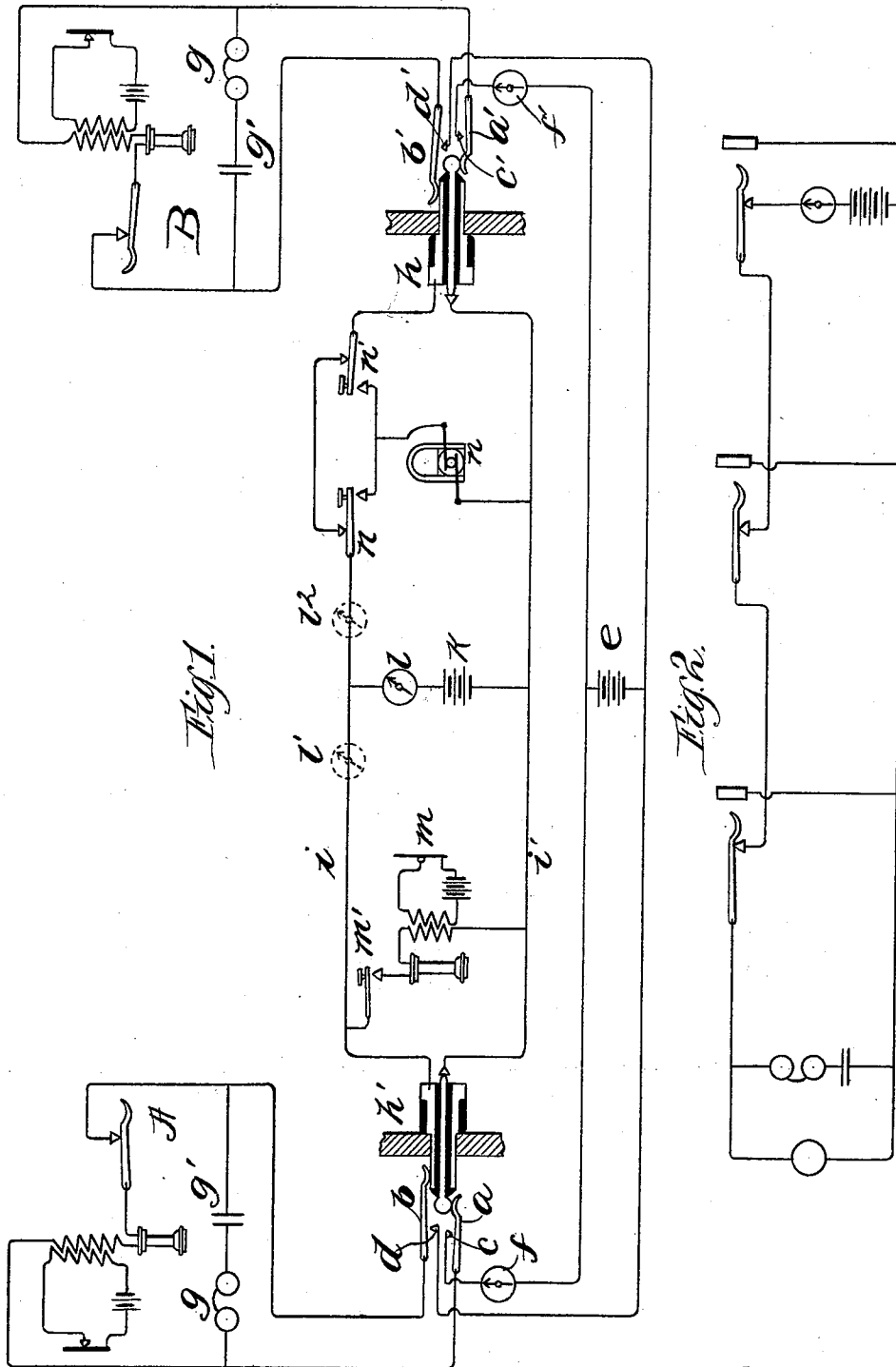


(No Model.)

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TELEPHONE EXCHANGE SYSTEM.

No. 518,331.

Patented Apr. 17, 1894.



Witnesses.

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UNITED STATES PATENT OFFICE.

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TELEPHONE-EXCHANGE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 518,331, dated April 17, 1894.

Application filed January 19, 1894. Serial No. 497,414. (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 at San Francisco, in the county of San Francisco and State of California, have invented a certain new and useful Improvement in Telephone Systems, (Case No. 6,) 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.

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 station with minimum exertion on behalf of the subscriber.

Our invention in its preferred embodiment comprises means whereby the subscriber may automatically signal the operator for connection and disconnection by removing the telephone receiver from its hook in the first instance, and by replacing it thereon in the second instance. Again, means are provided whereby one of two connected subscribers may transmit to the operator a selective signal indicating a desire for connection with another subscriber, and, further, the necessity of the operator's bridging her telephone into circuit to determine whether or not the conversation is completed, is obviated. An individual calling indicator and a battery are included in a bridge at the central station, the circuit through the battery being normally open at the subscriber's station whereby the subscriber, by closing the circuit, may actuate the indicator to signal the operator. A battery and a clearing-out indicator are included in a bridge between the strands of the cord connectors at the central station, circuit through the battery being closed so long as the subscribers remain in conversation to actuate the indicator and give the visual busy signal. When, however, the subscribers hang up their telephones, circuit through the battery is interrupted, and the indicator conveys the signal for disconnection. Instead of the one clearing-out indicator, two may be used placed in the strands, one upon each side of the bridge containing the battery, and when so employed, a clearing-out indicator is

individual to each of two connected subscribers.

