

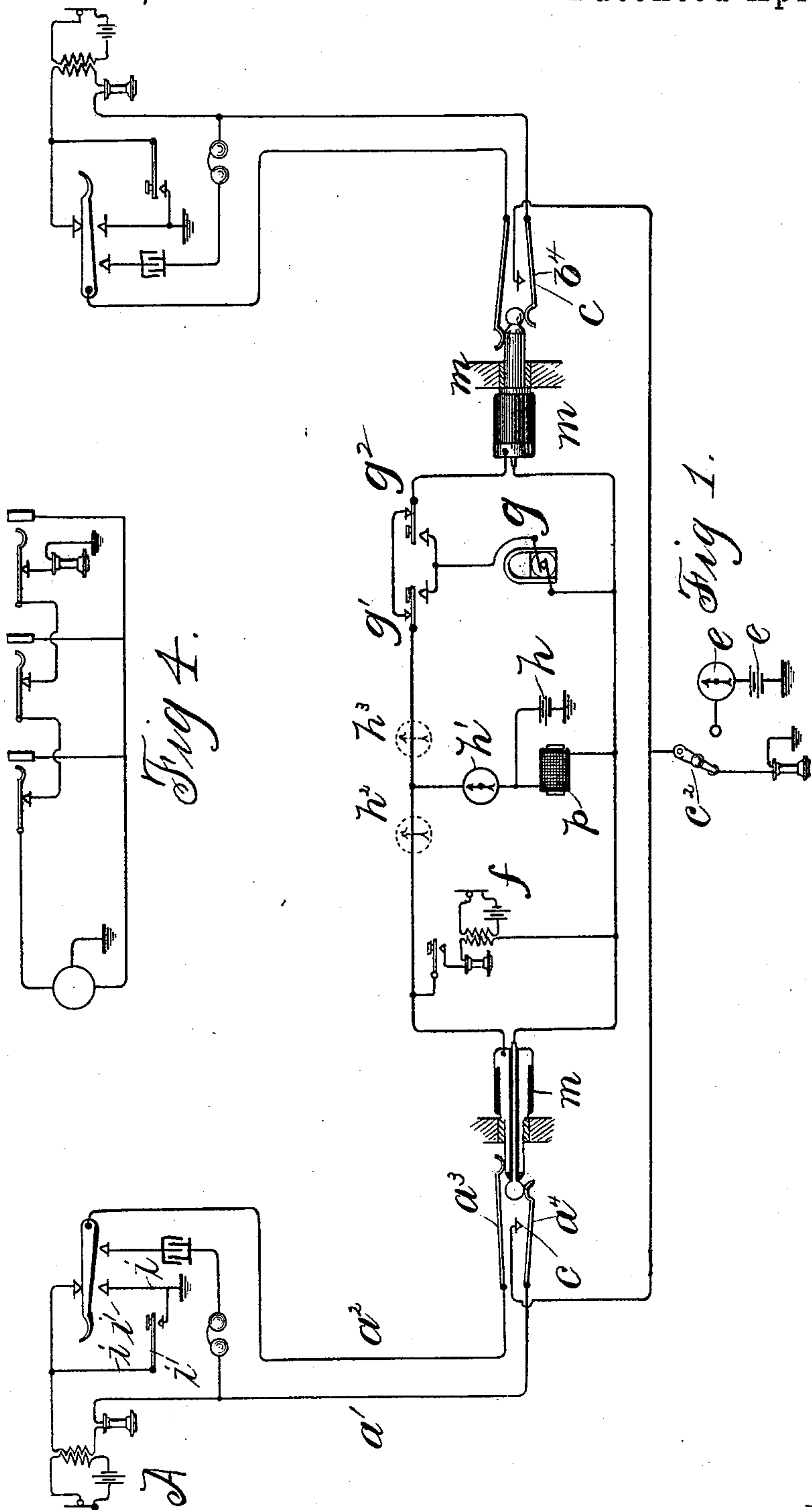
(No Model.)

2 Sheets—Sheet 1.

J. I. SABIN & W. HAMPTON.
TELEPHONE EXCHANGE SYSTEM.

No. 518,333.

