

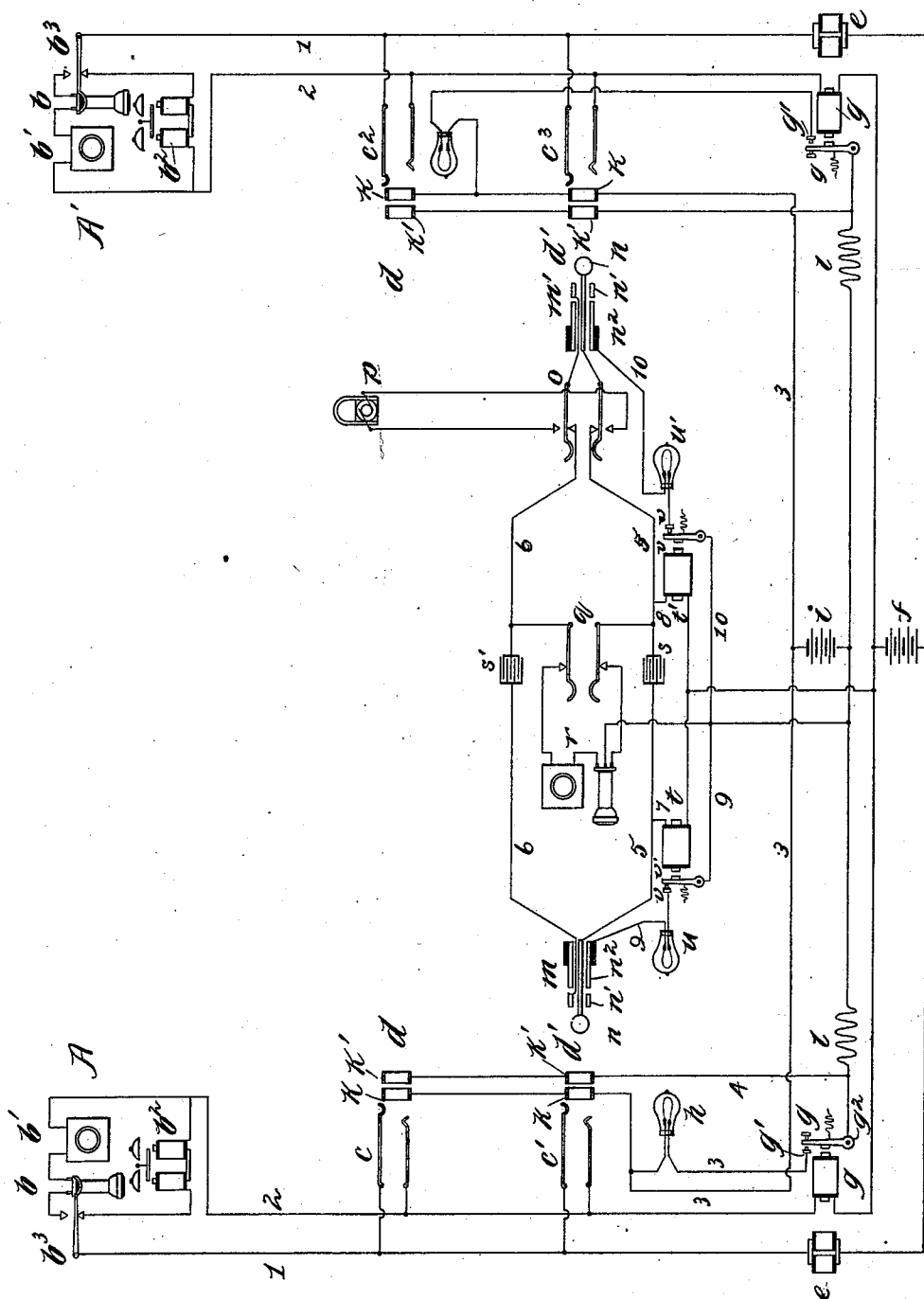
(No Model.)

C. E. SCRIBNER.

APPARATUS FOR TELEPHONE SWITCHBOARDS.

