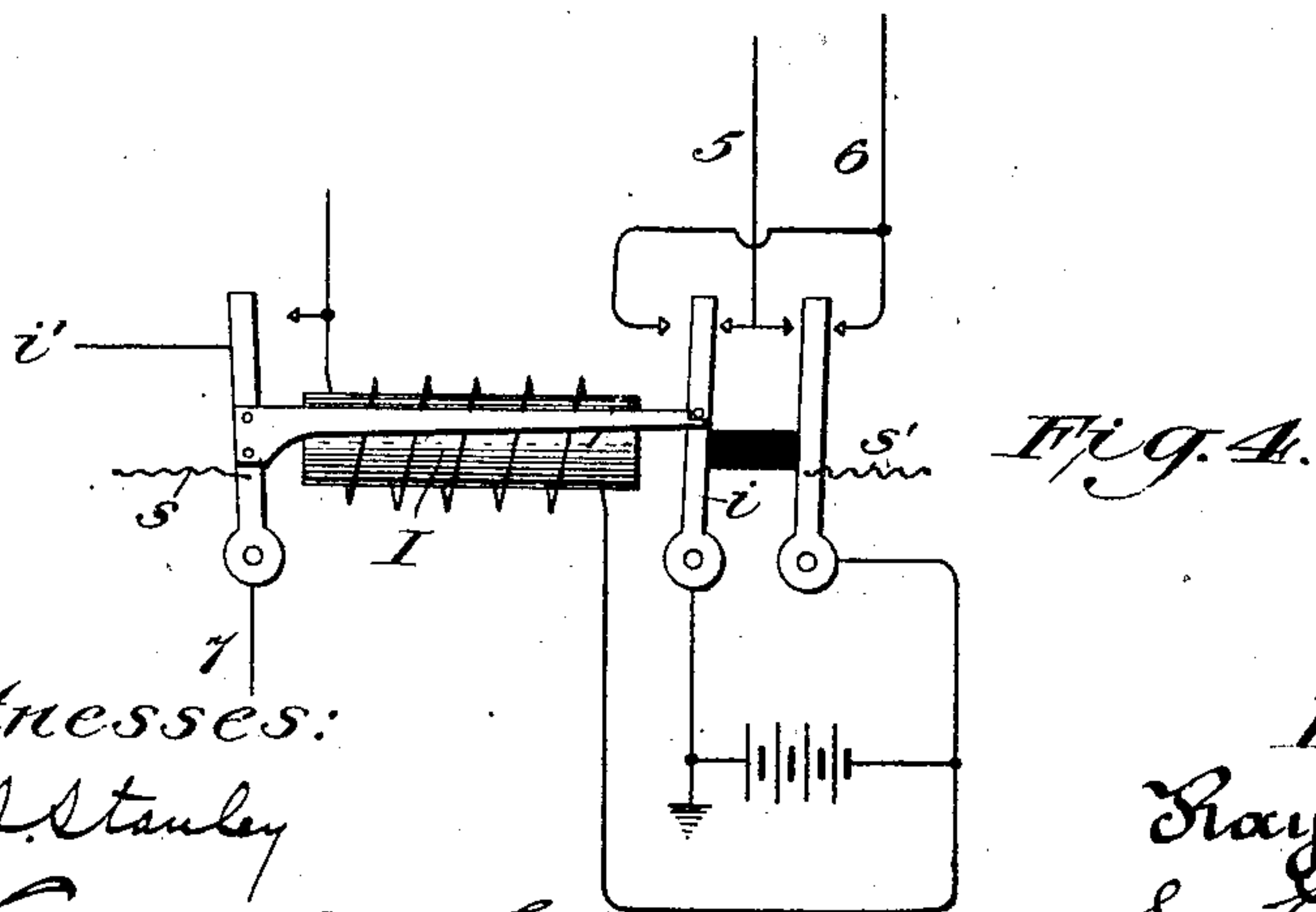
