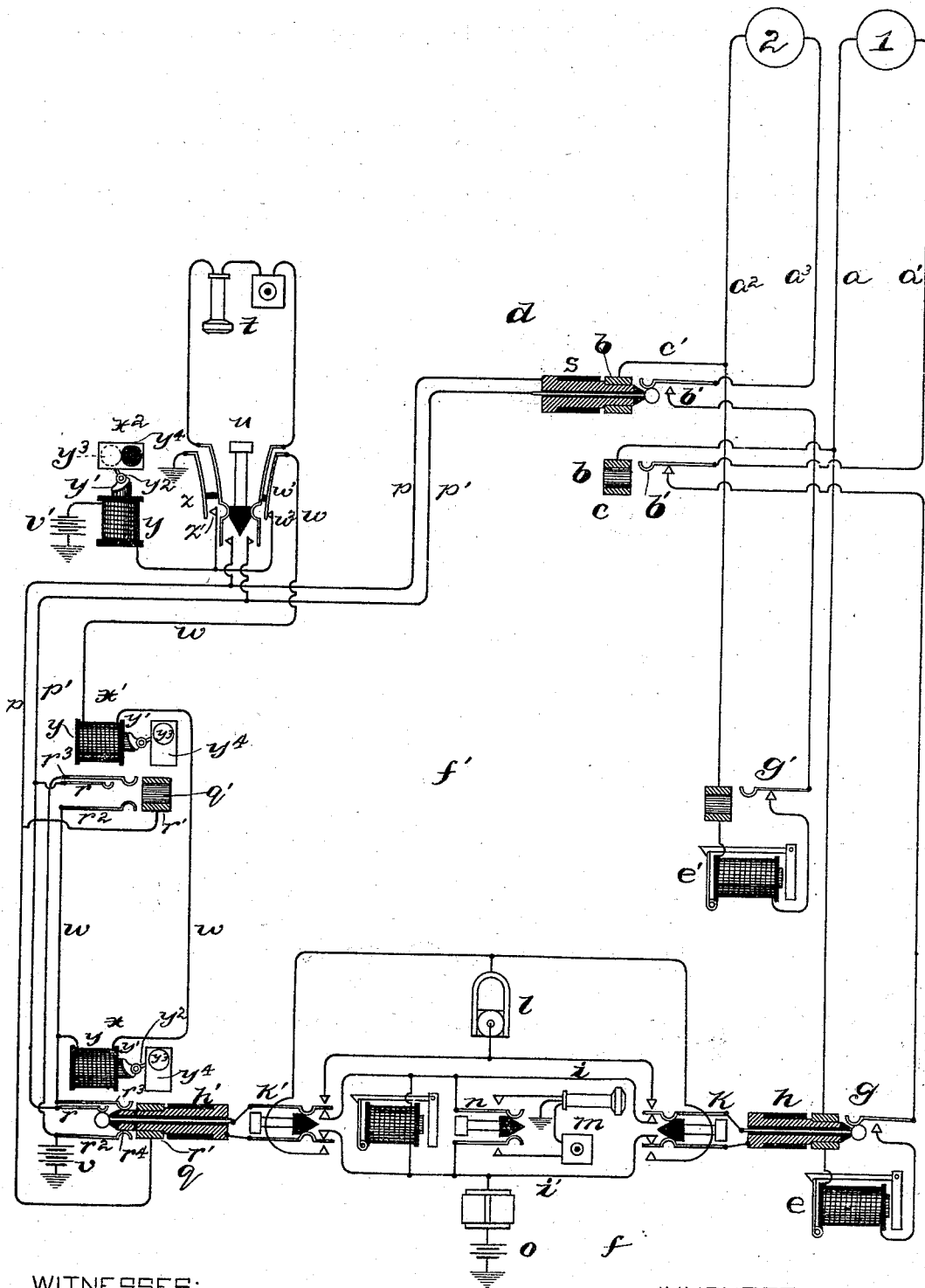


(No Model.)

C. E. SCRIBNER.
SIGNALING SYSTEM FOR TELEPHONE TRUNK LINES.

No. 513,537.