No. 548,228.

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APPARATUS FOR TELEPHONE-SWITCHBOARDS.

SPECIFICATION forming part of Letters Patent No. 548,228, dated October 22, 1895.

Application filed February 23, 1895. Serial No. 540,066. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. SCRIBNER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Apparatus for Telephone-Switchboards, (Case No. 376,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to the signaling and testing apparatus of telephone-switchboards, more particularly to multiple switchboards having subsidiary line-signals which are controlled by relays connected with the lines. Its object is to provide means for effacing or preventing the display of the line-signal and at the same time for altering the electrical condition of the test-rings in the spring-jacks to indicate the "busy" condition of the line.

My invention is applicable to the type of switchboard known as the "branch terminal switchboard," in which each spring-jack is provided with a pair of line-contacts and with a pair of normally-separated local contacts, one of which constitutes or is integral with a test-ring at the front of the jack. It applies particularly to switchboards in which each line-circuit includes permanently at the central station a source of current and a relay whose contact-points control a local circuit containing a signal on the switchboard associated with the spring-jacks of the line, as, for example, a small incandescent lamp.

My invention consists in so arranging the connections between the signals or lamps, the relays, and the local contacts of the jacks that when the relay is actuated to operate the signal the electrical condition of the test-ring is thereby altered, and also in providing contact-pieces in the spring-jacks and circuit connections therewith by which the insertion of the plug in a spring-jack short-circuits the signal and produces a similar alteration in the condition of the test-ring.

In a specific form of my invention I arrange local contact-pieces to be crossed together by a plug inserted in the spring-jack and provide a local circuit including a resistance-coil and divided into two parallel branches, one of which includes and is normally open at the contact-pieces of the line-

relay, and the other of which includes the normally-separated local contacts in the spring-jack, the signal or lamp being in circuit in the first-mentioned branch. With this arrangement the lamp is illuminated or the signal operated when the relay-contacts are closed together, but it becomes short-circuited, whereby the signal is effaced, when a plug is inserted in the spring-jack. At the same time the electrical condition of that local contact which constitutes the test-ring is altered by its connection with the other contact-piece. The test to determine the electrical condition of the test-rings may be made with a telephone, which may in practice be the operator's telephone connected with a conductor terminating in the tip of one of the plugs in the usual manner.

My invention is illustrated in the accompanying drawing, wherein two telephone substations A and A' are shown, connected by lines with the apparatus on a multiple telephone switchboard of two sections. The stations are provided with the usual telephonic and signaling appliances. These comprise a telephone-receiver *b* and transmitter *b'*, a signal-bell *b²*, and an automatic telephone-switch *b³* for switching the telephone and the bell alternately into connection with the line. Line-conductors 1 2 extend from the substation apparatus to the exchange and terminate there in the normally-open line-contacts of two spring-jacks *c* and *c'*, one upon each section *d* and *d'* of a multiple switchboard. Conductor 1 is continued through an impedance-coil *e* to one pole of a battery *f*, which is common to the different lines of the exchange. The other line conductor 2 is connected with the remaining pole of the battery through a relay *g*. This relay is provided with a forward contact-point *g'*, which constitutes the terminal of a conductor 3, including the lamp or other signal *h* placed near the spring-jack of the line in the switchboard, the conductor being connected with one pole of a battery *i*. The same pole of the battery is also connected with the local contacts *k* of the spring-jacks *c* and *c'*. The lever *g²* of the relay is connected by conductor 4 with the test-rings *k'* of the spring-jacks *c* and *c'*, and is led to the other pole of battery *i* through a resistance-coil *l*.

Connecting-plugs *m* and *m'* of the usual

type for electrically uniting or looping together different lines by means of their spring-jacks are furnished for the operator. The plugs comprise each a tip n and a short sleeve n' , which are adapted to register with the two line-contacts of the spring-jack, and a longer sleeve n^2 , which shall make contact with both of the local contacts k k' and cross them together. The tips of the two plugs are united through a conductor 5 and the sleeves through a conductor 6. These conductors include the switch-contacts of a calling-key o for looping a generator p of signaling-current into circuit with plug m' and are connected with a listening-key q , by which they may be extended to the operator's telephone r in the usual way. The operator's telephone is connected from the center with battery i in the ordinary manner. The conductors 5 and 6 also include condensers s and s' , respectively. Two branches 7 and 8 extend from conductor 5 through relays t and t' to the common signaling-battery f .