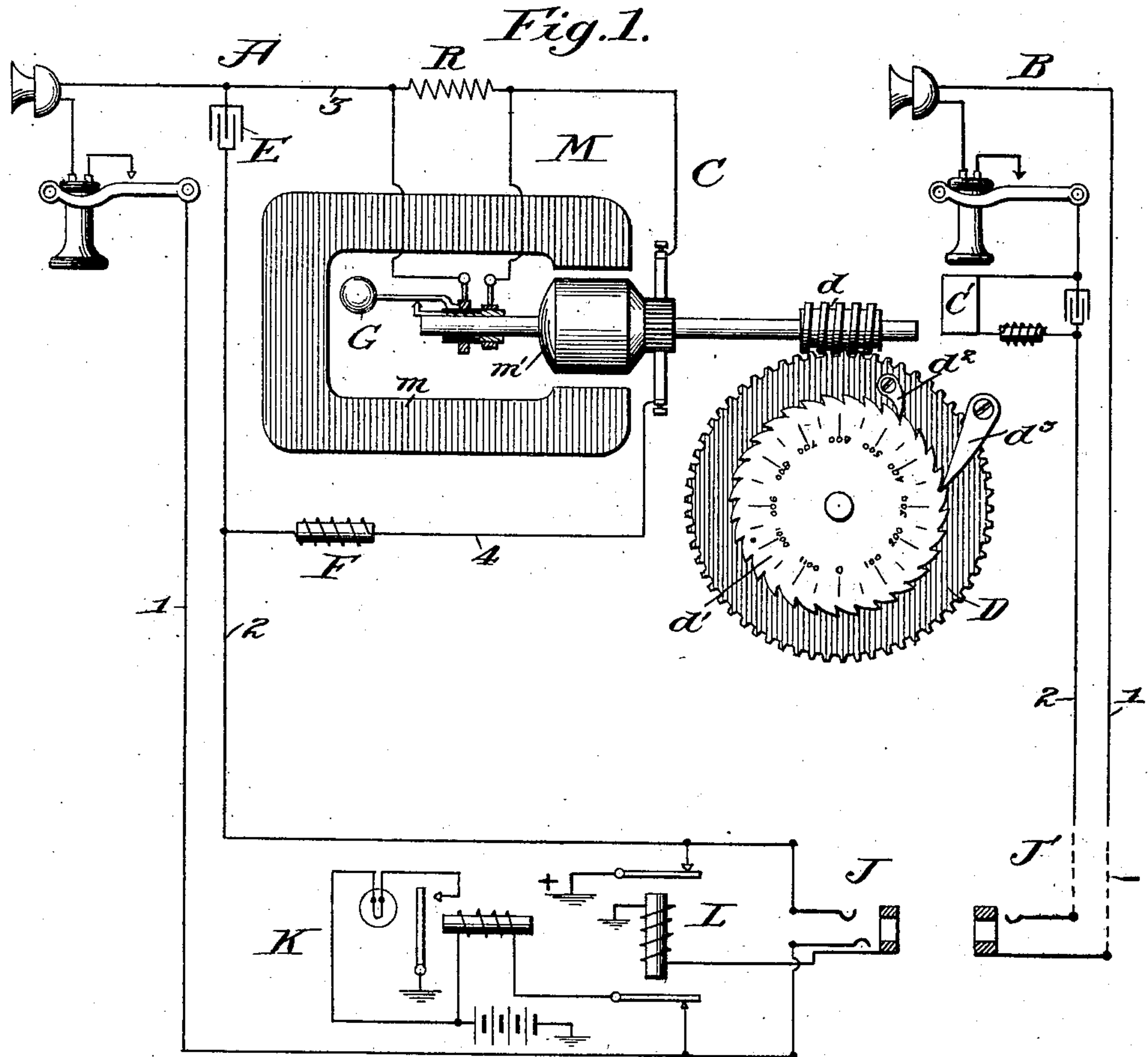