Patented Jan. 30, 1894.



WITNESSES:

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SIGNALING SYSTEM FOR TELEPHONE TRUNK-LINES.

SPECIFICATION forming part of Letters Patent No. 513,537, dated January 30, 1894.

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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 Signaling Systems for Trunk-Lines of Telephone-Exchanges, (Case No. 326,) 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 apparatus for signaling between the different operators in a telephone exchange system who may be engaged in establishing connection between two different lines through the medium of a trunk or transfer line; its object is to provide means whereby each operator will be automatically notified of the acts performed by the other operator in establishing such connection.

My invention is particularly applicable in central offices in which the signal receiving annunciators upon different lines are distributed upon different answering boards and the spring-jacks or connection sockets are arranged together upon a large switchboard, the call signals being received by an answering operator, and the connection between the calling line and the line called being completed by a switchman at the switching section, in accordance with the orders of the answering operator. In such systems trunk lines or transfer circuits are provided, extending from the answering operator to the switchman; the answering operator makes connection between the calling line and the trunk line by means of suitable appliances at her answering board, while the switchman establishes connection from the other terminal of the trunk line to a springjack of the line with which connection is ordered, thus looping the two lines into a continuous circuit including the trunk line and the connecting appliances at the answering board.

The object of my invention is, more specifically, to provide circuits and apparatus of simple and efficient character in connection with these trunk lines, whereby the answering operator may be made aware of the steps taken by the switchman in establishing an ordered connection, and, further, whereby the

act of the removal of the connection at the answering board will automatically signify to the switchman that the connection upon the switchboard is to be removed.

Speaking in a general manner, I provide in my invention an independent local circuit extending between the terminal stations of the trunk line, normally open at the answering board and normally closed at the switchman's board, including at each station a signal instrument adapted to give a visible or other indication and a source of current, in combination with means for automatically closing the local circuit at the answering board by the establishment of the connection with the terminal of the trunk line thereat, and a key at the switchman's section for connecting the switchman's telephone with the trunk line, which key also controls the continuity of the signaling circuit and the connections of the switchman's signal indicator so that whenever the signaling circuit is opened at the switchman's station, a local circuit is closed through the switchman's indicator. For this indicator I preferably employ a device which gives an indication only when no current traverses it. Thus the switchman's indicator is only operated or displayed upon the breaking of the signaling current at the answering station, while the indicators at the answering board are controlled by the circuit closers at both stations.

In practice one trunk line is usually connected with springjacks or connection sockets upon several different answering boards, in order that any of these several answering operators may utilize the trunk line in extending a circuit to the switchman's board.

In my invention I extend the signaling circuit to each of the answering boards whereon is a connection socket of the trunk line, and provide a signaling instrument and means for closing the local circuit in connection with each such jack. All the indicators of one signaling circuit, upon the different answering boards, are simultaneously actuated or caused to respond when the local circuit is closed, so that they constitute signals upon all the answering boards to indicate that the corresponding trunk line is in use.

I have illustrated my invention in the ac-

companying drawing, and will describe it fully in connection therewith.

In the drawing two substations are represented as connected by line wires with spring-jacks or terminal sockets upon a switchboard, and with annunciators upon two answering boards, the different annunciators being located upon the different answering boards. An answering springjack is provided for each line near its annunciator to permit the answering operator to connect with the line. A trunk line is shown extending from the answering boards, being connected with one springjack upon each of the answering boards, to the switchman's section, and my improved signaling system is shown in combination with the trunk line. The usual connecting appliances are represented at one of the answering boards as in the position of establishing connection between one of the lines and the trunk line. The trunk line is connected at the switchboard with the remaining line, whereby the two substations are connected together in a continuous circuit.

Considering the system in greater detail, I will trace the various circuits and describe the operations involved in establishing connection between the two substations indicating particularly the operation and utility of my invention.