Patented Apr. 17, 1894.



Witnesses:

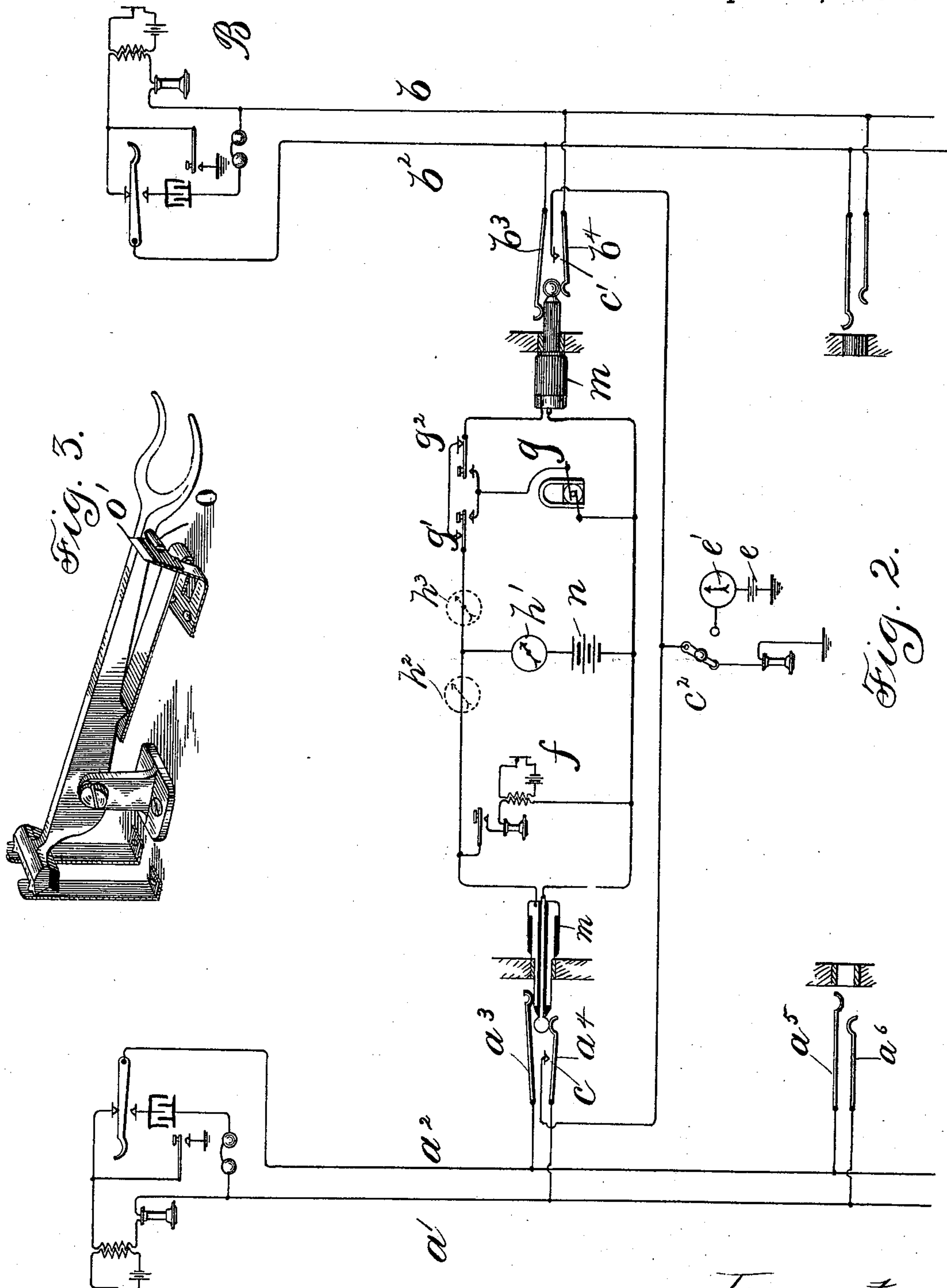
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By Collamer & Co.,
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UNITED STATES PATENT OFFICE.

