

No. 653,319.

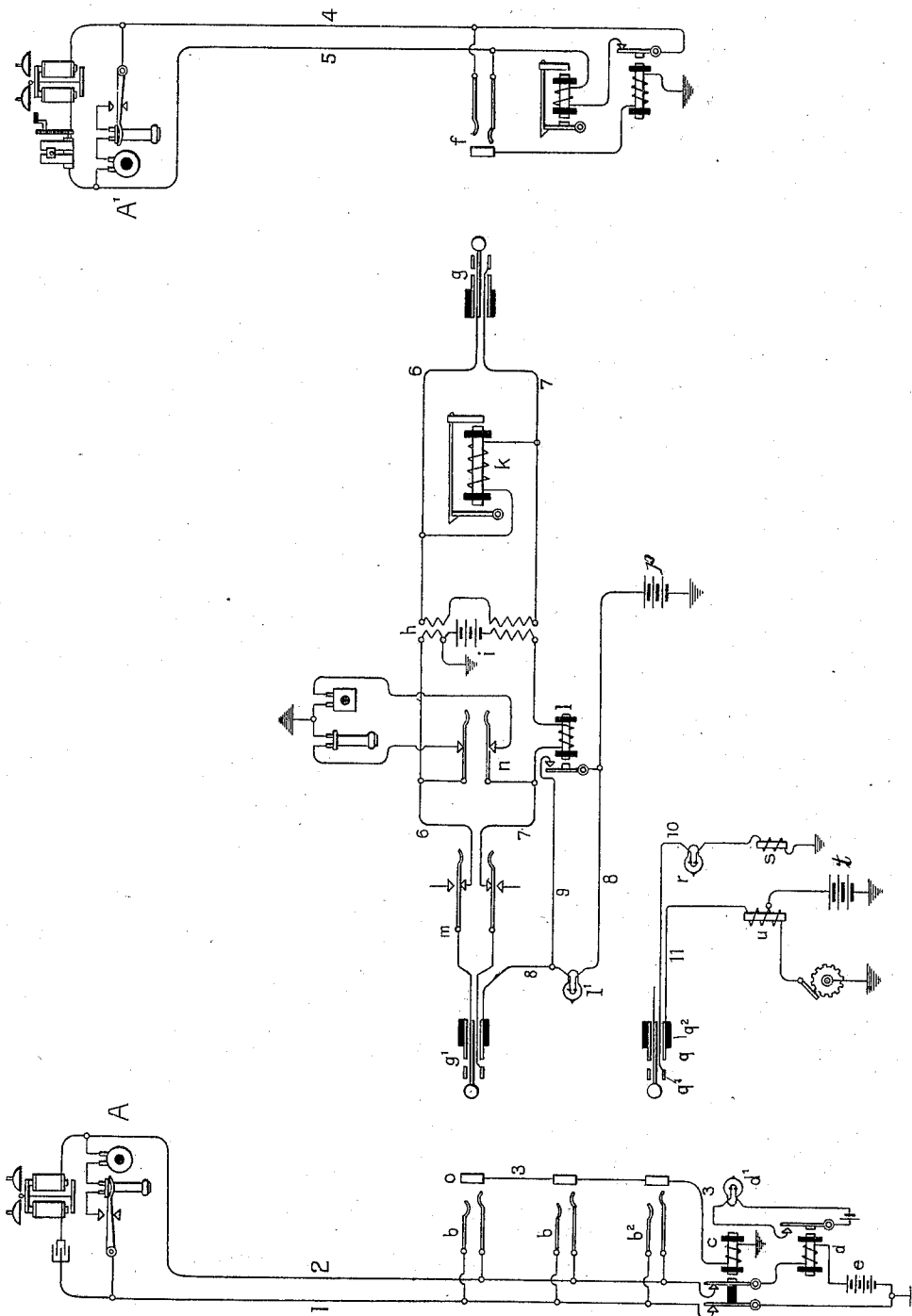
Patented July 10, 1900.

C. E. SCRIBNER.

SUPERVISORY AND BUSY TEST APPLIANCE FOR TELEPHONE LINES.

(Application filed Oct. 3, 1898.)

(No Model.)



Witnesses:

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UNITED STATES PATENT OFFICE.

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SUPERVISORY AND BUSY-TEST APPLIANCE FOR TELEPHONE-LINES.

SPECIFICATION forming part of Letters Patent No. 653,319, dated July 10, 1900.

