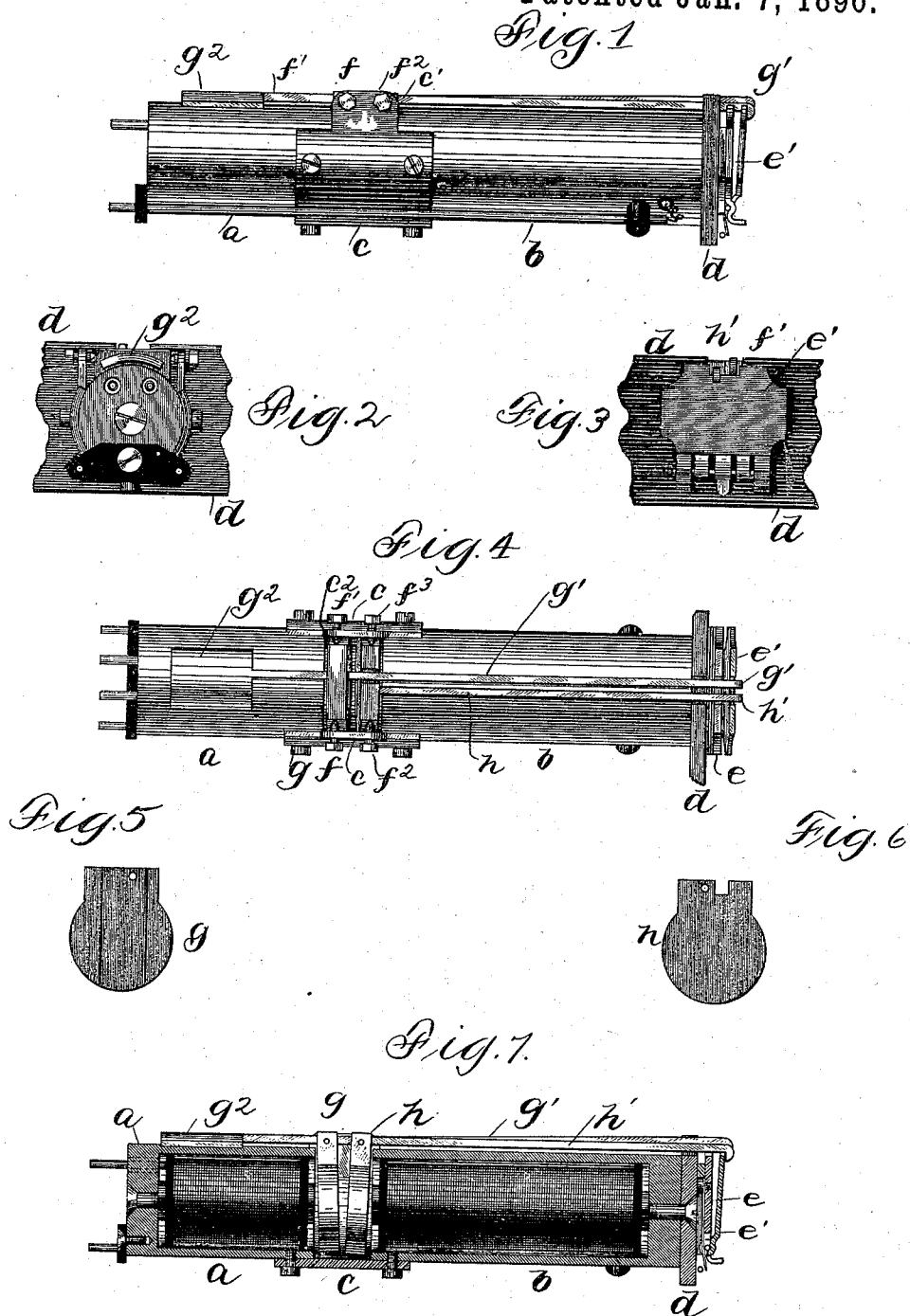


(No Model.)