Substation 1, for example, is connected with the central station by means of a line circuit $a a'$; the different sides of this circuit are connected with the thimble b and line spring b' , respectively, of a springjack c which is located upon the switchboard d at the central office. From the springjack c the circuit is continued to an annunciator e upon an answering board f . An answering springjack g is also provided upon this answering board having its thimble and line spring connected with the sides $a a'$, respectively, in a manner similar to the springjack c . The springjacks are provided with contact anvils against which the line springs normally rest, but from which they are separated when a connecting plug is inserted into the spring-jack. Thus when connection is made with either springjack, the remainder of the circuit including the annunciator is disconnected from the portion of the line extending to the substation. The substation 2 is similarly connected by line wires $a^2 a^3$ with a springjack c' upon the switchboard d , and also with an annunciator e' and answering jack g' upon an answering board f . The connecting appliances provided at the answering board f' are shown in full, but the corresponding apparatus at board f' is not shown. These connecting appliances are of well known character. The apparatus comprises a pair of loop plugs $h h'$ connected together by conductors $i i'$ so that by inserting the two plugs into two springjacks, the lines connected with the springjacks are looped into a continuous metallic circuit. Included in the conductors $i i'$ are two calling keys $k k'$, each of which is adapted, when

its plunger is depressed, to disconnect one of the plugs from the other and to connect it with the poles of a generator l of signaling current, whereby the operator is enabled to send a signaling current over either of two lines connected together through the medium of the plug circuit $i i'$. A telephone set m is furnished for the operator, connected with a listening key n , by depressing which the telephone set is connected with the plug circuit and the operator is placed in telephonic communication with the substations. A grounded battery o is connected at its free pole with the conductor i' for testing purposes, a retardation coil being included in the branch between the battery and the conductor of the plug circuit to prevent the escape of telephonic current to earth.

The trunk or transfer circuit $p p'$ is connected with springjacks q and q' , one upon each of the answering boards $f f'$. These springjacks are not provided with separable switch contacts, but consist simply of flexible line springs r and thimbles r' adapted to make contact with the corresponding portions of the loop plug h' . From the answering boards the trunk circuit extends to the switchboard d , where it terminates in a loop plug s adapted for insertion into any springjack of the switch board. The switchman is also provided with a telephone set t , connected with the contact springs of a key u whose corresponding contact anvils are connected with the trunk circuit $p p'$, whereby the telephone set may be connected with or disconnected from the trunk circuit.

In my invention two additional local springs $r^2 r^3$ are provided upon the springjacks $q q'$ of the trunk circuit at the answering boards. These local springs are normally separated and insulated from each other, but are adapted to be crossed together by an insulated metallic ring r^4 placed upon the plug h' in addition to the ordinary tip and sleeve contacts thereof. The springs r^2 are connected together and are grounded through a battery v . The remaining local springs r^3 are connected together and with the portion w of the signaling circuit extending to the switchboard. Visible signals $x x'$ are included in a signaling circuit, one upon each answering board near the corresponding springjack. The signal indicator employed comprises an electromagnet y and an armature y' carried upon a pivoted lever y^2 to the upper extremity of which an indicator y^3 is attached. The armature y' is of curved form and is arranged to swing past the pole of magnet y . A plate y^4 is placed in position to conceal the indicator y^3 when the latter is in its normal position, but is provided with an aperture through which the indicator appears when the magnet is energized, the armature being then attracted to a position opposite the pole of the magnet, and thus swinging the indicator to its alternate position.

The signaling circuit w may be closed to

earth at the switchboard d through the medium of a contact spring w' and its contact anvil w^2 , which are brought into contact when the key u is placed in position to disconnect the telephone set t from the trunk circuit $p p'$. From the contact anvil w^2 the circuit w is continued through a visible signal x^2 at the switchboard d , and through a battery v' to earth. The signaling instrument x^2 is provided with a plate x^4 whose aperture is at the opposite side from those of the instruments x and x' so that its indicator is displayed only when the magnet is not energized. The batteries v and v' are arranged with opposite poles to earth in order that when the signaling circuit is completed, the batteries shall assist each other. Other contact points $z z'$ are provided upon the key u normally separated but adapted to be closed together when the key is in position to connect the telephone set t with the trunk line, and when so closed, to complete a local circuit of the battery v' through the indicator x^2 to earth. The normal position of the key u is that in which it connects the telephone set t with the trunk line, in readiness to receive telephonic orders over the trunk line; the contact points $w' w^2$ are thus normally separated, opening the signaling circuit, while the contact points $z z'$ are closed together, completing the local circuit of battery v' through the signaling instrument x^2 and retaining the indicator thereof concealed.

