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TELEPHONE CIRCUIT

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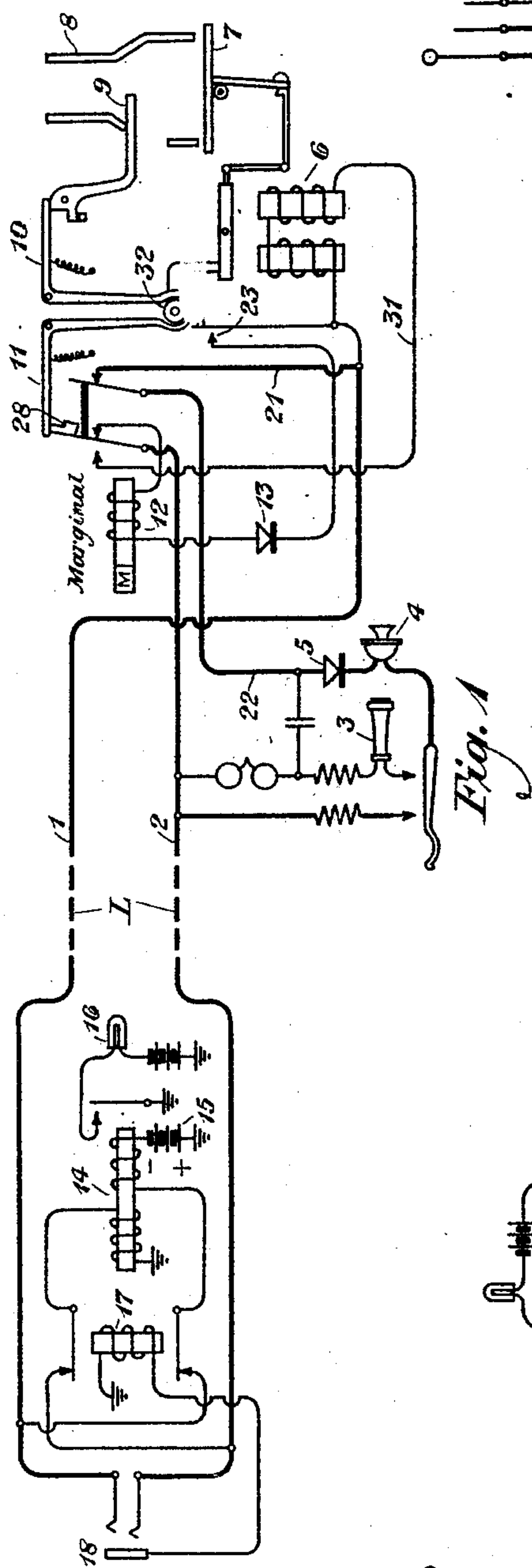


