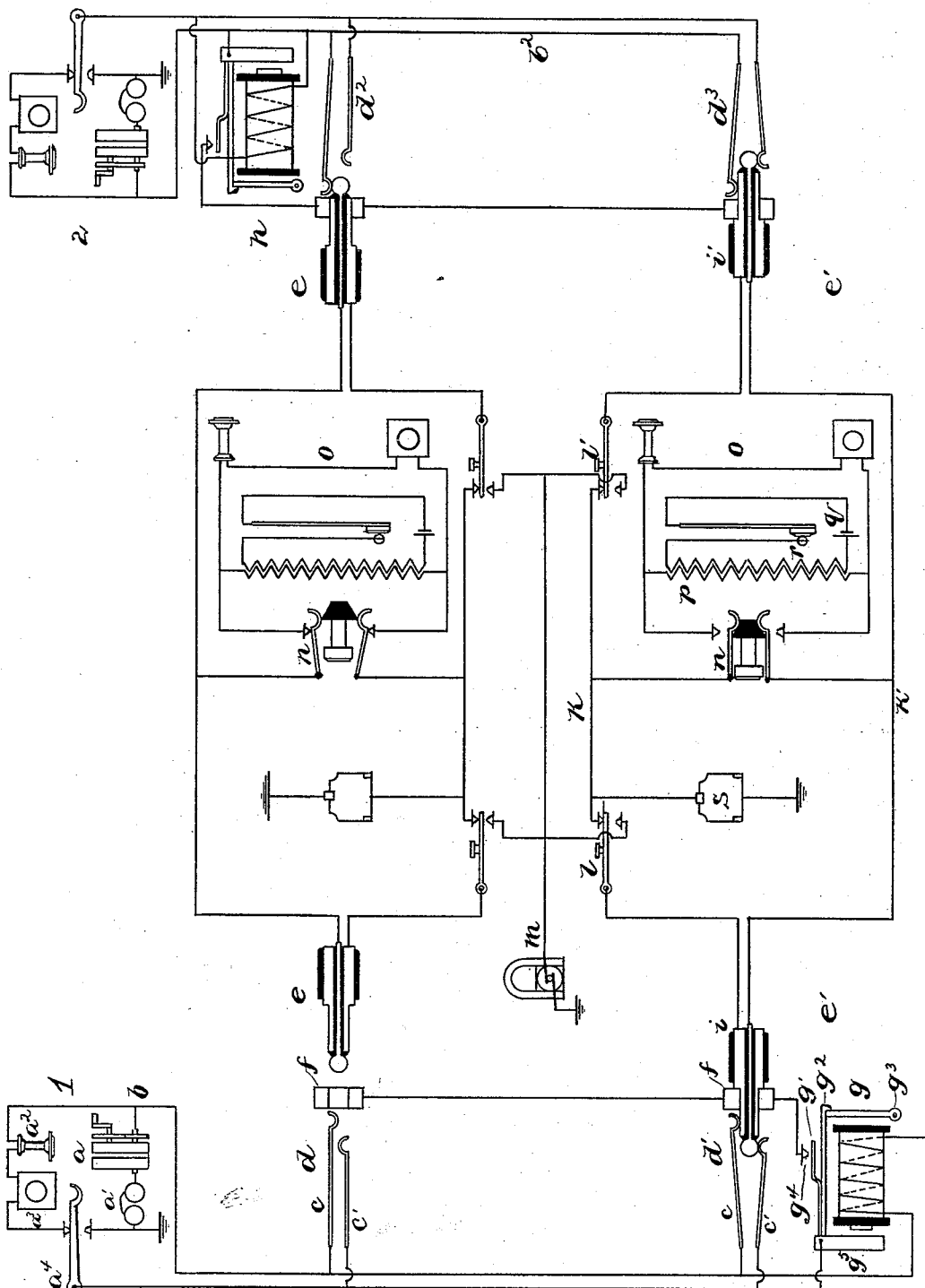


(No Model.)

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MULTIPLE SWITCHBOARD SYSTEM FOR TELEPHONE EXCHANGES.
No. 488,036.

Patented Dec. 13, 1892.



Witnesses:

George R. Cragg
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UNITED STATES PATENT OFFICE.

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MULTIPLE-SWITCHBOARD SYSTEM FOR TELEPHONE-EXCHANGES.