In the operation of the system, assume that the subscriber at station 1 desires to communicate with subscriber at station 2. Rotating his signaling generator, he transmits signaling current over the line $a a'$ to the central office, where it finds circuit through springjack c upon the switchboard d and the answering jack g upon the answering board f to the annunciator e upon the same board, actuating the latter and notifying the attendant operator that the connection is desired. The operator then inserts a plug h of a pair into the springjack g , at the same time depressing the plunger of her listening key m , connecting her telephone n with the cord circuit $i i'$, whereby she is placed in telephonic communication with subscriber at station 1. Having received his order for connection with station 2, she inserts the remaining plug h' of the pair into the springjack q of the trunk line $p p'$ upon the answering board f . The connection of the cord circuit $i i'$ is thus extended through the contact pieces of the plug h' and the co-operating contacts of the springjack q to the corresponding sides of the trunk circuit $p p'$. The operator at once addresses the switchman at switch board d and orders the trunk line $p p'$ connected with the subscriber's line to station 2. The switchman thereupon inserts the terminal plug s of the trunk line into the springjack c' of the line to station 2, completing the connection between the two lines, the circuit being continued

through the plug from the conductors $p p'$ to the conductors $a^2 a^3$ of the line to station 2. The switchman then places the listening key u in its alternate position, disconnecting the telephone t from the trunk line. Circuit is now completed from earth at the answering board f through battery v to the spring r^2 of springjack q , thence through the ring r^4 to spring r^3 from which it finds circuit through the signal indicators x and x' and the signal line w to the switchboard d ; there the circuit is continued through the contact points $w' w^2$ and the indicator x^2 and battery v' to earth. The indicators x and x' are now caused to display their signals. The operation of indicator x signifies to the operator at answering board f that the connection ordered has been made and that the switchman has disconnected his telephone from the trunk line. The display of indicator x' upon answering board f' signifies to that operator that the trunk line $p p'$ is in use and must not be disturbed. The indicator x^2 remains still undisplayed since although the local circuit of battery v' through it was opened at contacts $z z'$ when the telephone was disconnected from the trunk line, the signaling circuit is now completed through the indicator and maintains the magnetization of its magnet. The operator at answering board f , having been thus assured that connection has been made between the trunk line and line to station 2, depresses the plunger of the calling key h' , sending a call signal to station 2 to operate the bell at the station. When the subscriber at station 2 has responded, the operator disconnects her telephone m from the plug circuit $i i'$ by permitting the plunger of listening key n to rise. When the connected subscribers have finished their conversation, one of them—for example subscriber at station 1—again rotates his calling generator, transmitting a second signaling current to the central office, where it finds circuit to the cord circuit $i i'$, and thence largely through the clearing-out annunciator i^2 , operating the annunciator and indicating the signal for disconnection to the attendant. The answering operator then removes the plugs h and h' from the springjacks. The removal of the plug h' from the springjack q opens the local circuit w , by removing the connection between the local springs $r^2 r^3$. The indicators x and x' being thus de-energized return to their normal positions, concealed from view; but the de-energization of magnet y of indicator x^2 permits this indicator now for the first time to display its signal. The switchman is thus apprised that the signaling circuit has been opened at the answering board by removing the connecting plugs to disconnect the lines, and accordingly completes the disconnection by removing the terminal plug s of the trunk line from the subscriber's springjack. He then replaces the key u in its normal position of connecting the telephone with

the trunk line circuit, whereby the local circuit is again closed through the indicator α^2 and the indicator is returned to its normal concealed position.