Fig. 1

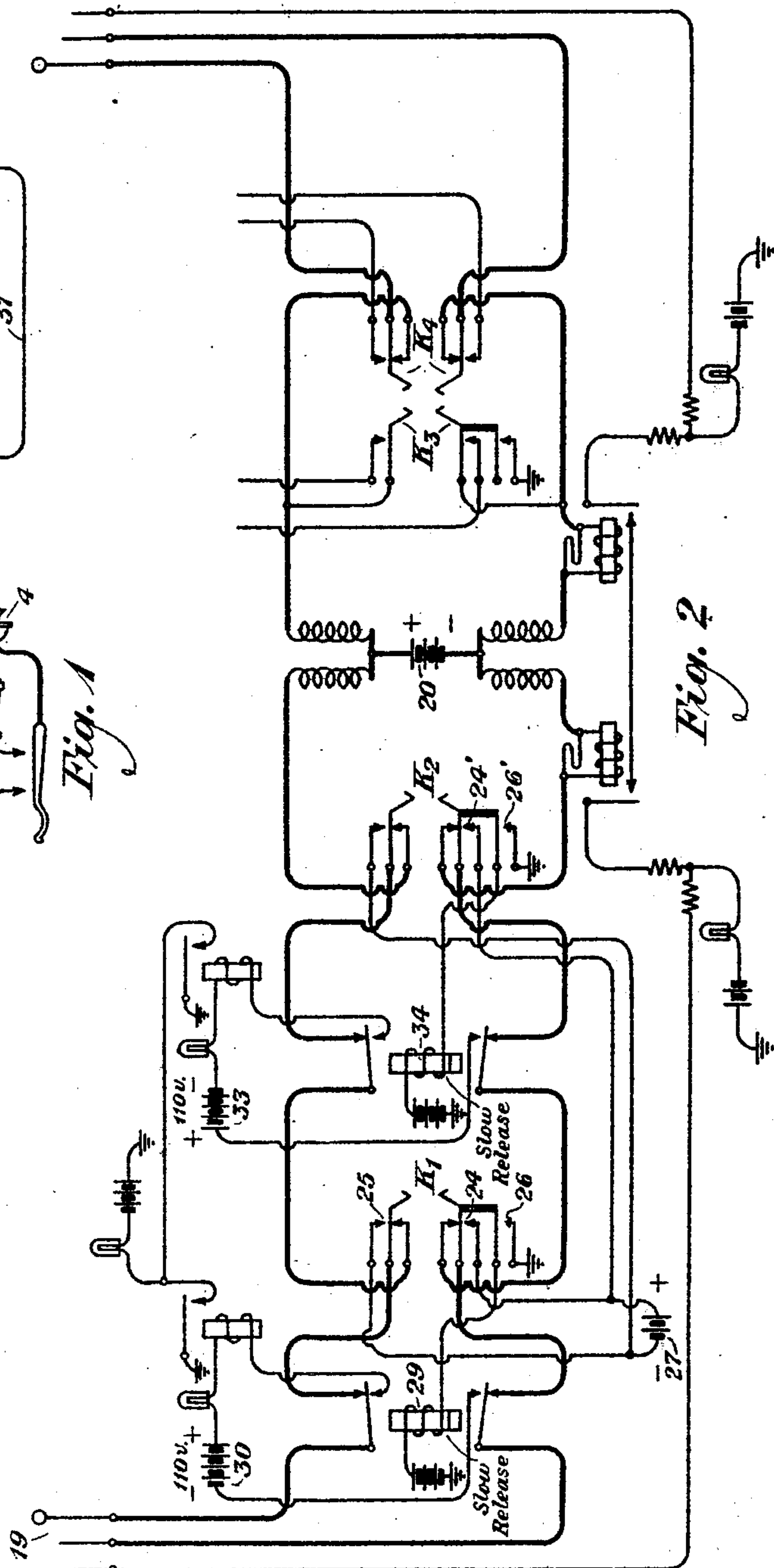


Fig. 2

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TELEPHONE CIRCUIT

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This invention relates to telephone systems; and more particularly to improvements in circuits in such systems involving the operation of coin collector apparatus or message register apparatus.

In certain types of telephone circuits heretofore utilized it has been the practice to connect to ground the magnet or relay controlling the coin collector or message register apparatus at the subscriber's station. The presence of this ground at the station has given rise to certain operating disadvantages in such circuits in that the susceptibility to inductive interference from unbalanced power circuits is increased, and the length of the subscriber's loop is restricted, especially where there is considerable ground potential, by certain marginal requirements in the magnet or relay circuit. Accordingly, it is one of the primary objects of the arrangements of this invention to provide a means whereby coin collector or station message register apparatus may be operated without the customary ground connection at the station. This will tend to reduce the inductive interference with the talking apparatus at the station and remove former restrictions as to the length of the subscribers' loops which may be utilized. In the arrangements of the invention this is accomplished by providing battery of one polarity for talking purposes and battery of opposite polarity as line current. Rectifiers will be provided at the station, one of which will be in circuit with the telephone apparatus and be so poled as to allow the ready transmission of current from the talking battery, and the other of which will be part of a circuit including the coin collector apparatus and will readily allow the transmission of the line battery current. Further features and objects of the invention will appear more fully from the detailed description thereof hereinafter given.

The invention may be more fully understood from the following description, together with the accompanying drawing in the Figures 1 and 2 of which is shown a preferred form of the invention. Fig. 1 is a circuit diagram of a line interconnecting a central office to a station including coin collector or

message register apparatus. Fig. 2 is a circuit diagram of cord circuit apparatus suitable for use with the type of line or loop circuit of Fig. 1.

In Fig. 1 is shown a loop circuit L comprising the tip conductor 1 and the ring conductor 2 connecting central office equipment with a subscriber's station. At the subscriber's station there is provided the usual talking set comprising the receiver 3 and the transmitter 4. At the station there is also provided coin collector apparatus comprising the coin relay magnet 6. Associated therewith is the coin trap 7, coin hopper 8, coin trigger 9, the coin trigger lever arm 10, an armature locking lever 11 and a marginal relay 12. A rectifier 5 is included in the circuit with the talking apparatus heretofore mentioned and is poled to pass the talking current readily and to oppose the line current. In circuit with the marginal relay 12 is a rectifier 13 poled to pass the line current readily and to oppose the talking current. At the central office the line L will terminate in the jack 18. A cut-off relay 17 is connected to the sleeve of this jack. There is also provided a line relay 14 having two windings having high resistance, such as approximately 1,000 ohms each. The left-hand winding is connected to ground and to the ring conductor of the loop circuit. The right-hand winding is connected to the negative side of battery 15 and thence to the tip conductor of the loop circuit L. The battery 15 supplies current known as the line current.

