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TELEPHONE SYSTEM.

APPLICATION FILED NOV. 5, 1900.

NO MODEL.

Fig. 1.

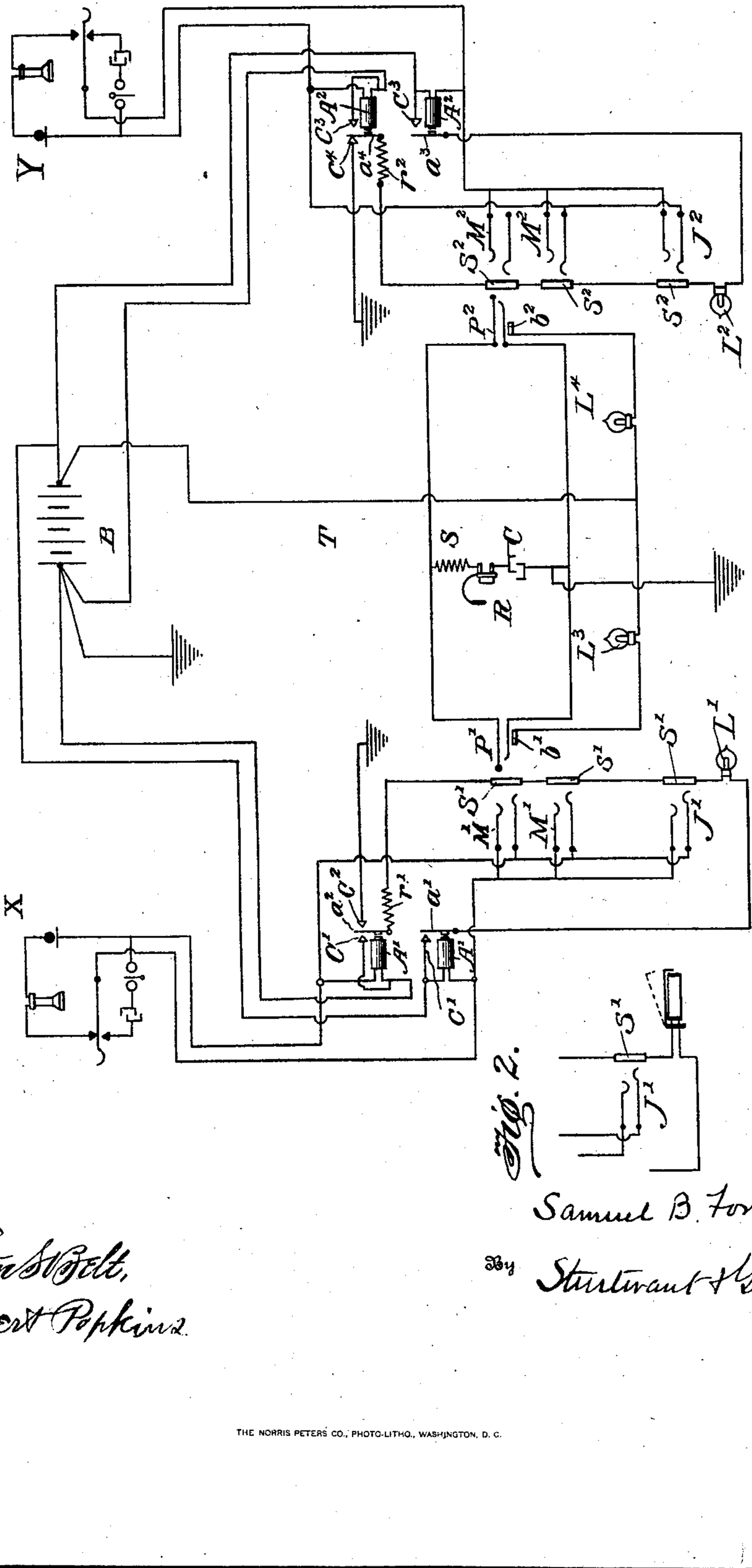

Fig. 2.