R. H. MANSON.
TELEPHONE METER SYSTEM AND APPARATUS.
APPLICATION FILED APR. 18, 1907.

946,382.

Patented Jan. 11, 1910.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 2.

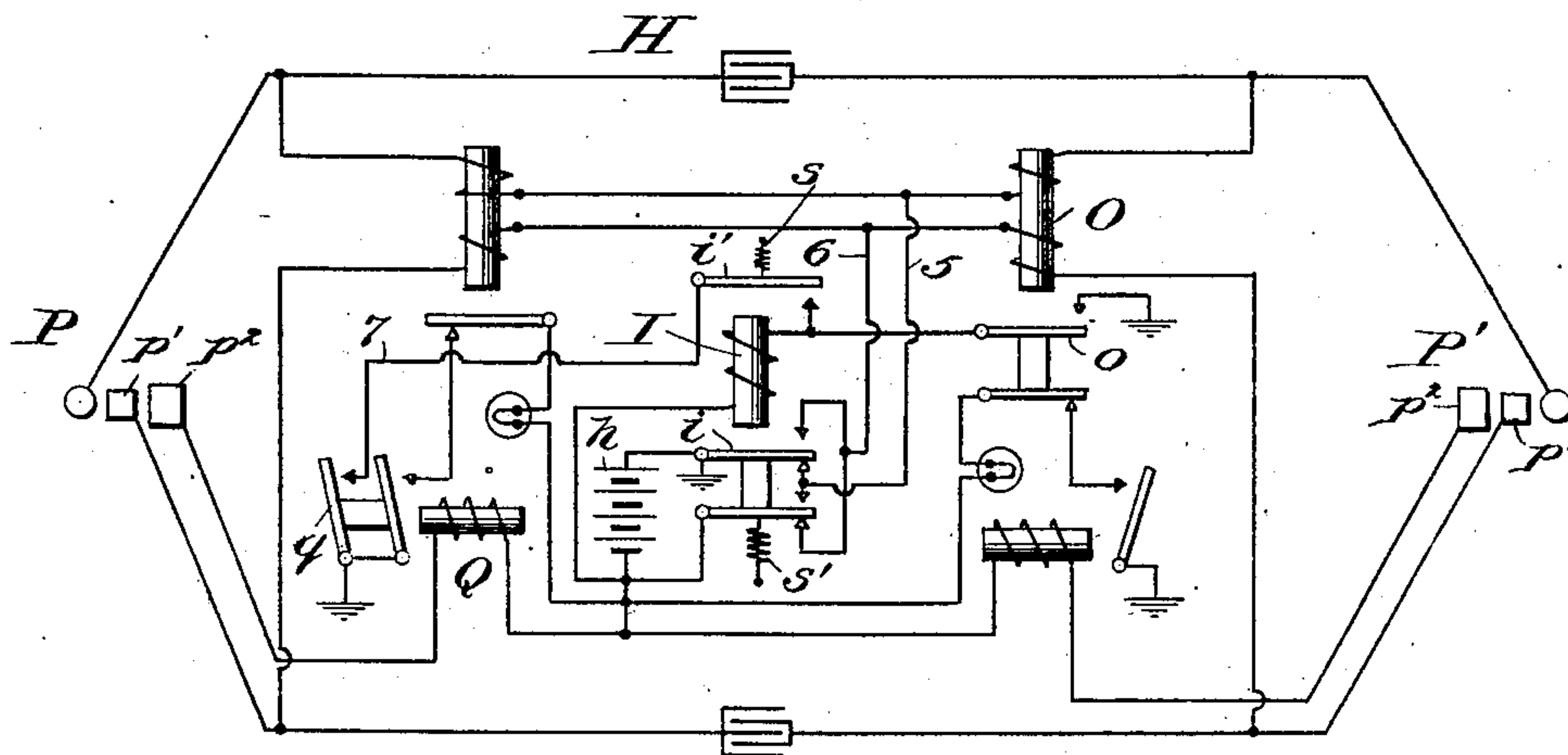
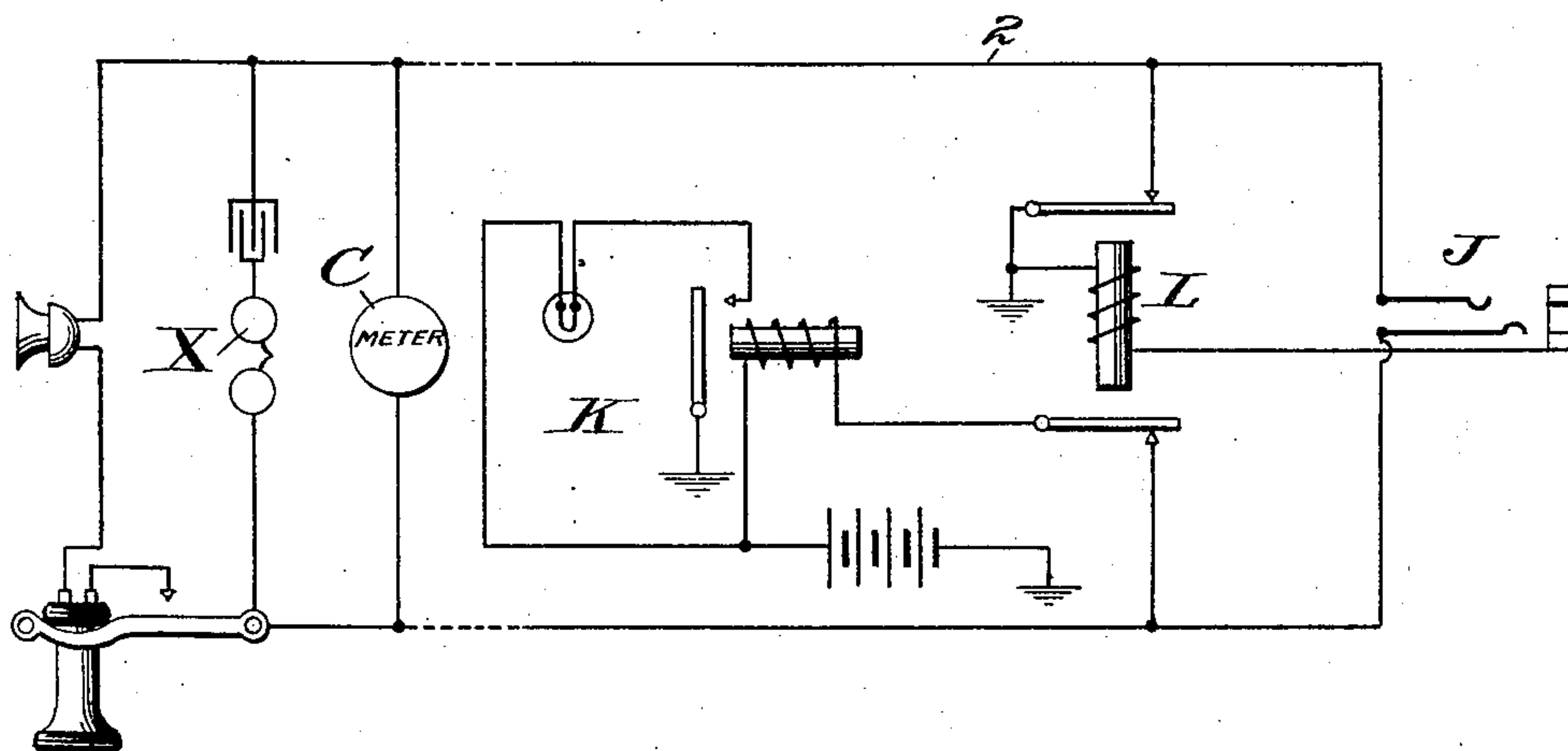