Application filed October 3, 1898. Serial No. 692,487. (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 Supervisory and Busy-Test Appliances for Telephone-Lines, (Case No. 469,) of which the following is a full, clear, concise, and exact description.

10 This invention concerns the process of making connection between subscribers' telephone-lines and stations of toll-lines or pay-stations; and it consists in certain mechanism and circuit connections thereof for assisting in the supervision of the line which is to be united with the toll-line and in guarding the same against interference pending the establishment of the connection.

The establishment of connection with toll-
20 lines in most exchange systems involves a different mode of operation than the uniting of subscribers' lines, inasmuch as it is deemed advisable to preserve a record of the identity of the calling line and of the toll-line with
25 which connection is made therefrom of the duration of the connection and of various other incidents of the conversation. It thus becomes necessary to provide an operator whose especial duty it is to make connection
30 with the toll-lines and to make and preserve the records of such connections. The most efficient mode of conducting such communications consists in assigning a recording operator to the making of records or tickets
35 and to instructing switching operators, and one or more switching operators under the direction of the recording operator to make connections between subscribers' lines and toll-lines.

40 The process of making a connection from the line of a calling subscriber to the toll-line is as follows: The subscriber's operator answers the call in the usual way, and learning that connection is to be made with a toll-
45 line informs the recording operator that the particular subscriber demands a toll-line, after which the subscriber's operator in the ordinary course of business gives the connection no further attention. The recording
50 operator makes a record of the call and the party required and at an opportune time di-

rects a switching operator to make connection between the line of the calling subscriber and the toll-line required. To this end the lines which appear in spring-jacks before the
55 subscribers' operators appear also in multiplied jacks before the switching operator, and order circuits are arranged from the subscribers' operators to the recording operator and from the recording operator to the switch-
60 ing operator. In the operation of such a system of switching it is necessary that the line of the calling subscriber be guarded from interference, preferably by some device in the nature of a busy-test, during the interval be-
65 tween the release of the line by the subscriber's operator and the establishment of connection therewith by the switching operator, and this test should be of such a nature that the switching operator may distinguish the
70 test of a line thus held from the usual test, in order that she may disregard the special test. To this end it is desirable to provide for the subscriber's operator a special plug, associated with mechanism producing a special test-
75 sound, for insertion into the spring-jack of the calling line, and to provide further mechanism to indicate the placing of the connection by the switching operator, after which the subscriber's operator may remove the special
80 test-plug from the calling line. The present invention is addressed to these objects.

It consists in the combination, with the subscriber's line multiplied before the subscriber's and the switching operator, of a special
85 plug for the subscriber's operator, a supervisory signal in connection therewith in one conductor terminating in the plug, a source of specialized testing-current connected with another conductor of the plug, a local test-
90 circuit extending to the spring-jack before the switching operator, the usual connecting appliances for the switching operator, and means whereby the establishment of connection with the subscriber's line at the station
95 of the switching operator displays the supervisory signal at the station of the subscriber's operator.

It consists, further, in certain details of circuit arrangement and construction which will
100 be set forth at length in the specification.

The drawing herewith illustrates the inven-

tion. This drawing shows, diagrammatically, a subscriber's substation with the line therefrom to a switchboard in a central office, a toll-line entering the same office, switching apparatus for the switching operator, and special testing and supervising mechanism at the portion of the switchboard assigned to the subscriber's operator.

The subscriber's station is of the usual nature, being equipped with telephones and a call-bell, a switch controlled in the use of the telephone being arranged to close the line-circuit as respects continuous current while the telephone is in use. Line conductors 1 and 2 are led from the apparatus at this substation A to spring-jacks b , b' , and b^2 in a switchboard in the central office, whence they are normally prolonged to ground connections in the office, the continuity of these normal connections being controlled by a cut-off relay c . A relay d is interposed in one line conductor 2, together with a source of current e . The relay controls a secondary line-signal associated with the spring-jack b^2 through the agency of a local circuit and a source of current therein. The actuating-magnet of the cut-off relay c is included in a grounded conductor 3, which forms a portion of the test-circuit. The spring-jack b^2 is located at the station or position assigned to the subscriber's operator. The spring-jack b is located in the switchboard at the station of the switching operator.