The sleeve n^2 of plug m forms the terminal of a conductor 9, which includes a clearing-out-signal lamp u and is connected with battery i . Conductor 10 from sleeve n^2 of plug m' includes another signal-lamp u' , and is similarly connected with battery i . Conductors 9 and 10 include the contact-points v v' of the two relays t t' , by which their continuity is controlled.

The normal condition of the apparatus is as shown in the drawing. The telephones at the sub-stations being upon their switch-hooks, the circuit of battery f through the lines is practically interrupted and the levers g^2 of the line-relays rest upon their stops. When one of the subscribers—as, for example, subscriber at station A—removes his telephone from the switch-hook, the lines 1 2 are connected together through the comparatively-low-resistance telephone b and transmitter b' . Current then flows from battery f through the relay g . The lever of the relay is drawn forward and closes upon its contact-point g' , completing the local circuit of battery i through the signal-lamp h , thus illuminating the lamp. Upon perceiving this signal the operator inserts plug m into spring-jack c' and throws her listening-key q into position to connect her telephone r with the plug-circuit 5 6. The insertion of plug m into the spring-jack creates a short circuit about the signal-lamp h , since a direct connection is formed through the sleeve n^2 between the contact k and the thimble k' of the spring-jack. At the same time the conductor 9, including the signal-lamp u , is closed to the battery i . The relay t is, however, excited by current from battery f through conductor 5 of the plug-circuit to the line, thence through the telephonic instruments at the sub-station, returning through line 1 to the battery. Hence by the insertion of the plug m into the spring-jack the individual signal-lamp h is extinguished and the clearing-out-signal lamp u

remains unlighted. It will also be noted that from the moment the relay was excited and closed the local circuit through lamp h and the test-rings k of the spring-jacks c and c' were connected with the battery i , and hence were in condition to test "busy." If after the insertion of the plug m into the spring-jack c' the relay should release its armature, the test-ring k' would still be connected with the contact-ring k' , and hence would still be electrified.

Having inserted the plug into the spring-jack and depressed the listening-key q , the operator is in position to communicate with subscriber at station A and to receive his order—say for connection with station A'. She then tests the line to station A' to determine whether it is already in use by applying to the test-ring k' the tip of the remaining plug m' . It will be obvious that if the line were already in use a current would be produced from the electrified test-ring k' through the conductor 5 of the plug-circuit to the telephone r , thence returning to battery through the central connection from the telephone. A click would thus be produced in the telephone at each application of the testing-plug to the test-ring, which would signify the "busy" condition of the line. From what has been said just prior it will be seen that the line would test "busy" from the moment the subscriber removed his telephone from its switch-hook to begin conversation until the connecting-plug had been finally removed from the spring-jack to effect disconnection.

Having ascertained the line tested to be free, the operator inserts plug m' fully into the spring-jack c^2 of line to station A' and operates the calling-key o , thus ringing the bell b^2 at station A'. When the subscriber at that station has responded and removed his telephone from its switch-hook, the subscribers are in position to communicate with each other, their instruments being connected together in a complete metallic circuit. It will be noted that when plug m' is inserted into the spring-jack c^2 the signal-lamp h' of that line, which is located upon the section d of switchboard, is short-circuited, and hence fails to be lighted when the telephone is removed from its switch. The line is made to appear "busy" in subsequent tests, as described before in connection with line to station A.

When the subscribers have finished their conversation and have replaced their telephones upon the switch-hooks, the circuits from battery f through relays t and t' are interrupted. These relays, therefore, release their armatures, which fall back and complete the conductors 9 10, and thus illuminate the clearing-out signals u and u' . This signifies to the attendant that the connection is no longer required, and she accordingly removes the plugs from their spring-jacks.