Fig. 3.



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UNITED STATES PATENT OFFICE.

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TELEPHONE METER SYSTEM AND APPARATUS.

946,382.

Specification of Letters Patent.

Patented Jan. 11, 1910.

Application filed April 18, 1907. Serial No. 369,018.

To all whom it may concern:

Be it known that I, RAY H. MANSON, a citizen of the United States, residing at Elyria, in the county of Lorain and State of Ohio, have invented certain new and useful Improvements in Telephone Meter Systems and Apparatus, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to telephone-meter systems and apparatus in general, and particularly to such as are designed and constructed to measure and register the duration or length of time the telephone is used for conversational purposes, as distinguished from the number of conversations.

In my companion application, Serial No. 369,017 I have disclosed a system in which electrically operated meters are provided at the subscribers' stations, the electric motor for operating each meter being arranged to drive the meter when supplied with current from the line in a given direction and to reverse and run idly without driving the meter when the current in the line is reversed, the arrangement being such that when a connection is completed between two subscribers current will be flowing in the two lines in opposite directions so that the meter of only one of the subscribers will record. In accordance with my present invention I employ, preferably, the same meter and motor mechanism employed in connection with the system just mentioned, and so arrange the circuits that when a calling subscriber is in communication with the central office, his meter motor will be supplied with current in a direction to cause it to run idly without driving the meter mechanism, and when the central office operator makes connection to the line of the called subscriber current will be supplied to, and the motor at that station operate in, the same direction as that of the calling subscriber, but when the called subscriber answers and thus completes the talking connection with the calling subscriber, the current in both lines will be reversed, thus reversing both meter motors and causing both meters to register. In order to effect this reversal of current in the lines I provide a special relay in connection with the central office operator's cord circuit so arranged that when the called subscriber answers, the armature of the relay will be attracted and will reverse the current flow-

ing from the cord circuit out over both lines.