JOHN I. SABIN AND WILLIAM HAMPTON, OF SAN FRANCISCO, CALIFORNIA.

TELEPHONE-EXCHANGE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 518,333, dated April 17, 1894.

Application filed March 3, 1893. Serial No. 464,509. (No model.)

To all whom it may concern:

Be it known that we, JOHN I. SABIN and WILLIAM HAMPTON, citizens of the United States, residing in the city and county of San Francisco, State of California, have invented an Improved Subscriber's Signaling and Clearing System for Telephone-Lines, of which the following is a specification.

Our invention relates to telephone systems, and its object is to reduce and render more uniform the time required to secure connection and to provide means whereby signals for disconnection and for calling may be transmitted to the central office with minimum exertion on behalf of the subscriber.

The calling-up feature of our invention, considered broadly, consists of a subscriber's metallic circuit normally open at the subscriber's station, a normal connection to ground from one limb of the circuit being provided at the central station containing an operator's cap telephone, or other calling device, the subscriber being provided with means whereby he may close the circuit to include himself directly in circuit with the operator.

The clearing-out feature of our invention, broadly considered, consists in a connection to ground from one limb of the metallic circuit, containing a battery, the battery being on an open circuit so long as the subscribers remain in conversation, means being provided at the subscriber's station for closing the said limb to ground when he desires disconnection, thereby closing the battery circuit through an indicator that conveys to the operator the desire for disconnection.

In the preferred embodiment of our invention, the limbs of the metallic circuit extend to line springs upon the several sections of the multiple switch-board, when a multiple system is used, or to a single pair of line springs upon single boards. At the section at which the subscriber is to secure his connection, a contact anvil is provided against which one of the line springs normally rests, the same being connected to ground through the operator's cap telephone. A switch is provided at the subscriber's station by means of which he may ground through his telephone the limb which is thus grounded at the central station, thereby, connecting himself directly in cir-

cuit with the operator's cap telephone. It will be understood that each operator attends to the calls of a definite number of the subscribers of the exchange, and the contact anvils belonging to the spring jacks of all such subscribers, are connected through the operator's cap telephone, so that any one of the subscribers so connected may cut himself into circuit even though the operator be holding conversation with another subscriber. The operator becomes trained in attending to the various calls, though several be calling for connection at the same time. The subscribers when in conversation are connected by a pair of plugs provided with two strands, a tip and a sleeve strand. The line spring normally in contact with the contact anvil is moved away from the same when the plug is inserted, the operator's cap telephone being thereby cut out of circuit. The operator's listening-in telephone and generator are adapted to be bridged between the cord strands. From one strand a connection extends to ground and includes a battery. This battery so long as the subscribers are in conversation is on open circuit since the subscribers talk over a metallic circuit, but when the telephones are hung on their hooks, the limb of the metallic circuit from which said ground connection extends, is closed to ground at the subscriber's station, and the battery circuit is closed to cause the clearing-out indicator to display the clearing out signal.

While we preferably employ the above described clearing-out apparatus, described and claimed in its broad features in an application, Serial No. 470,229, filed by us April 13, 1893, we have hereinafter particularly described how this system may be adapted to the calling-up apparatus of the present invention.

We will describe our invention more in detail in connection with the accompanying drawings, in which—

Figure 1 illustrates two subscribers connected together for conversation. Fig. 2 illustrates two subscribers thus connected, the cords being provided with a clearing-out apparatus different from that shown in Fig. 1. Fig. 3 is a detail view of the telephone switch. Fig. 4 illustrates a telephone line connected with a multiple switch board, the cap tele-

phone being in a ground connection from the last board.

Like letters refer to like parts throughout the several figures.