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

Figure 1 is a diagrammatic view showing two subscribers connected together for conversation, after the manner of our invention. Fig. 2 is a diagrammatic view showing a manner of applying our invention to multiple switch board systems.

Like letters refer to like parts throughout both views.

In Fig. 1 we have illustrated the subscribers' lines extending to a single board at the central station, it being understood that our invention may equally be applied to multiple boards, as illustrated in Fig. 2, or by extending the lines to switches in multiple at other boards, in which case it would be preferable to extend the local circuit containing the calling indicator through the several spring jacks so that a connection made at any board would serve to cut the indicator from circuit. The spring jacks at the switch board comprise each a pair of springs *a b*, *a' b'*, adapted to make contact respectively with the sleeve and the tip of a plug adapted to be inserted therein. The springs normally rest against contact anvils *c d*, *c' d'*, which are connected to the opposite sides of a source of electricity, such as a battery *e*, a galvanometer *f*, or other device responsive to the passage of an electric current being provided in circuit with the battery and mounted upon the board so that it may be observed by the operator. The several circuits thus formed through the individual indicators *f f'* and the battery *e* are normally open at the subscriber's station to the passage of the continuous battery current, while means are provided at the subscriber's station whereby he may close the circuit, thus completing the battery circuit through his particular individual indicator to signal the operator for connection. We preferably secure the normal opening of the circuit at the subscriber's station by so arranging the telephone hook that when the telephone is hung thereon the circuit is maintained open, but is closed when the telephone is removed therefrom.

The subscriber's bell *g* is included in a

bridge between the two sides of the line and is included in circuit with a condenser g' so that the battery current is prevented from traversing the bridge containing the bell.

5 The battery circuit is thus controlled entirely by the subscriber's hook switch, being closed when the telephone is removed, and open when the telephone is hung up. The condenser permits the passage of the alternating

10 current from the operator's generator.

The central station apparatus comprises a number of pairs of plugs, but one pair $h h'$ being shown in the drawings, each plug being provided with a tip adapted to make contact

15 with the shorter of the line springs, and with a sleeve adapted to make contact with the longer of the line springs. The tips and the strands of the plugs are respectively connected together by tip and sleeve strands $i i'$.

20 In a bridge between the two strands is included a battery k and a clearing-out indicator l . Instead of the single clearing-out indicator, a pair of indicators $l' l''$, one individual to each of the subscribers, may be employed, placed in the strands, one upon each

25 side of the bridge containing the battery.

Ringings keys $m m'$ are provided adapted, when depressed, to sever the connection between the plugs and to connect one of the

30 plugs with the calling generator n . The operator's telephone set m is included in a bridge between the tip and sleeve strands, a bridging-in key m' being provided adapted to connect or disconnect the telephone set.

35 We will now describe the several operations necessary to secure connection between two subscribers. Subscriber A, desiring connection with subscriber B, removes his telephone from the hook, thus completing the circuit

40 of battery e through individual indicator f , thereby notifying the operator, who inserts plug h' into the spring jack of subscriber A, the springs $a b$ being thereby moved away from the contact anvils $c d$ to open the circuit through the individual indicator f . The

45 operator next bridges her telephone into circuit and receives from A the number of the called subscriber B. She then inserts plug h into the spring jack of subscriber B. If B is

50 engaged in conversation with some other subscriber through a connection at another board, there will be a difference of potential between springs a' and b' , and the closing of the circuit through the operator's telephone by the

55 insertion of the plug, will cause a click in the telephone, indicating that the line is busy. If the line be not busy she will hear no click upon inserting the plug, and she will then depress ringing key m' , thereby sending current from the alternating current generator

60 n through B's bell, the alternating current passing freely through the bridge containing the condenser and bell. B having removed his telephone from its hook, is in communication with A, and the operator cuts out her

65 telephone. When the subscribers have completed conversation and hang up their tele-

phones, the clearing-out indicator l informs the operator of the fact and she removes the plugs.

70 It will be observed that when each subscriber has an individual clearing-out indicator, as indicated in dotted lines, the operator may cut out her telephone as soon as the plug has been inserted in the spring jack of the

75 called subscriber, the fact that the called subscriber has responded and is in communication being indicated by the visual signal of his individual clearing-out indicator. And when either double or single clearing-out

80 indicators are employed, the operator is not at the necessity of bridging her telephone into circuit from time to time to learn if the subscribers are through conversation and have

85 forgotten to ring off, as has been necessary heretofore, for so soon as the telephone is hung up at the completion of the conversation, the clearing out indicator visually conveys this fact to the operator.