SPECIFICATION forming part of Letters Patent No. 488,036, dated December 13, 1892.

Application filed April 16, 1892. Serial No. 429,488. (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 Multiple-Switchboard Systems for Telephone-Exchanges, (Case No. 303,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to that class of multiple-switchboard systems in which the individual annunciator of a telephone-line is permanently connected with the line-circuit. Its object is to provide means for preventing the operation of the individual annunciator by signaling-currents sent over the line-circuit from either of the connected sub-stations after a connection has been made to the line.

My invention consists in a normally-open shunt or short circuit about the individual annunciator of the line and means actuated by an electro-magnetic device in the line-circuit to close the shunt-circuit when signaling-current is sent over the line-circuit while a connection exists to the line.

My invention comprises a shunt or short circuit about the individual annunciator normally open at two points, an electro-magnetic device in the line-circuit arranged to close one of the breaks of the shunt-circuit when actuated, and normally-insulated contact-pieces upon the different spring-jacks of the line constituting the terminals of the remaining break of the shunt-circuit, and a contact-piece upon the loop-plug used in making connection with the line adapted to cross together the said contact-pieces, and thus to complete the shunt-circuit when the plug is inserted into the spring-jack. In the normal condition of the line the shunt-circuit is, as stated, open at two points. When the call-signal is sent from the sub-station of the line to the exchange, the shunt-circuit is closed by the electro-magnet thereat at one point, but being open at another point does not short-circuit the annunciator, which is accordingly operated, giving the signal to the attendant. When, however, a connection has been made to line by inserting a loop-plug into one of

the spring-jacks of the line, the shunt-circuit is closed at the other break, and a subsequent calling-signal from the sub-station causes the electro-magnet to again close the remaining break of the short-circuit around the annunciator, thus preventing the operation of the annunciator.

In practice I have found it desirable to place one pair of contacts upon the annunciator itself, thus making the annunciator perform the function of the electro-magnetic device described. The movable contact-piece upon the annunciator may be carried by an armature or the catch-arm thereof, and may be sufficiently flexible to allow motion of the armature after the contact-spring is closed upon its contact-anvil, the catch of the annunciator which engages with the shutter thereof being made of such length as not to release the shutter until after the points have been closed together. Thus when the annunciator is energized by a calling-current the first portion of the movement of its armature closes the two contact-points together, which, if the remainder of the shunt-circuit be completed, prevents further operation of the annunciator. If the remainder of the shunt-circuit be incomplete, the armature is further attracted, so as to release the shutter. The remaining break of the shunt-circuit may be situated upon the spring-jacks, each spring-jack having two contact-pieces, representing the normally-separated terminals of the shunt-circuit, all the corresponding contact-pieces of the spring-jacks being connected together, the loop-plug or connecting-plug being arranged to cross together the two terminal contact-pieces.

My invention is illustrated in the accompanying drawing. Therein I have shown two sub-stations equipped with the ordinary apparatus, each connected with spring-jacks upon one of two sections of multiple switchboard and with an individual annunciator upon one of the switchboards. Two cord-circuits or connecting-outfits are shown, one at each board, that at one of the boards being shown in position of connecting the two subscribers' lines and that at the other board being shown in the act of testing a line to determine whether it is already in use or not.

The apparatus at sub-station 1, for example, comprises a calling-generator a , and signal-bell a' , and a telephone-receiver a^2 , and transmitter a^3 in two separate branches from one side b of the line, and a gravity-switch a^4 , connected with the other side b' of the line-circuit, adapted to connect the telephone apparatus or the calling apparatus alternately into the line-circuit, according to the position of the switch. An earth connection is attached to the branch, including the generator and signal-bell, in order that call-signals may be sent or received either over a metallic circuit made up of the lines b b' or over a grounded circuit formed of the line b and an earth-return. The lines b b' extend to the exchange, where they are connected to the line-springs c c' of two spring-jacks d d' upon two sections of multiple switchboard e e' . The spring-jacks d d' are of ordinary construction, each having, in addition to the two line-springs c and c' , a test-ring f , insulated from the line-springs. The test-rings f f are electrically connected together. The conductors b b' after passing the different spring-jacks upon the switchboards are connected together through the electro-magnet coil of the individual annunciator g of ordinary construction. Annunciator g is provided, as described, with a flexible contact-spring g' , carried upon the arm g^2 , carrying the catch engaging with the shutter g^3 . A contact-anvil g^4 is disposed in proper position to make contact with the spring g' when a very slight motion is communicated to the armature g^5 . The catch carried by the arm g^2 , engaging the shutter g^3 , is made of such length as not to release the shutter until a movement greater than necessary to close the contacts $g' g^4$ has been given to the armature. The arm g is connected through the pivot supporting the armature with the side b' of the line-circuit. The contact-anvil g^4 is connected with the conductor, joining the different test-rings f of the spring-jacks d d' . The apparatus at the remaining sub-station is of similar character and is connected with similar apparatus at the exchange, the annunciator h of the line being, however, placed upon the section e of switchboard, so as to be under the care of a different attendant operator.