5 The limbs a' a^2 of the metallic circuit of subscriber A are connected with the line springs a^3 a^4 at the first board, and with the line springs a^5 a^6 at the second board. Likewise, the limbs b' b^2 of the metallic circuit of
10 subscriber B are connected with the line spring b^3 b^4 at the first board, and with the line spring b^5 b^6 at the second board. The spring a^4 rests normally against contact anvil c , which is connected to ground through the
15 operator's cap telephone d . Likewise the spring b^4 rests against the contact anvil c' , which is also connected to ground through the operator's cap telephone. In the ground connection is included a three-point switch c^2 by
20 means of which the operator, when she desires to remove her cap telephone, may cut the same from the circuit, and include therein the battery e , and operator's individual indicator e' . When the battery and indicator are
25 thus in circuit, the subscriber, by removing his telephone from the hook, closes the battery circuit, and the indicator displays the visual signal, thus informing the operator that a connection is desired. She may then re-
30 place the cap telephone and receive the order.

Both subscribers, A and B, are shown connected with the operator at the first board; if, however, subscriber B were connected with the operator at the second board, the contact
35 anvil c' would be placed at the second board and connected through the telephone of the operator thereat.

When in conversation, the subscribers are connected by a pair of plugs and a double
40 stranded cord. The plugs when inserted in the spring jacks, move the line springs away from their contact anvils, thereby cutting the cap telephone out of the circuit.

The operator's listening-in telephone set f
45 is included in a bridge between the two strands of the cord, and a key f' is provided whereby the telephone may be bridged into circuit. The calling generator g is likewise included in a bridge between the strands, a
50 pair of keys g' g^2 being provided whereby the calling currents may be sent through either plug. From one of the strands, the tip strand as shown in the figure, a connection to ground is provided containing a battery h .
55 So long as the subscribers are in conversation over the metallic circuit, the circuit of battery h is open, but when the limb of the circuit to which said battery is attached is connected to ground, the battery circuit is closed
60 and current traverses the clearing-out indicator, which displays the visual signal for disconnection. A single indicator h' may be used included in the ground connection, or two indicators h^2 h^3 may be used, placed in
65 the tip strand, one on either side of the ground connection. In the former case, the visual signal is displayed when either or both sub-

scribers hang up their telephones, while in the latter case the indicator h^2 does not display its signal until subscriber A hangs up
70 his telephone, and the indicator h^3 , not until subscriber B hangs up his telephone. With either construction one of two connected subscribers may signal the operator for a new
75 connection; thus, when the single indicator is used, the subscriber who does not desire re-connection, merely hangs up his telephone, while the other subscriber by means of his
80 telephone hook repeatedly opens and closes the battery circuit, thereby causing the movable member of the indicator to vibrate to call the attention of the operator. When two
85 indicators are used, the operator observing that but one displays the visual signal for disconnection, may bridge her listening-in telephone set into circuit and receive the order, or, if she does not immediately notice
90 the signal thus indicated, the subscriber may repeatedly open and close the battery circuit by means of his telephone hook, thereby causing the removable member of his individual
95 clearing-out indicator to vibrate to call the attention of the operator. The indicator preferably employed is one that displays black when at rest, and white when a dis-connection
100 is desired, so that the rapid change from black to white readily attracts the attention of the operator. A resistance coil p may be included in a line extending from the sleeve strand to the ground connection, to balance for electrostatic discharges, but it may be dispensed with.

The subscriber's station apparatus comprises the usual bell and telephone set in separate circuits, while a normally open ground
105 connection i is provided so located with respect to the telephone set, that when closed by a key i' , said telephone set will be included in circuit with the operator's cap telephone at the central office. A second ground
110 connection l is provided which terminates in a contact anvil l' adapted to make contact with the telephone hook when the latter is depressed.

We will now describe the several operations required to secure connection between
115 two subscribers. Suppose subscriber A desires to talk with subscriber B; having removed his telephone, subscriber A depresses key i' , thereby including his telephone directly in circuit with the operator's cap telephone. Having received the number of subscriber B, the operator inserts plug m' into
120 the spring jack of subscriber B, and bridges her listening-in telephone set between the cord strands. If B is busy in conversation through a connection at some other board, there will be a difference of potential between the line springs of the spring jack, and as
125 the plug is inserted, she will hear a click in her telephone. If subscriber B be not busy, the operator inserts plug m in the spring jack of subscriber A, and depresses ringing
130 key g^2 to send a calling current to subscriber

B. Subscriber B having responded, she cuts out her telephone set and the subscribers are in connection. When the conversation is completed, the subscribers hang up their tele-
 5 phones, thus closing the battery circuits through ground at the subscribers' stations and causing the indicator to display the signal for dis-connection. Should either sub-
 10 scribe desire a re-connection with some other subscriber, it can be obtained in a manner hereinbefore pointed out.