2 Sheets—Sheet 1.

C. E. SCRIBNER.
SWITCHBOARD SYSTEM FOR TELEPHONE EXCHANGES.
No. 552,726.

Patented Jan. 7, 1896.



WITNESSES

George L. Cragg.
George M. Nelson.

INVENTOR

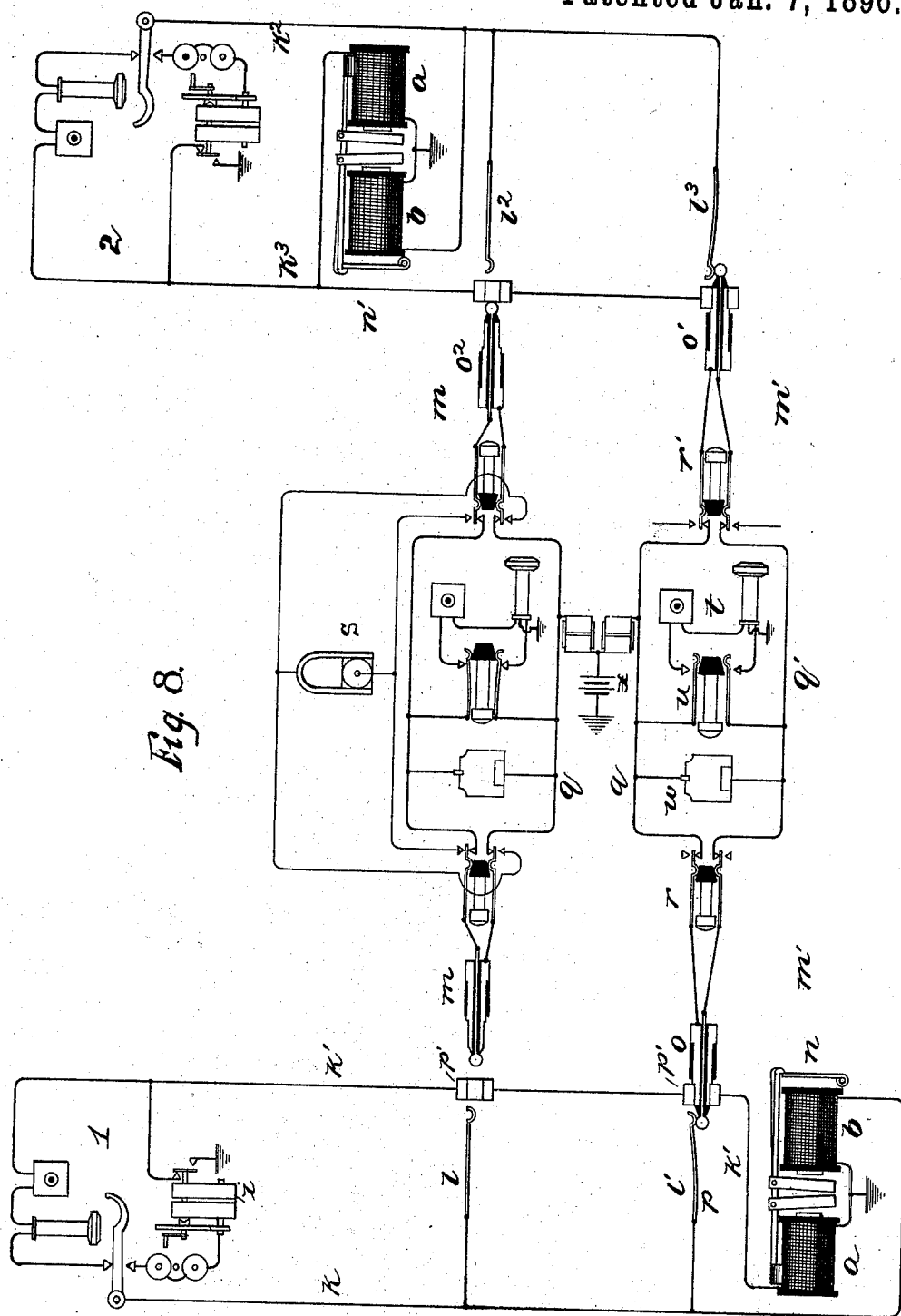
Charles E. Scribner
By *Barton Brown* Attys

2 Sheets—Sheet 2.

C. E. SCRIBNER.
SWITCHBOARD SYSTEM FOR TELEPHONE EXCHANGES.

No. 552,726.