The operator's connecting apparatus is of well-known character. It comprises two loop-plugs i i' , each having two contact-pieces, one of which—the tip—makes contact with the shorter line-spring c' of the spring-jack into which the plug may be inserted and the other of which—the sleeve—makes contact with both the longer line-spring c and with the test-ring f of the spring-jack. The like contact-pieces of the two plugs of a pair are connected together by conductors k k' , ringing-keys l l' being included in the conductor k , each adapted to disconnect the sleeve of the plug from the conductor k and to connect it with one pole of the calling-generator m , whose other pole is grounded when the key is de-

pressed. A listening-key n has its contact-springs connected with the different conductors k k' , respectively. Its contact-anvils constitute the terminals of the operator's telephone set o . In order to enable the operator to test any spring-jack to determine whether the line thereof is already in use or not, an induction-coil p is provided, having its secondary connected in parallel with the telephone-set o , its primary being included in a local circuit with a battery q and a microphone r , lightly adjusted and kept in continuous slight vibration. A slight telephonic undulatory current is thus induced in the secondary of the coil p and normally finds circuit through the operator's telephone set o , producing a slight rustling noise therein. When the operator desires to test a line to determine whether it is already in use or not, she inserts one connecting-plug of a pair just so far into the spring-jack to be tested that the tip and sleeve of the plug make contact with the longer line-spring and the test-ring of the spring-jack, respectively, at the same time connecting her telephone set with the plug-circuit and fixing her attention upon the slight noise in the receiver. If the line be not in use, the test-ring f and the line-spring will be insulated from each other and the sound in the telephone will continue uninterrupted; but if the line tested were in use the said contact-pieces would be short-circuited, and would thus short-circuit the secondary of the induction-coil p , completely shunting the current thereof from the telephone-receiver, and hence producing silence therein. This silence will be interpreted by the operator making the test to be an indication that the line tested is already in use. A clearing-out annunciator s is included in a branch from the conductor k to earth.

When a generator at a sub-station—for example, sub-station 1—is operated to send calling-signal to the exchange, the current therefrom flows over the line-circuit b b' —the switch-hook a^4 being in its lowest position—to the exchange, and there through the electro-magnet coil of the annunciator g of that line. The electro-magnet being energized attracts its armature g^5 , closing the contacts $g' g^4$ together; but since the test-rings f of the spring-jacks of the line are still insulated, the line not being in use, the annunciator is not shunted and continues to actuate the armature until the shutter g^3 is released and falls, indicating the signal to the operator. The operator at board e' then inserts one plug, as i , of a pair into spring-jack d' at her board. The lines b b' from sub-station 1 are thus extended to the conductors k k' , and when the operator has depressed the plunger of key n to connect her telephone-set to the cord-circuit she is enabled to communicate with the subscriber at station 1 and to receive his order—say for connection with station 2. She then proceeds to test the line called for in the manner described, and having found it to be