It will be observed that when the telephones are hung up, the battery current will continue to flow through the clearing-out indicator un-
 15 til the operator removes the plug. It is sometimes desirable that the clearing-out signal may be of but short duration, and in order to accomplish this, the circuit to ground is closed only during the descent of the telephone hook,
 20 the circuit being opened when the hook reaches its lowermost position. In Fig. 3, we have shown in detail a form of telephone hook adapted to accomplish this result; the hook is
 25 provided with a pin *o* which engages with the metallic upper surface of a flat spring *o'* in its descent, the spring, however, being cut away so that the pin does not make contact therewith when it has reached the bottom of
 30 its stroke. The pin makes contact with the under side of the spring *o'* during the ascent of the hook, the under side being insulated so that the pin does not close circuit there-
 through during the ascent of the hook.

In Fig. 2, we have illustrated our present
 35 invention, so far as it relates to the calling-up feature, as used in connection with the clearing-out apparatus of a concurrently pending application before referred to. A
 40 battery *n* is provided in a bridge between the strands of the cord, and either a single indicator is placed in said bridge, or two indica-
 45 tors are used, placed in the strands, one upon each side of the bridge. When thus employed, the current from the battery *n* traverses the
 50 indicator so long as the telephones remain off the hooks, but when they are replaced thereon the battery currents are interrupted to give the visual signal. When this form of
 clearing-out apparatus is used, the ground
 55 connection that is closed when the telephone hook is hung up, may be omitted, since the visual signal for dis-connection is displayed when the metallic circuit is broken by hang-
 ing up the telephone.

In an application, Serial No. 465,791, filed by us we have described a telephone system embodying the general features of the pres-

ent invention, and so far as claims therein, cover the apparatus of the present case, the present application is to be considered as sub- 60
 sidiary thereto.

Our invention evidently is susceptible of many modifications, and we do not therefore desire to limit ourselves to precise construc- 65
 tions.

Having described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination with a metallic circuit telephone line extending to the central sta- 70
 tion, of a normally closed ground branch from one limb of said line, through an operator's telephone, a ground connection at the sub-
 scriber's station adapted to be closed to in-
 75 clude the subscriber's telephone set in circuit with the operator's telephone, double strand cord connectors adapted to loop the telephone
 line in circuit with another line at the cen-
 80 tral station, a ground branch from one of the strands of said connector including a battery, a self restoring clearing out indicator in cir-
 85 cuit with said battery, and means at the sub-
 scriber's station for opening or closing the circuit through said battery, substantially as described.

2. The combination with two metallic cir-
 90 cuit telephone lines looped together at the central station by a double strand cord con-
 ductor, of a ground connection from one of the strands of said cord conductor, a battery
 in said ground connection, a self restoring in-
 95 dicator in circuit therewith, and means for closing a ground branch at the subscriber's station to complete the circuit of said battery
 through the clearing out indicator, substan-
 tially as described.

3. The combination with two metallic cir-
 100 cuit telephone lines looped together at the central station, of a ground branch from one limb of the metallic circuit thus formed, a
 battery in said ground branch, a self restor-
 ing indicator in circuit therewith, and means
 105 for closing a ground branch at the subscrib-
 er's station when the subscriber hangs up his telephone, thereby completing the circuit of
 said battery through the clearing out indica-
 tor, substantially as described.

In testimony that we claim the foregoing we have hereunto set our hands and seals.

JOHN I. SABIN. [L. S.]

WILLIAM HAMPTON. [L. S.]

Witnesses:

EDWARD E. OSBORN,
 R. M. EDWARDS.