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

1. The combination with a telephone line, of a relay included in the line circuit, a local circuit including a source of current and a subsidiary signal, controlled by the relay, and means for short circuiting the said signal when connection is made with the line, substantially as described.

2. The combination with a telephone line, of a source of current and a relay included in the line, a local circuit including a source of current and a subsidiary signal, controlled by the relay, two normally separated contacts in the springjack connected respectively with the terminals of the said signal, and means for electrically connecting the contact pieces when a plug is inserted into the springjack, substantially as described.

3. The combination with a telephone line, of means for closing the line at the substation while it is in use, a relay and a source of current in the line at the central station, a local circuit controlled by the relay including a source of current, a resistance coil, and a signal lamp, and contact pieces in the springjack and circuit connections therewith adapted to short circuit the signal lamp when connection is made with it, substantially as described.

4. The combination with a telephone line, of a relay and a source of current in the line, a signal in a local circuit controlled by said relay, springjacks connected with the line, and test contacts in the springjacks, electrically connected with said local circuit, the connections being so made that the electrical condition of the test rings is altered when the local circuit is closed, substantially as described.

5. The combination with a telephone line provided with means at the substation for closing the line circuit thereat, and with a relay at the central station adapted to be operated when the line circuit is closed, a local circuit controlled by said relay, springjacks connected with the line, test-contacts in the springjacks, and electrical connections from the test-contacts to the local circuit adapted to alter the electrical condition of the test-contacts when the local circuit is closed by the relay, whereby the springjacks are caused to test busy when the line is closed at the substation.

6. The combination with a telephone line, of a switch controlling its continuity at the substation, and a relay at the central station adapted to respond to the closure of the line, a local circuit controlled by the relay including a signal, springjacks connected with the line, test contacts in the springjacks, switch contacts in each springjack constituting normally separated terminals of the said signal, means for crossing said normally separated terminals together when a plug is inserted into the springjack, and circuit connections adapted to alter the electrical condition of the test contacts both when the local circuit

is closed and when the signal is short circuited, whereby the springjacks are caused to test busy when the line circuit is closed at the substation or when a plug is inserted in a springjack of the line.

7. The combination with the springjacks of a telephone line in a multiple switchboard, of test contacts in the different springjacks electrically connected together, and two normally open branches from a battery to said test rings, means for closing one of said branches when a plug is inserted in the springjack, and relay contacts adapted to close the other of said branches, the relay being responsive to currents in the line circuit, and an instrument for testing the electrical condition of any test ring, substantially as described.

8. The combination with the springjacks of a telephone line in a multiple telephoneswitchboard, of test contacts in the different springjacks electrically connected together, two normally open branches from one pole of a battery to said test rings, one of said branches terminating in a contact in each springjack adapted to be closed to the test ring when a plug is inserted into the springjack, relay contacts included in the other branch, the relay being connected in the line circuit and adapted to close the branch when the telephone is removed from the switch hook at the substation, and a testing instrument connected in a branch from the other pole of the battery adapted to be applied to any test ring to ascertain its electrical condition, substantially as described.

9. The combination with a telephone line, of means for closing the line at the substation during the use of the telephone, and a relay and source of current at the central station, said relay being adapted to close its contacts when excited, springjacks upon the different sections of a multiple switchboard connected with the line, a local circuit including a source of current and a resistance coil, and divided into two parallel branches, one of said branches including a signal and the contact points of said relay, the other of said branches terminating in normally separated contact pieces in each of said springjacks, adapted to be connected together by a plug inserted in the springjack, and a test ring in each springjack connected with the local circuit, whereby the signal is operated and the condition of the test rings is altered when the telephone is brought into use, and whereby the signal is short circuited and the altered electrical condition of the test rings is maintained when the plug is inserted into a springjack of the line, substantially as described.

In witness whereof I hereunto subscribe my name this 19th day of January, A. D. 1895.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,
LUCILE RUSSELL.