The toll-line 4 5 terminates in the spring-jack f , located before the switching operator. This operator is provided with the usual mechanism for making connection between subscribers' lines or trunk-lines and toll-lines. This may consist in pairs of plugs g and g' , whose like line-contacts are, in effect, united by conductors 6 and 7, constituting the plug-circuit. For use in uniting lines adapted for automatic signals, such as the subscriber's line herein exemplified and toll-lines arranged for magneto signaling, it is usual to interpose a repeating-coil h in the plug-circuit, those windings of the coil which are to come into circuit with the toll-line being united directly and those which are to be brought into circuit with the subscriber's line being united through a battery i . A clearing-out drop k is placed in the bridge of the portion of the plug-circuit connected with plug g . A controlling-relay l for the supervisory signal l' , associated with the plug g' , is placed in the circuit between the battery i and the plug, in the conductor 7. The plug-circuit traverses the switch-contacts of the usual calling key m for looping a source of calling current into circuit with the plug g' , and is connected with the switch-pieces of a listening-key n for bringing the operator's telephone into the circuit.

The sleeve contact piece or plug g' , which is designed to make connections with the ring or test contacts o of the spring-jacks, forms the terminal of a conductor 8, which includes

the lamp l' , together with a source p of current. The supervisory lamp l' is controlled by the relay l , through the agency of a shunt 9, whose continuity is normally interrupted at the contact-points of the relay.

The subscriber's operator at the station or position with spring-jack b^2 and line-signal d' is furnished with the usual pairs of plugs and plug-circuits for uniting the subscribers' lines in the normal course of business. These have not been shown, in order that confusion of the drawing may be avoided. In addition to these usual appliances, however, she has, in accordance with the present invention, a special plug q , having three contact-pieces for registering with the two line-contacts and the ring-contact o , respectively, of the spring-jack b^2 . The contact-piece q' , which is adapted to register with the spring representing the conductor 2 in the spring-jack, forms the terminal of a wire 10, which is grounded at its other terminal and which includes a supervisory signal-lamp r and an impedance-coil s . The sleeve contact-piece q^2 of the plug, which is designed to register with the ring-contact o of the spring-jack, forms the terminal of a wire 11, which includes the source t of current, together with the secondary helix of an induction-coil u , whose primary helix is in circuit with a source of suitably characteristic or specialized test-current—as, for example, a battery and a rapid circuit-breaker.

The process of making connection from the station A, as a connection originating or calling station to the toll-line station A', is as follows: The user of the telephone at the subscriber's station in taking the telephone for use closes the line-circuit as respects current from battery e , whereby the line-relay d is excited and the line-signal d' is displayed to the subscriber's operator. This attendant, observing the call, makes connection with the spring-jack b^2 in the usual way by means of one of her ordinary connecting-plugs and ascertains the order for the line required. Having learned the subscriber's demand for connection with the toll-station A', the subscriber's operator brings her transmitting-telephone into an order-circuit and informs the recording operator of the identity of the calling party and his demand. At the same time the subscriber's operator withdraws the answering-plug from the spring-jack b^2 and puts in place of it the special plug q . This act on the part of the subscriber's operator completes a local circuit 11 3, in which current from the battery t flows to excite the cut-off relay c , which severs the normal ground connections of the subscriber's line, and thus extinguishes the line-signal lamp d' . The same circuit, inasmuch as it contains a source of vibrating or other characteristic test-current, impresses a varying or characteristic electromotive force on the conductor 3, which terminates in the test-ring o of the spring-jack b' in readiness to give the characteristic

test-signal. It will be noted that a connection of usual character, such as that which would be made by means of a plug similar to plug g' , would merely impress on the test-circuit an unvarying electromotive force.

The insertion of plug q into the spring-jack b also brings conductor 10 into connection with line conductor 2. The battery reaching this conductor by way of the line-circuit to the substation will be insufficient to light the supervisory lamp r in this circuit. Having made the necessary records, the recording operator by any suitable means—as, for example, by passing a ticket or orally—instructs the switching operator to make connection between the subscriber's line to station A and the toll-line to station A'. The switching operator tests the subscriber's line in the usual way by applying to the test-ring o thereof the tip-contact of the plug g' . If the line were in use for an ordinary connection, the application of the testing-plug to the test-ring of the spring-jack would result in a steady flow of current from the battery connected with the local conductor of the plug, by means of which such connection existed through the test-conductor 3 and thence through a portion of the winding of the telephone of the switching operator to earth. Such a test-current would produce a click in the telephone at each application or removal of the test-plug. Such a connection could of course not be interrupted in order that the switchman might make the toll-line connection demanded. However, in the case of a line which is held busy by the subscriber's operator in virtue of the presence of the special plug q in the spring-jack of the line an undulating or other characteristically-modified current will flow from the source u through the conductors 11 and 3 of the test-circuit to the tip of the testing-plug g' , and thence to earth through the telephone of the switching operator. The characteristic test-signal thus produced in this telephone will denote to the switching operator that the line is being held for the completion of connection with the toll-line. Hence this operator will make the connection by inserting plug g' into the spring-jack b and plug q into the spring-jack f of the toll-line. Complete connection will thus be established between the stations. The insertion of plug g' into the spring-jack b completes a circuit from battery i through conductor 7 of the plug-circuit to the line conductor 2, from which it finds a path through the conductor 10 at the station of the subscriber's operator. The current in this circuit lights the supervisory lamp r , and thus indicates to the subscriber's operator that the required connection has been established and that the line need no longer be held by means of the special busy-signal. Hence this operator may withdraw the plug q from the spring-jack b^2 and give the connection no further attention. During the presence of the plug q in the spring-jack b^2 , however, conversation

