is at once known whether the line wanted is or is not already in use.

The word "Line" in Fig. 1 indicates that that circuit is the main line, which therefore includes the subscriber's instruments, the ground *e* being at the subscriber's station. In our invention the lifting of the subscriber's plug immediately places the main line in circuit with the test-wire, whereas in the patent No. 356,859 the mere lifting of the subscriber's plug does not place the test-wire in circuit with the main line. (See lines 81 to 87, inclusive, in said patent.)

A second part of our invention relates particularly to the apparatus.

Referring particularly to Figs. 2, 3, 4, 5, and 6, the multiple spring-jack consists of the combination of an insulating-block, *o*, carrying tubes *a*, one spring, *b*, pressing against the tube, a second spring, *d*, and a third strip or spring, *h*, against which the second spring presses. The tubes *a* project from the insulating-piece and carry a face-board, *p*, by friction.

It is evident that this face-board and the tubes may be separated from each other and from the block *o* for the purpose of polishing the inner surfaces of the tubes and of cleaning

the contact-surfaces between the outer surface of the tubes and the spring *b*.

Referring to Fig. 7, the plug consists of an insulating-tube, *q*, containing a metal piece, *r*, having a hole in one end and the plug *s* proper screwed into the other end, and a groove, *t*, containing a wire, *u*, which passes through said hole and into said groove.

Referring to Figs. 8, 9, and 10, the metal part *v* of the frame of the annunciator is one terminal and the spring *w* is the other terminal, and is separated from the portion *v* by the insulating-support *x*. When a current passes through the magnet *i*, the drop *y* falls, because the movement of the armature *z* raises the catch A. The falling of the drop, which is pivoted at its lower part at B, causes the end C to press the spring *w* upward against the metal part *v*, thus completing a local circuit, D, which may include an audible signal, such as an electric bell, *b'*. The solenoids *i* are held in their supports by screw-threads turned upon their cores.

We claim as our invention—

1. In a multiple-switch-board system, the combination of a switch having one of its terminals connected with the main line and its other terminal connected with the test-wire, and a subscriber's plug normally carried by the operating-lever of said switch, the said main line normally including the subscriber's instruments.

2. In a multiple-switch-board system, the combination of the usual spring-jack and an open switch normally carrying a subscriber's plug, and in circuit with that terminal of said spring-jack which is connected to the main line and with the tube or mouth-piece of the spring-jack, said tube being electrically connected to the test-wire.

3. In a multiple-switch-board system, the combination of a main line including a subscriber's instruments, a test or dead wire having electrical connections with duplicate spring-jacks, and an automatic circuit-controller independent of said spring-jacks and normally maintained open by a subscriber's plug, said controller being in circuit with the test-wire and with the main line.

4. In a multiple-switch-board system, the combination of a subscriber's plug normally separating two electric contact-points, a main line, a test-wire, and an electrical connection between the test-wire and one of the said contact-points, and another electrical connection between the main line and the other contact-point.

5. In a multiple-switch-board system, the combination of a subscriber's plug, an electric connection independent of a circuit-interrupter between the said plug and the main line, a spring-jack, an open switch normally carrying the subscriber's plug and in circuit with the test-wire, with said spring-jack, and with the main line, and an operator's plug in circuit with the operator's instrument and normally in an open local circuit.

6. The combination of an insulating-block support, multiple spring-jacks mounted thereon having projecting and detachable receiving-tubes, and an insulating face-plate provided with holes which fit upon said projections.

In testimony that we claim the foregoing as our invention we have signed our names, in presence of two witnesses, this 15th day of March, 1887.

EDWARD P. TRAYER.
GEORGE H. KUGLER.

Witnesses:
EDWARD P. THOMPSON,
JOHN P. WRIGHT.