idle, she inserts the other plug i' of the pair into the spring-jack d^3 of the line called for at her board. The line-circuit from station 1 is thus farther extended from the conductors k k' of the cord-circuit through the plug i' to the corresponding sides of the line to station 2, the subscribers at stations 1 and 2 being thus looped into a continuous metallic circuit, which may be readily traced. The operator now depresses the key l' , thereby disconnecting the sleeve of the plug i' from the conductor k and connecting it to one side of the calling-generator, whereby calling-current is sent over the line b^2 to the sub-station 2 and through the signal-bell thereat. When the subscribers have completed their conversation, either of them—for example, that one at station 1—may send a “clearing-out” or “disconnection” signal to the exchange. A portion of this current will find circuit to earth at the sub-station and over the line b to the exchange and through the line-spring c of spring-jack d' to the sleeve of the plug i , and thence to the conductor k and through the clearing-out annunciator s to earth, thus operating the clearing-out annunciator and indicating the signal for disconnection to the operator. Another portion of the calling-current will find circuit over the metallic line b b' and through the annunciator g . The armature g^5 of the annunciator will thereby be attracted; but in its first movement will close together the contacts g' g^4 , thus completing a short circuit from the line b' through the armature g^4 to the contact-point, thence through the contact-points to the test-ring f of spring-jack d' , thence through the sleeve of plug i to the line-spring c of the jack, thence to the line b . The annunciator is thereby short-circuited before the catch has been lifted to a sufficient distance to release the shutter, and as long as the current continues will vibrate slightly without releasing the shutter.

As I have before generally mentioned, it may be desirable to employ a separate electro-magnetic circuit-closer in place of the annunciator, provided with several contact-points in the same relation to the line-circuit as the annunciator herein. The method of accomplishing the substitution will be obvious to any one skilled in the art, and I do not deem it necessary to describe this modification.

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

1. The combination, with an individual annunciator, of an electro-magnetic switch adapted to close the circuit when energized, a shunt or short circuit about the said annunciator normally open at two points, adapted to be closed at one point by the said electro-magnetic switch, and means for closing the short circuit at another point when connection is made with the line, substantially as described.

2. The combination, with a telephone-line circuit, of an annunciator included in circuit

therewith, an electro-magnetic switch also in circuit between the different sides of line, adapted to close the circuit when energized, a shunt or short circuit about the said annunciator normally open at two points, but connected with the said electro-magnetic switch to be closed at one point when said switch is actuated, and means for closing the short circuit at the remaining break when connection is made with the line, substantially as described.

3. The combination, with a telephone-line circuit, of an individual annunciator included therein, contact-points upon said annunciator, adapted to be closed together when the magnet of the annunciator is energized, a shunt or short circuit about the annunciator normally open at two points, connected with the contact-points of said annunciator so as to be closed at one point when said annunciator is energized, and means for closing the remaining break when connection is established with the line, substantially as described.

4. The combination, with a telephone-line extending from a sub-station to an exchange, of spring-jacks at the exchange, each having two contact-pieces connected with the different sides of the line-circuit, respectively, and a third contact-piece insulated from the said line-contacts, a connecting-plug inserted in the said spring-jack having two contact-pieces, one making contact with one of the line-contacts and the other with the remaining line-contact and the extra contact-piece of the spring-jack, an individual annunciator having its electro-magnet coil included in circuit between the different sides of the line-circuit and provided with contact-points adapted to be closed by the first movement of the annunciator, and circuit connections joining one of the said contact-points with the extra contact-piece upon all the spring-jacks of the line and the other point with that side of the line-circuit which is not crossed with the said extra contact-piece, substantially as described.

5. The combination, with a telephone-line extending from a sub-station to an exchange, of spring-jacks at the exchange, each having two line-contacts connected with the different sides of the line-circuit, respectively, and a third piece normally insulated from the line-contacts, and an individual annunciator having its coil included in the line-circuit, provided with an armature and with contact-points adapted to be closed by the first movement of the armature, and an indicator adapted to be actuated by a subsequent movement of the armature, circuit connections joining one of said contact-points with the normally-insulated contact-piece upon the different spring-jacks and joining the remaining contact-point with one side of the line-circuit, and a connecting-plug inserted into the spring-jack having two contact-pieces, one making contact with that line-contact

which is connected with one of the said contact-points and the other to cross together the remaining contact-pieces of the jack, substantially as described.

- 5 6. The combination, with a source of calling-current at a sub-station, of the line-circuit extending therefrom to an exchange, spring-jacks connected with the line-circuit at the exchange, an individual annunciator
10 thereat, a shunt-circuit about said annunciator normally open at two points, contact-points upon the spring-jacks adapted to close

the said shunt-circuit at one point when connection is established with the line, an electro-magnetic device adapted to be actuated by 15 the signaling-current to close the remaining break of the shunt-circuit, substantially as described.

In witness whereof I hereunto subscribe my name this 10th day of March, A. D. 1892.

CHARLES E. SCRIBNER.

Witnesses:

M. J. TALLETT,

GEORGE W. MCMAHON.