Should one of the connected subscribers

90 desire a reconnection with some other subscriber, he has but to move his telephone hook up and down several times, thus causing the visual signal of the clearing out indicator to rapidly change, to attract the attention of

95 the operator.

In an application, Serial No. 490,950, filed November 15, 1893, we have described a telephone system similar in some respects to the present invention, and so far as matter shown

100 therein is claimed in the present application. Said application is to be considered subsidiary hereto, and vice versa.

Our invention is susceptible of many modifications, and we do not, therefore, desire to

105 limit ourselves to precise details.

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

1. In a telephone system, the combination

110 with a metallic circuit telephone line, of an individual indicator and battery in a bridge of said circuit at the central station, a calling device in a permanent bridge of the subscriber's station, means at the subscriber's

115 station for short-circuiting said permanent bridge to close said battery operatively in circuit with said indicator to operate the same, and means for cutting out said battery and indicator when connection is made at the central station with said metallic circuit, substantially as described.

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2. In a telephone system, the combination with a metallic circuit telephone line, of an individual indicator and battery at the central station in a bridge of said metallic circuit, a permanent bridge at the subscriber's station containing a calling device, a normally open telephone circuit around said bridge, and means for closing said telephone circuit

125 to include said battery operatively in circuit with said individual indicator to actuate the same, substantially as described.

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3. In a metallic circuit telephone system,

an individual annunciator and battery at the central station in a bridge of the metallic circuit, a condenser and bell at the subscriber's station connected in a permanent bridge of said metallic circuit, a normally open telephone circuit around said bell circuit, and means at the subscriber's station for short-circuiting said bell circuit, substantially as described.

4. In a metallic circuit telephone system, an individual annunciator and battery at central station in a bridge of the metallic circuit, a normally open telephone circuit at the subscriber's station, means for closing said telephone circuit and means for cutting out said annunciator and battery, substantially as described.

5. In a metallic circuit telephone system, an individual annunciator and battery at central station connected in a separable bridge of the metallic circuit, a condenser and bell at the subscriber's station connected in a permanent bridge of said metallic circuit, a normally open telephone circuit and means for closing same at subscriber's station, to shunt the bell circuit, substantially as described.

6. In a metallic circuit telephone system, an individual annunciator and battery at central station connected in a bridge of the metallic circuit, a condenser and bell at the subscriber's station connected in another bridge of said metallic circuit, a normally open telephone circuit, means for closing same, and means for cutting out said annunciator and battery, substantially as described.

7. In a metallic circuit telephone system, an individual annunciator and battery at central station connected in a bridge of the metallic circuit, a condenser and bell at the subscriber's station connected in another bridge of said metallic circuit, a normally open telephone circuit, means for closing same, a clearing out annunciator at the central station, and means for simultaneously cutting out said individual annunciator and battery, and cutting in said clearing out annunciator, substantially as described.

8. In a telephone system, the combination with a metallic circuit connecting two subscribers' stations and including the primary of the transmitter induction coil at each station, of two clearing out annunciators at the central station, and a battery included in a bridge of said metallic circuit between said clearing out annunciators, substantially as described.

9. In a telephone system, the combination with a metallic circuit connecting two subscribers' stations, of a bridge at each of said stations containing a bell and condenser,

clearing out annunciators at the central station, a battery included in a bridge of said metallic circuit between said clearing out annunciators and a generator adapted to be connected through said metallic circuit with either one of said subscribers' stations, substantially as described.

10. In a metallic circuit telephone system, the combination with a condenser and bell permanently connected in a bridge of the metallic circuit at each subscriber's station, of a battery connected in a separable bridge of each of said circuits, an individual indicator in circuit therewith a generator at the central station adapted to be temporarily connected in individual circuit with each bell and condenser, substantially as described.

11. In a metallic circuit telephone system, the combination with an individual annunciator and battery in a bridge of the metallic circuit at the central station, of means for automatically cutting out said battery and indicator when connection is made at central station with said metallic circuit, and a generator at the central station adapted to be looped into said metallic circuit.

12. In a telephone system, the combination with a telephone line extending to the central station, of a battery and an individual indicator in a bridge at the central station, means for cutting said battery and individual indicator from line by the act of making connection therewith at the central station, and a battery and clearing-out indicator adapted to be bridged between the two sides of said line by said act of connecting with the line, substantially as described.

13. In a telephone system, the combination with a battery and individual indicator in a bridge of the telephone line at the central station, of means at the subscriber's station for operatively closing said battery in circuit with said indicator to operate the same, means for cutting said battery and indicator from the line by the act of making connection therewith at the central station, a clearing-out indicator, a battery adapted to be bridged between the two sides of the telephone line by the act of connecting therewith, and means at the subscriber's station for controlling the circuit of said battery through said clearing-out indicator, substantially as described.

In witness whereof we hereunto subscribe our names this 2d day of January, A. D. 1894.

JNO. I. SABIN.
WM. HAMPTON.

Witnesses:

JNO. A. MALLORY,
WM. F. MARTIN.