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

1. The combination with a trunk line extending between the terminal stations thereof 10 of provided with appliances at each station for establishing connection with the trunk line, of a signaling circuit extending between the terminal stations of the trunk line and including a signal indicator at the sending end 15 thereof, a key at the receiving end thereof adapted to control the connections of a telephone with the trunk line, and auxiliary switch contacts actuated by the said key controlling the continuity of the signaling circuit, whereby the attendant at the sending 20 end of the trunk line may be apprised of the position of the key at the receiving station, substantially as described.

2. The combination with a trunk line extending between two stations and provided at 25 each end with appliances for establishing connection with it, of a signaling circuit extending between the stations including a signal indicator at each of said stations, a switch 30 at each station controlling the continuity of the signaling circuit, the switch at the sending station being operated by the act of establishing connection with the trunk line, the switch at the receiving station being operated 35 in the reverse manner by the act of connecting the operator's telephone with the trunk line, substantially as described.

3. The combination with a telephone trunk line, of an independent signaling circuit extending 40 between the terminal stations thereof, contact springs included in the signaling circuit at one station adapted to close the circuit when connection is established with the trunk line, a listening key at the other station 45 for connecting the telephone with the trunk line, contact points controlled by the listening key adapted to open the signaling circuit when the telephone is connected with the trunk line, signal indicators in the signaling 50 circuit at each station, and a source of electric current in the circuit, substantially as specified.

4. The combination with a trunk line, of an independent signaling circuit extending between 55 the terminal stations thereof, means for establishing connection with the trunk line at either of said stations, contact points at one of said stations adapted to close the signaling circuit when connection is made 60 with the trunk line, a listening key at the other station for connecting an operator's telephone with the trunk circuit, contact points controlled by the key to open the signaling circuit when the telephone is connected with 65 the trunk line, signal indicators at each sta-

tion in the signaling circuit and switch contacts controlled by the listening key to close a local circuit containing a source of electric current through the indicator at the corresponding station when the key is in position 70 to connect the telephone with the trunk line, substantially as specified.

5. The combination with a trunk line, of a signaling circuit extending between the terminal stations thereof and normally including 75 a signal indicator at each of said stations, a local branch circuit at one of said stations including a source of electric current, and a key at that station adapted to connect the corresponding signal indicator alternately 80 into the signaling circuit and the local circuit, substantially as described.

6. The combination with a trunk line, of a signaling circuit extending between the terminal stations thereof normally open at one 85 of the stations, a signal indicator at each station, means for closing the normally open signaling circuit at one of the stations, a local circuit at the other station including a source 90 of electric current and a key adapted to include the signal indicator alternately into the signaling circuit and the local circuit, the said signal indicator being adapted to display its signal only when no current finds circuit 95 through its coils, whereby the condition of the signal indicator at one station may be altered by altering the circuit connections at either station while the condition of the signal indicator 100 at the other station is altered only by changing the circuits at the other terminal station of the trunk line, substantially as described.

7. The combination with a trunk line extending between terminal stations, of a signaling circuit extending between the same 105 stations, including a signal indicator at each station, the indicator at one of the stations being adapted to display its signal only when its magnet coils are unexcited, means for altering the continuity of the signaling circuit 110 at either station, and a local circuit adapted to be closed through the magnet coils of the indicator which displays its signal when its coils are unexcited, when the signaling circuit is opened at the corresponding terminal station, whereby the said last mentioned 115 indicator displays its signal only when the signaling circuit is opened at the other station, substantially as described.

8. The combination with a trunk line extending from an answering board to a switch- 120 man's board, of a signaling circuit extending between the same stations including at the answering board an indicator adapted to display its signal when its magnet is excited and at the switchman's board an indicator 125 adapted to display its signal only when its magnet is not excited, contact points at the answering board adapted to close the normally open signaling circuit thereat when connection is made with the trunk line, a key at 130

the switchman's section for opening the signaling circuit at that station, and a local circuit controlled by said key to be closed when the signal circuit is opened thereby, said local circuit including the magnet coils of the indicator at the switchman's board, substantially as described.

In witness whereof I hereunto subscribe my name this 4th day of April, A. D. 1893.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,
LUCILE RUSSELL.