Patented Jan. 7, 1896.



WITNESSES

George L. Cragg.
George W. Mahon.

INVENTOR

INVENTOR
Charles E. Scribner:
By Barton & Brown Attys

UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN
ELECTRIC COMPANY, OF SAME PLACE.

SWITCHBOARD SYSTEM FOR TELEPHONE-EXCHANGES.

SPECIFICATION forming part of Letters Patent No. 552,726, dated January 7, 1896.

Application filed April 26, 1893. Serial No. 471,975. (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 Switchboard Systems for Telephone-Exchanges, (Case No. 315,) 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 signaling apparatus for telephone-lines connected with multiple switchboards in a telephone-exchange system. It concerns more particularly the construction of a new form of signal-receiving annunciator and the organization of circuits in combination therewith, such that the annunciator shall be rendered irresponsive to signaling-currents during the existence of a connection with its telephone-line.

In multiple-switchboard systems for telephone-exchanges each telephone-line is connected with a terminal socket or spring-jack upon each section of the multiple switchboard and with a signal-receiving annunciator upon some one section, the different annunciators being distributed among the different sections of switchboard so as to be under the attendance of different operators. It thus becomes necessary to devise some means by which, during the connection of two lines upon one section of the switchboard, the annunciators of the lines shall be rendered irresponsive to any signal-currents which may be sent upon the lines, as from the exchange to the subscriber's station, or between the different connected subscribers' stations, in order to avoid the confusion which would arise if an annunciator of some line already connected upon a distant switchboard should respond to a signaling-current in that line.

In my invention I provide an annunciator having two independent electromagnets, a movable armature for each, and catches controlled by the different armatures, one of which catches is normally in engagement with the indicator of the annunciator, and the other of which is normally out of engagement there-
with. I connect the electromagnet whose

catch normally engages the indicator with the telephone-line so as to be in circuit of signaling-current therein, and I connect the remaining electromagnet in a normally-open local circuit controlled by contact-pieces at each switchboard, which act to close the local circuit whenever connection is made with the line. Thus as long as no connection exists with the line, only the catch controlled by the electromagnet in the line-circuit is in engagement with the indicator, and the indicator is actuated in response to the magnetization of the line-magnet by a signaling-current; but during connection with the line the normally-open local circuit is closed, and the local electromagnet may be energized to bring the catch which it controls into engagement with the indicator to prevent its operation. In one form of my invention this local circuit is connected with the line-circuit itself as a parallel branch therefrom at the exchange through contact-pieces upon the connecting-plug by means of which connection is established with the line. In this instance any signaling-current sent subsequent to the establishment of connection with the line divides at the spring-jack with which connection is made, and the different portions pass through the two electromagnets of the annunciator, thus bringing the normally-disengaged catch into engagement with the indicator and retaining the annunciator irresponsive.

I have illustrated my invention in the accompanying drawings, Sheets 1 and 2, showing my improved annunciator in detail, and also in connection with appropriate circuits and switchboard apparatus.

Referring to Sheet 1 of the drawings, Figure 1 is a side elevation of my improved annunciator. Fig. 2 is a rear elevation thereof. Fig. 3 is a front elevation. Fig. 4 is a plan of the annunciator. Fig. 5 is an elevation of one of the armatures detached from the annunciator, and Fig. 6 of the other armature. Fig. 7 is a view of the annunciator in longitudinal section. Fig. 8, Sheet 2, is a diagram showing two telephone-lines extending to the telephone-exchange, and each connected thereat with spring-jacks and with one of my improved annunciators, the connecting appa-

ratus upon the switchboards at the exchange being also shown in position of connecting the two lines together.