At the central office there is provided a cord circuit, the answering end of which terminates in the plug 19. In the cord circuit is provided a source 20 of talking current. It is pointed out that the positive side of the battery 20 is connected to the tip conductor of the cord circuit and may be thence applied to the tip conductor of the loop circuit L, while in the case of the line battery the negative side thereof is connected to the tip conductor of loop circuit L. The cord circuit includes the refund key K_1 , the collect key K_2 , the operator's talking key K_3 and the ringing key K_4 . Further details of the cord circuit structure will appear from the de-

tailed description of the operation of the invention hereinafter given.

When the receiver is removed from the hook and before a coin is inserted at the subscriber's station, current will normally flow from the negative side of battery 15 over the following circuit: from ground, battery 15, right-hand winding of relay 14, tip conductor 1, conductor 21, right-hand contact of relay 12, conductor 22, rectifier 5, through the switch hook, over ring conductor 2, the left-hand winding of relay 14 to ground. However, the rectifier 5 is so poled that it offers considerable resistance to current of this polarity. The relay 14 will not operate at this time due to the small amount of current that is permitted to flow through the rectifier, and accordingly the signal lamp 16 will not operate. When the coin is inserted in the coin hopper 8 it will depress the coin trigger 9 and release the coin trigger lever arm 10, allowing contact 23 to be closed. Current will now flow from the tip conductor 1, through contact 23, rectifier 13, winding of marginal relay 12, middle contact of relay 12, and over the ring conductor 2 to ground. The rectifier 13 is poled to pass current of this polarity readily and accordingly the relay 14 will be operated. This will operate the signal lamp 16 and notify the operator that the subscriber's station is calling. It is pointed out that this current will not operate the marginal relay 12 because of the high resistance in the circuit of the windings of relay 14. The operator will now insert the plug 19 into the jack 18. The positive side of the talking battery 20 will now be connected to the tip conductor 1 of the loop L and will flow over the two previously described parallel paths, one of which is through the rectifier 5 and the talking apparatus and the other of which is through the rectifier 13 and the coin collector apparatus. As the talking battery which is applied to the tip conductor 1 is of opposite polarity to the line battery, the talking battery will be readily transmitted through the talking apparatus by the rectifier 5, and the subscriber may converse. However, the rectifier 13 is poled to oppose the talking battery and hence the coin collect apparatus will not be affected thereby, nor will it act as a low resistance shunt on the talking currents.

When the conversation is completed the cord circuit operator will operate either the refund key K_1 or the collect key K_2 . If the key K_1 is operated, the contact 24 will be closed before the contact 26. This will result in a preliminary pulse of current being sent out over the line from the battery 27. In other words, the negative side of battery 27 will be connected by contact 25 to the tip conductors of the cord and loop circuits, and the positive side of battery 27 will be connected by contact 24 to the ring conductors of

the cord and loop circuits. This current will be transmitted over conductor 1, contact 23, rectifier 13, winding of marginal relay 12, middle contact of relay 12, and thence over the ring conductor 2. As this circuit does not include the high resistance windings of relay 14, the marginal relay 12 will be operated by this preliminary pulse of current and will pull up its armature, which will become mechanically locked up by the stop 28. The complete operation of key K_1 will close a circuit from ground, contact 26, winding of the refund relay 29, to battery and ground. This will operate the refund relay, which is a slow release relay. This will connect the tip and ring conductors of the cord to the 110-volt battery 30, the negative side of which will be connected to the ring and the positive side of which will be connected to the tip conductors of the cord and loop. This current will flow from the tip conductor 1, through the windings of the coin relay magnet 6, conductor 31, left-hand contact of marginal relay 12, and over the ring conductor 2 of the loop circuit, thereby operating the magnet 6 to its refund position. The operation of the magnet 6 will so move the roller 32 that the coin trigger lever arm 10 and the armature locking lever 11 will be restored to their normal positions, thereby placing the circuit arrangements at the station in their original condition. In a similar manner, if the operator should throw the refund key K_1 , the contact 24' will operate before the contact 26' and transmit a preliminary pulse from the battery 27 out over the loop circuit L to operate the marginal relay 12. The further operation of the collect key K_2 will operate the collect relay 34 and connect the positive side of the 110-volt battery 33 to the ring conductors and the negative side of said battery to the tip conductors of the cord and loop to operate the coin relay magnet 6 to the collect position.