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TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 721,882, dated March 3, 1903.

Application filed November 5, 1900. Serial No. 35,446. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL B. FOWLER, a citizen of the United States, residing in the city of Morristown, in the State of New Jersey, have invented certain new and useful Improvements in Telephone Systems, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

This invention relates to common-battery telephone systems or systems in which the battery or other source of electrical energy is centralized at one point and in which local batteries at the subscribers' stations are or may be dispensed with. The invention is particularly concerned with that part of such a system which is comprised in the circuits of the switchboard in the central office or exchange. The objects attained by the invention are the simplification of the signaling-circuits, particularly the cord-circuit, the provision of a positive busy test, and the doing away with the need of cutting off the signaling battery-current and the substitution of another current for talking.

The invention will be fully described hereinafter with reference to the accompanying drawings, Figure 1 of which represents, diagrammatically, a telephone system established in accordance with the invention; and Fig. 2 shows a substitute form of line-signal.

In the drawings two subscribers' stations X and Y are shown with their lines extended to the switchboard, a station X being shown with the receiver off the hook and the apparatus at the switchboard in the position or condition for giving to the operator the signal to plug into the line. Station Y is shown with the receiver on the hook, and its connections and the corresponding apparatus at the switchboard in the normal or usual condition of a circuit not in use. At the switchboard or exchange one complete cord-circuit is shown, together with all other parts of the switchboard with which the invention is concerned. For the sake of clearness the plugs of the cord-circuits are not shown as actually inserted in the jacks, and other parts of the usual switchboard apparatus, such as the ringing-key and the operator's cam, with which the invention is not directly concerned, are not represented at all. As represented in the drawings, the two wires from each station come direct to the multiple jacks M' and M^2 of the usual switchboard arrangement, and thence to the line or answering jacks J' and J^2, respectively. At any convenient point before these wires are connected to the multiple jacks the line-drop or signaling apparatus for each station is bridged on the line of that station. The relay or relays of the annunciator or line-drop (by which terms the signaling apparatus for the operator will be referred to hereinafter regardless of the particular nature of the signaling devices) control the signaling-circuit through the armatures a' and a^2 and may consist for convenience of two single-pole relays, which are indicated in the drawings at A'. From the armature-terminal a' the conductor extends to the line-signal L', which is preferably an incandescent lamp, but may be a drop-signal, as shown in Fig. 2, thence to all of the sockets s' of the jacks J' and M', and thence back to the armature a^2, a resistance r' being included between the armature a^2 and the nearest jack-socket s'. In the line-signal L', as shown in Fig. 2, the solid line shows the position of the shutter when the line is not in use, the dotted line showing the position of the shutter giving the signal when the line has been closed at the subscriber's instrument. A front contact c' is provided for each armature a' and a^2 for electrical connection therewith when the relay or relays are energized, these contacts c' being connected to the opposite poles of the common battery B. A back contact c^2 is provided for electrical connection with the armature a^2 when the relay or relays are not energized, the back contact c^2 being connected to the earth or other common return-circuit. Station Y is similarly connected to the multiple jacks M^2, and the line or answering jack J^2 and the relays A^2 of the line-drop are connected to the line in the same manner, controlling the armatures a^3 and a^4, which are connected to the line-signal L^2, jack-sockets s^2, and resistance r^2, the front contacts c^3 being connected to opposite poles of the common battery B and the back contact c^4 of the armature a^4 being connected to earth or the common return-circuit. The cord-circuit,