In the description of the figures I will indicate parts by letters and numerals of reference, similar parts being indicated by like letters and numerals throughout the different figures.

Referring to Sheet 1, *a* and *b* are two tubular magnets of ordinary construction. These are secured in axial alignment with their poles separated to a slight distance by means of a sleeve *c* of non-magnetic material, and the magnet *b* is fixed to a base-plate *d*, which may be common to several annunciators. On the opposite side or face of the plate *d* is mounted the plate *e*, and to this an indicator *e'* is hinged below and to one side of its center of gravity so as to fall outward when free. The sleeve *c* is provided with upward extensions *c'* which carry trunnions *f*, *f'*, *f²*, and *f³*. Upon the trunnions *f* *f'* and near the poles of magnet *a* is hung an armature *g*. (Seen in elevation, Fig. 5.) The armature *g* carries an arm *g'*, which extends forward through a slot in the plate *d* and terminates in a catch which is adapted to engage with the shutter *e'* when the armature *g* is attracted by its magnet. The armature is, however, normally held away from its magnet and the catch out of engagement with the shutter *e'* by a weight *g²* upon a rearward extension of the arm *g'*. Upon the trunnions *f²* *f³* is hung another armature *h*, (shown in Fig. 6,) carrying an arm *h'*, also terminating in a catch which is normally in engagement with the shutter *e'* and is disengaged therefrom when the armature is attracted to the magnet *b*. Thus in the normal position of the parts the shutter *e'* is retained in its vertical position by the catch *h'*, the catch *g'* being out of engagement with the shutter. When signaling-current finds circuit through the coil of magnet *b*, the armature *h* is attracted and releases the shutter *e'*, which falls into a horizontal position and discloses the name or number which may be painted upon the face of the plate *e* in the usual way. When, however, current finds circuit through magnet *a*, the armature *g* is attracted, bringing the catch *g'* into engagement with the shutter, and thus retaining it, independent of the magnetic condition of the magnet *b*.

Referring now to Fig. 8, I will describe the circuits therein shown in connection with my improved annunciator, and will trace the operation of the device. In the diagram two sub-stations 1 and 2 are represented. These are shown as equipped with the usual telephonic and signaling appliances, connected with a switch by which the telephone or the signaling bell and generator are switched into circuit by the removal of the telephone from the switch-hook or its replacement thereon. The calling-generator *i* is provided with the well-known automatic device by which the circuit is closed to earth while the generator is being operated. The apparatus of sub-

station 1 is connected by line-wires *k* *k'* with the switching mechanism in the exchange. This comprises two spring-jacks *l* and *l'* of the usual form, which are assumed to be located upon two different sections *m* *m'* of a multiple switchboard. The lines *k* *k'* are also permanently connected through the different coils *b* and *a*, respectively, of an individual annunciator *n* such as described. This annunciator is placed upon section *m'* of the switchboard so as to be under the attendance of the operator at that section. The apparatus of station 2 is likewise connected by lines *k²* and *k³* with spring-jacks *l²* and *l³* upon the different sections *m* and *m'* of the switchboard, and with an annunciator *n'*, which, however, is located upon the section *m* of the switchboard.

Each of the sections of switchboard is equipped with several pairs of connecting-plugs adapted for insertion into the spring-jacks, the plugs being connected together by means of flexible conducting-cords, and being also connected with telephone and signaling appliances and with the various keys for connecting and disconnecting these different appliances. One such pair of plugs with its accessory keys and connections is shown for each section *m* and *m'* of the switchboard. Thus at the switchboard *m'* the plugs *o* *o'* are provided, each having two parts insulated from each other, adapted to make contact with the spring *p* and the ring or thimble *p'*, respectively, of a spring-jack into which it may be inserted. The like parts of the two plugs are connected together through conductors *q* and *q'*. In these conductors are included the contact-points of two calling-keys *r* and *r'*, each of which is adapted to disconnect one of the plugs from the other and to connect it with the poles of a calling-generator *s*, such as shown in complete connection with the cord-circuit at the section *m* of the switchboard. Thus by depressing either of the keys the operator is enabled to send a signaling-current to the line into whose spring-jack the corresponding plug is inserted.