may be carried on over the connected lines, inasmuch as the shunting of telephonic current through the conductor 10 is prevented by the impedance-coils therein. Having established the connection, the operator supervises it by means of the usual clearing-out drop, referring to the toll-line, and signal l' , referring to the subscriber's line, removing the connection in accordance with the display of these signals.

I claim as the invention and desire to secure by Letters Patent—

1. The combination with a telephone-line and multiple spring-jacks thereof in different sections of a switchboard, and a test-circuit for the multiple spring-jacks, of a source of specialized test-current and means for connecting the said source of current with the test-circuit of the line at one of said sections, a signal at the same section and means for connecting it with the line simultaneously with the connection of the test-current, means for closing the test-circuit at another section of the switchboard to obtain a test-signal, and other means at said second-mentioned section made operative in establishing connection with the line to display the said signal, as described.

2. The combination with a telephone-line, multiple spring-jacks thereof at different sections of the switchboard, and a test-circuit for the spring-jacks, of a source of specialized test-current and a supervising-signal connected with the plug at one of the sections; means at another section for detecting the connection of said source of specialized test-current with the test-circuit, and a source of current at said second-mentioned section, and switch-contacts made operative in establishing connection with the line at said second-mentioned section to connect the said source of current with the line to operate the signal at the other section, substantially as described.

3. The combination with a telephone-line, multiple spring-jacks thereof in different sections of the switchboard, and a normally-open test-conductor uniting the test-contacts of the spring-jacks; of a source of specialized test-current, a plug having a contact-piece adapted to make connection with the normally-open test-conductor, connected with said source of test-current, a signal and a conductor including the signal connected with another contact-piece of the same plug; means at another section for testing the line to determine the presence of such specialized test-current; a plug for making connection with the line at such other section, and a source of current in circuit therewith adapted to be brought into circuit with the signal in making connection with the spring-jack, as described.

4. The combination with a telephone-line and multiple spring-jacks thereof in different sections of a switchboard, of connecting-plugs at the different sections, and a local test-con-

ductor uniting the test-contacts of the spring-jacks; a source of specialized test-current connected with a contact-piece of one of the plugs adapted for connection with said local
5 test-conductor, a signal and an impedance-coil in a conductor connected with another contact-piece of said plug adapted to register with a line-contact of the spring-jack; a source of current connected with the corre-
10 sponding line-contact of the other plug; whereby a signal is given to disconnect the source of specialized testing-current from the line when the required connection is made with the line, as described.
15 5. The combination with the telephone-line, multiple spring-jacks thereof in different sections, of a switchboard, and normal ground connections of the line, the cut-off relay for severing such ground connections and the
20 grounded local test-circuit including the actuating-magnet of said relay; of a connecting-plug at one of the sections, a source of steady current for operating the cut-off relay and a source of specialized test-current, connected

with a contact-piece of said plug adapted to 25 make connection with the test-circuit, and a conductor connected with a line-contact of the plug including a signal together with an impedance-coil; another connecting-plug at a different section, a source of current con- 30 nected with the contact-piece thereof adapted to make connection with the test-circuit, and a second source of current connected with the line-contact thereof to operate the signal at the other section; whereby a spe- 35 cialized busy-test may be applied at one section, a signal may be given from the other section to disconnect such specialized testing-current, and the cut-off relay is made operative during the existence of either con- 40 nection, as described.

In witness whereof I hereunto subscribe my name this 2d day of April, A. D. 1898.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,
FRANK R. MCBERTY.