as usual, terminates in two plugs P′ and P², commonly called the "answering-plug" and the "calling-plug." The two tips and the two sleeves of these plugs are electrically connected in the usual manner, and there is shown bridged across the two conductors the secondary circuit of an operator's set, which may comprise the secondary S of an induction-coil, a receiver R, and a condenser C, while a ground connection is shown from the operator's circuit on the opposite side of the condenser from the receiver. In addition to the tip and sleeve conductors of the cord-circuit a third conductor is shown, terminating in connections, which are marked, respectively, b' and b^2, such connections being adapted to make electrical contact with the sockets s' and s^2 when the plugs are inserted in the jacks. Included in this third conductor is a clearing-out drop or signal L³ and a supervisory drop or signal L⁴, both signals being preferably incandescent lamps. From the point between the two lamps connection is established through wire T with one pole of the common battery B, the other pole being connected to earth or a common return-circuit. The relays A′ and A² have one terminal of each connected to the respective station-circuits and the other terminal of each connected, respectively, to the opposite poles of the common battery B.

The operation of a telephone system established in accordance with this invention is as follows: The lifting of the receiver from the hook at station X closes the circuit in the usual manner and allows current to flow from the common battery B through the relay-coils A′ out on the line and through the instrument at station X. The relays A′ being energized, the armatures a' and a^2 are attracted and make contact with the front contacts c'. This allows current from the common battery to flow through the circuit including the line-signal L′, which if a lamp is thereby illuminated or if a drop-signal is operated to throw the shutter into the position shown in dotted lines in Fig. 2. The lamp should be one requiring less than the voltage of the common battery, and as it has the resistance r' in series with it only sufficient current flows over the circuit to properly illuminate the lamp. If before the operator has time to answer or at any other time while the receiver is off the hook some other subscriber wishes to be connected to station X, the operator making the busy test touches the tip of any plug in which the operator's set is connected to the sockets s' on the line of station X. Current will at once flow to charge the condenser from the ground connection at the common battery to the ground connection of the operator's set by way of the contact c', armature a', and socket, and the disturbance set up in the receiver will be notice to the operator that station X is busy. In contradistinction from the operation of the usual busy test this device will always test busy if the receiver is off the hook, and, furthermore, the current working this busy test is applied to the jack-sockets by the action of the user of the instrument and does not depend on the insertion of the answering-plug. In answering the call the operator inserts plug P′ in jack J′, whereby the contact b' of the plug makes electrical connection with the socket s' of the jack J′. This at once provides for the current flowing through resistance r' to the line-signal or lamp L′ another path through contact b', clearing out lamp L³ and conductor T. The resistance of the lamps and the resistance r' are so proportioned that while the total current flowing through resistance r' is sufficient to light either lamp, yet when this current is divided between the two lamps there is not enough current flowing through either to light it. Therefore when the answering-plug is inserted in the jack J′ the line-signal L′ is extinguished. The operator completes the desired connection by inserting the calling-plug P² in the multiple jack M² of station Y, the contact b^2 of the plug P² making electrical connection with the socket s^2 at the same time. As the line of station Y is not in use at this instant, the receiver being on its hook, this station-circuit is open, the relays A² are not energized, the armatures a^3 and a^4 are not drawn up, and armature a^4 is in electrical connection with the ground through its back contact c^4. Current therefore flows from the common battery B through the wire T, supervisory lamp L⁴, contact b^2, socket s^2, resistance r^2, armature a^4, and back contact c^4 to ground and back to the battery B. The supervisory lamp L⁴ is therefore lighted and remains lighted until station Y answers the call, when, the receiver at Y being removed from the hook, current flows through the coils A², drawing up the armatures a^3 and a^4 and breaking the ground-circuit at c^4. This extinguishes the supervisory lamp L⁴, indicating that station Y has answered. Current still flows through the resistance r^2; but as it is divided between the line-signal lamp L² and the supervisory lamp L⁴ neither of them is lighted. When conversation is finished, the hanging up of the receivers at the respective stations X and Y will stop the flow of current through the respective relays A′ and A², their armatures will fall back, and sufficient current from the common battery will flow through the clearing-out lamp L³ and the supervisory lamp L⁴ over the earth circuit to light these lamps, thus giving to the operator the signal to disconnect or clearing-out signal. When the plugs are removed from the jacks, the lamps L³ and L⁴ will be extinguished.