A telephone-set *t* is furnished for the operator, connected with the contact-anvils of a listening-key *u*, whose corresponding contact-springs are connected with the conductors *q* and *q'* of the cord-circuit, so that the depression of the listening-key *u* connects the operator's telephone-set *t* with the cord-circuit.

A clearing-out annunciator *w*, of ordinary construction, is permanently connected with the conductors *q* *q'* to receive and respond to the signal for disconnection of two lines placed in connection by means of the pair of plugs *o* *o'*.

A testing-battery *x* is connected through a retardation-coil with the conductor *q* of each cord-strand, and is thus electrically connected with the thimbles or test-rings *p'* of all the spring-jacks of a line into one of whose spring-jacks a plug is inserted. The test-rings *p'* of

any line are thus electrified to a difference of potential from the earth whenever a connection is made with the line, whereby an operator at any section of the switchboard other than that upon which the connection exists is enabled to determine whether the line is free or not by applying to the test-ring of the spring-jack at her section of the switchboard a testing-plug which is grounded through any suitable responsive device. In this instance a ground connection is extended to the center of the coil of the operator's telephone-receiver, by which the plug itself is grounded through the telephone-coil. Hence upon the application of the tip of one of the plugs to the test-ring of the line with which connection is ordered, a click is produced in the telephone if the line is in use or connected at some other section of the switchboard, by the creation of a current through the ground-circuit including the plug and the telephone. The plug o^2 of the cord-circuit at switchboard m is shown thus applied to the test-ring of the spring-jack l^2 .

In tracing the operation of establishing connection between two telephone-lines, it may be assumed that subscriber at station 1 desires connection with subscriber at station 2. The subscriber at station 1 by rotating his generator, the telephone being upon the hook, automatically closes the circuit of the generator from earth to one side of the telephone-line, at the same time disconnecting it from the other side of the line-circuit, and sends a signaling-current over the line k to the exchange, whereat it finds circuit through the coil b of the annunciator n to earth. The magnet b attracts its armature and releases the indicator e' , giving the signal to the attendant operator. The operator at the section m' inserts one plug o of a pair into the spring-jack l' of the line to the calling-station 1 and depresses the plunger of the listening-key u . When the subscriber has removed his telephone from the switch-hook, he is in position to communicate his order to the operator at the section m' of the switchboard. The operator, having received the order, tests the spring-jack of the line called for upon the same section of the switchboard by means of the remaining plug o' of the pair, and having found the tested line free inserts the plug o' fully into the spring-jack l^3 . The sub-stations 1 and 2 are now connected through a metallic circuit which may be traced from sub-station 1 over the line-wires k and k' , through the spring-jack l' and the plug o inserted therein, to the corresponding conductors $q' q$ of the cord-circuit, thence through the plug o' and the spring-jack l^3 to the line-wires $k^2 k^3$ of the line to station 2. The operator then depresses the plunger of calling-key r' , looping the calling-generator s into the circuit with the line-wires to send a call-signal to station 2. The greater portion of this signaling-current finds circuit through the line-wires $k^2 k^3$ to the sub-station and through the signal-