What is claimed is:

1. In a telephone system a loop circuit including a subscriber's set, a circuit associated with said loop and including a marginal relay, a second circuit associated with said loop and including coin collector apparatus, said coin collector apparatus circuit being controlled by said marginal relay circuit, and oppositely poled rectifiers in said loop circuit and said marginal relay circuit.

2. A telephone system comprising a loop circuit, a source of line current of a certain polarity connected to said loop circuit, a subscriber's set in said loop circuit, a rectifier connected to said subscriber's set and poled to oppose the flow therethrough of said line current, a circuit associated with said loop and including relay means, a rectifier in said last mentioned circuit poled to readily transmit said line current, and apparatus controlled by said relay means.

3. A telephone system comprising a loop circuit, a source of line current of a certain polarity connected to said loop circuit, a subscriber's set in said loop circuit, a rectifier
 5 connected to said subscriber's set and poled to oppose the flow therethrough of current of the polarity of said line current, a circuit associated with said loop and including relay means, a rectifier in said last mentioned
 10 circuit poled to readily transmit said line current, apparatus controlled by said relay means, a cord circuit adapted to be associated with said loop circuit, and a source of talking current in said cord circuit of opposite
 15 polarity to said line current.

4. A telephone system comprising a loop circuit, a source of line current of a certain polarity connected to said loop circuit through a high resistance, a subscriber's set
 20 in said loop circuit, a rectifier connected to said subscriber's set and poled to oppose the flow therethrough of current of the polarity of said line current, a circuit associated with said loop and including a marginal relay, a rectifier in said circuit poled to readily
 25 transmit said line current, said marginal relay being unoperated by said line current due to said high resistance in series therewith, and apparatus controlled by said marginal relay.

5. A telephone system comprising a loop circuit, a source of line current of a certain polarity connected to said loop circuit through a high resistance, a subscriber's set
 35 in said loop circuit, a rectifier connected to said subscriber's set and poled to oppose the flow therethrough of current of the polarity of said line current, a circuit associated with said loop and including a marginal relay, a rectifier in said circuit poled to readily trans-
 40 mit said line current, said marginal relay being unoperated by said line current due to said high resistance in series therewith, apparatus controlled by said marginal relay, a cord circuit adapted to be connected to said
 45 loop circuit, and means in said cord circuit for applying current to said loop circuit to operate said marginal relay.

6. A telephone system comprising a loop circuit, a source of line current of a certain polarity connected to said loop circuit through a high resistance, a subscriber's set
 50 in said loop circuit, a rectifier connected to said subscriber's set and poled to oppose the flow therethrough of current of the polarity of said line current, a circuit associated with said loop and including a marginal relay, a rectifier in said circuit poled to readily trans-
 55 mit said line current, said marginal relay being unoperated by said line current due to said high resistance in series therewith, a circuit including coin collector apparatus controlled by said marginal relay, a cord circuit adapted to be connected to said loop circuit,
 60 means in said cord circuit for applying cur-

rent to said loop circuit to operate said marginal relay whereby said coin collector apparatus circuit may be closed, and means in said cord circuit for applying current to said loop and said coin collector circuit to operate
 70 the apparatus therein.

7. A telephone system comprising a loop circuit, a source of line current of a certain polarity connected to said loop circuit through a high resistance, a subscriber's set in
 75 said loop circuit, a rectifier connected to said subscriber's set and poled to oppose the flow therethrough of current of the polarity of said line current, a circuit associated with said loop and including a marginal relay, a rectifier in said circuit poled to readily transmit said
 80 line current, said marginal relay being unoperated by said line current due to said high resistance in series therewith, a locking device for said marginal relay, a circuit including coin collector apparatus controlled by said marginal relay, a cord circuit adapted to be connected to said loop circuit, means in
 85 said cord circuit for applying current to said loop circuit to operate said marginal relay whereby said coin collector apparatus circuit may be closed, means in said cord circuit for applying current to said loop and said coin collector circuit to operate the coin collector
 90 apparatus therein, and means controlled by said coin collector apparatus for releasing said marginal relay locking device and restoring the circuit to normal.

In testimony whereof, I have signed my name to this specification this 11th day of
 100 May, 1929.

WILLIAM H. EDWARDS.

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