It will be seen that the two lamps in the third conductor of the cord-circuit work independently of each other and that the working of the hook at either station to open and close the circuit alternately will cause the "flashing" of the corresponding lamp in the

third conductor, and thus furnish a positive signal for the operator to connect into the circuit.

I claim as my invention—

1. In a common-battery telephone system, the combination of a subscriber's line, a common battery, and a local annunciator-circuit controlled thereby, a relay permanently bridged on the line in series with the common battery, and an annunciating device also in series with the common battery when the relay is energized.

2. In a common-battery telephone system the combination of a subscriber's line, open when not in use, a common battery connected to ground, a relay bridged on the line in series with the common battery, a circuit including the sockets of all the multiple jacks of the line and adapted to be connected by the action of said relay to the common battery, and an operator's set having a connection to the ground and adapted to be connected electrically to any of said sockets.

3. In a common-battery telephone system the combination of a subscriber's line, open when not in use, a common battery connected to ground, a relay bridged on the line in series with the common battery, a circuit including the sockets of all the multiple jacks on the line and adapted to be connected by the action of said relay to the common battery, a cord-circuit, and an operator's set having a connection to the ground bridged on said cord-circuit.

4. In a common-battery telephone system the combination of a subscriber's line, open when not in use, a common battery, a relay bridged on the line in series with the common battery, a circuit including the sockets of the jacks on the line and also including a lamp and a resistance and adapted to be connected by the action of the relay to the common battery, and a conductor connected to the common battery and adapted to be connected to any of said sockets, whereby a second path from said circuit to the common battery is offered and the current through the lamp is thereby reduced to extinguish the same.

5. In a common-battery telephone system the combination of a subscriber's line, open when not in use, a common battery, a relay bridged on the line in series with the common battery, a circuit including the sockets of the jacks and also including a lamp and a resistance and adapted to be connected by the action of the relay to the common battery, a cord-circuit, and a third conductor incorporated with the cord-circuit and having terminals for contact with said sockets and a connection to the common battery whereby a second path from said circuit to the common battery is offered and the current through the lamp is thereby reduced to extinguish the same.

6. In a common-battery telephone system the combination of a subscriber's line, open when not in use, a common battery connected to ground, a relay bridged on the line in series with the common battery, a circuit including the sockets of the jacks and a resistance between the sockets and one terminal and adapted to be connected by the action of said relay to the common battery, a back contact for said terminal connected to the ground, and a conductor connected to the common battery and adapted to be connected to any of said sockets and including a lamp, whereby when the line is open and said terminal is against its back contact current is caused to pass through said lamp.

7. In a common-battery telephone system the combination of a subscriber's line, open when not in use, a common battery connected to ground, a relay bridged on the line in series with the common battery, a circuit including the sockets of the jacks and a resistance between the sockets at one terminal and adapted to be connected by the action of said relay to the common battery, a back contact for said terminal connected to the ground, a cord-circuit, and a third conductor incorporated with the cord-circuit and having a terminal for contact with any of said sockets, including a lamp and connected to the common battery, whereby when the line is open and the terminal of said circuit is against its back contact current is caused to pass through said lamp.

8. In a common-battery telephone system the combination of a subscriber's line, open when not in use, a common battery connected to ground, a relay bridged on the line in series with the common battery, a circuit including the sockets of the jacks and a resistance between the sockets and one terminal and adapted to be connected by the action of said relay to the common battery, a back contact for said terminal connected to the ground, a conductor adapted to be connected to any of said sockets and including two lamps, and a connection from said conductor, at a point between said lamps to the common battery.

This specification signed and witnessed this 29th day of October, A. D. 1900.

SAMUEL B. FOWLER.

In presence of—

A. N. JESBERA,

W. B. GREELEY.