bell thereat; but a portion is shunted through the coils a and b of the annunciator n' of that line. Both magnets a and b are thus energized, but although the magnet b is thereby caused to release the indicator of the annunciator the magnet a at the same instant brings its catch into engagement with the indicator and retains it irresponsive. When the subscriber at station 2 has removed his telephone from the switch-hook, the circuits are in condition to permit of telephonic communication between the sub-stations. When the conversation is finished, either of the subscribers may again rotate his signaling-generator to give the signal for disconnection of the lines. It may be assumed that subscriber at station 1, at whose instance the connection was initiated, signals also for disconnection. The signaling-current thus sent finds circuit from earth over the line k to the spring-jack at which the connection is established, as before; but at that point it divides, a portion passing through the line-spring p of the spring-jack to the tip of the plug o and thence to the conductor q' of the cord-circuit, and thence largely through the clearing-out annunciator w to the conductor q , returning through the plug to the test-ring p' of the spring-jack, and thence through the retaining-coil a of the annunciator to earth. A small portion of the current also finds circuit from the cord-circuit $q q'$ to the line-wires $k^2 k^3$, and thence through both magnets of the annunciator n' of that line, but this annunciator is retained inoperative in the manner described in connection with the operation of signaling to sub-station 2. The remainder of the signaling-current takes the path from spring-jack l' through the further extension of the wire k and the coil b of annunciator n , as before; but since both magnets of this annunciator are now energized this annunciator also remains irresponsive to the signaling-current. The clearing-out annunciator is, however, free to respond to the current which finds circuit through it, and indicates to the operator the signal for disconnection. The operator, noting the fall of the shutter of this annunciator, proceeds to disconnect the lines by withdrawing the plugs o and o' from the spring-jacks.

There are various other switchboard systems known in the art to which my invention pertains, in which are provided local circuits adapted to be closed by the operation of establishing connection with the line. My improved annunciator is applicable to many of these systems, and may be readily arranged in connection with them by one skilled in the art. Hence I do not limit myself to the specific circuits and arrangement of apparatus herein shown and described, but

I claim as new and desire to secure by Letters Patent—

1. In an annunciator the combination with the indicator thereof adapted to display a signal when released, of two electromagnets, ar-

matures therefor, and catches controlled by the different armatures, one of said catches normally engaging with the said indicator, and the other normally disengaged therefrom
 5 but adapted to be brought into engagement therewith when its magnet is energized, substantially as described.

2. In combination, the electromagnets *a* and *b*, the armatures *g* and *h* for the magnets, respectively, the catch *h'* controlled by armature *h*, normally engaging with the indicator *e'*, and the catch *g'* held out of engagement with the indicator by the weight *g²*, substantially as described.

3. In combination with a telephone line, an annunciator having an indicator and two electromagnets, each of said electromagnets being provided with an armature, one of which armatures normally engages the indicator, but releases it when energized, and the other of which is normally disengaged from it but retains it when energized, the first mentioned of said magnets being permanently connected with the line circuit and the other being included in a local circuit adapted to be closed
 25 by the act of establishing connection with the line, substantially as described.

4. In combination with a telephone line extending from a substation to a central station, an annunciator at the central station having two electromagnets and an indicator, an armature controlled by one of said magnets normally engaging the indicator to prevent its display, but adapted to release it when its
 35 magnet is energized, said magnet being connected with the line circuit, another armature controlled by the remaining magnet adapted to be brought into engagement with the indicator when its magnet is energized to retain

the indicator inoperative if released by the other armature, and a normally open local branch of the line circuit including the latter magnet, adapted to be closed by the act of establishing connection with the line, substantially as described.

5. The combination with the signaling circuit of a telephone line, of an annunciator comprising two separate electromagnets controlling separate armatures, one of which is normally in engagement with an indicator to prevent its operation, and the other of which is normally disengaged from the indicator but adapted to be brought into engagement therewith when attracted, the two magnets being connected in separate parallel branches of the signaling circuit, substantially as described.

6. The combination with a signaling circuit extending from a substation to a central station and connected thereat with a spring jack and with the main or operating coil of an individual annunciator controlling an armature, of a connecting plug inserted in the spring jack, a conductor extending from the said plug through a clearing-out annunciator to the other limb of the said signaling circuit, and a retaining magnet controlling a separate armature adapted to prevent the display of the signal of the individual annunciator when the retaining magnet is energized, said retaining magnet being included in the temporary
 70 branch with the clearing-out annunciator, substantially as described.

In witness whereof I hereunto subscribe my name this 28th day of February, A. D. 1893.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,
 LUCILE RUSSELL.