In the accompanying drawings I have illustrated my invention as embodied in a system in which the well known three-wire line terminal is employed, in combination with a three-wire cord circuit, also well known, to which I have applied the necessary apparatus and circuit connections for attaining the objects of my invention.

In the drawings, Figure 1 is a diagram showing the apparatus and line circuit in detail of one subscriber and the circuit of a second subscriber with the apparatus symbolically shown; Fig. 2 is a diagram of a cord circuit, and Fig. 3 is a schematic view of a modification of the subscriber's circuit. Fig. 4 shows in detail view a modified form of construction of the relay I shown in Fig. 2.

Referring to the drawings, A represents a subscriber's station, which will be for convenience designated the calling subscriber's station, and B the called subscriber's station, each being provided with the usual transmitting and receiving instruments. Station A is connected by line wires 1 and 2 with the answering jack J at the central office. Any preferred line indicator and cut off, represented by K and L, respectively, may be employed at the central office in connection with jack J, those shown being of a well known type which need not be described in detail, but will be referred to in the description of operation of the invention.

The meter C comprises an electric motor M having a permanent or separately excited field magnet m and an armature m^1 . The armature m^1 is geared by worm d to a large gear wheel D of the registering mechanism. Concentric with gear wheel D, or otherwise mounted in relation thereto, is a dial disk d^1 adapted to be engaged by a pawl d^2 mounted upon gear wheel D and driven thereby when said gear wheel rotates in a given direction, but to pass idly thereover when said gear wheel is rotated in the opposite direction. A stop pawl d^3 also engages the teeth of the dial disk d^1 to positively prevent the backward rotation of the latter.

The armature of the motor M is connected in series with the line by leads 3 and 4, and a condenser E is bridged across the terminals of these motor leads. An inductive resistance or choking coil F. is

preferably inserted in the armature circuit of the motor to choke back or eliminate any noise producing changes that might be produced and impressed upon the line from the commutator of the motor. In order to provide a constant speed for the motor, I employ a regulating resistance, shown diagrammatically at R, and controlled in any suitable manner, such as by a centrifugal governor G mounted upon or controlled by the armature shaft of the motor. This regulating resistance R is normally short circuited through the contacts of governor G, but when the speed of the motor exceeds a predetermined limit this short circuit is opened and the resistance R thereby becomes effective to reduce the speed. It will be observed that as the field magnet of the motor is independent of the armature circuit, the direction of rotation of the armature will depend upon the direction of current flow in the line circuit. In Fig. 1 it will be further observed that the motor M is connected in series in the subscriber's line so that it will be supplied with current in series with the transmitting and receiving instruments when the receiver is off the hook, the ringer of this station having been omitted to avoid complication of the drawing. In Fig. 3 I have shown a ringer X bridged across the line in parallel with the transmitting and receiving instruments, and have also shown the meter (in outline only) bridged across the line.

The cord circuit H, as has been said, is of a three-wire type and is provided with an answering plug P and a calling plug P¹, each provided with a tip contact and two sleeve contacts, p¹ and p², respectively. The cord circuit is supplied with current from battery h through conductors 5 and 6, the connection being controlled by armature i so as to cause the current to flow in either direction. Relay I has a second armature i¹ adapted to control a holding or locking circuit which passes through an extra contact q on armature of the answering sleeve relay Q. It is desirable in the operation of relay I, that armature i¹ should be attracted and close its contact before the armature i is attracted to reverse the battery current. This may be effected in any suitable way, such as by adjusting the springs of these armatures, and is shown by making the spring s lighter than the spring s¹.

The circuit connection through the coil of reversing relay I is controlled by a relay energized when the called subscriber answers, and for this purpose I preferably employ the tip calling (supervisory) relay O and provide the armature thereof with an extra contact o. When the called subscriber answers a call, therefore, relay O will be energized and by attracting its armature will close the circuit of battery h

through reversing relay I which will then attract its armature i and reverse the current flowing to the line.

From the foregoing, the operation of the system will be apparent and is as follows: When calling subscriber A removes his receiver from the hook the circuit of line battery at central is completed to display his line signal K in the usual way. When the central office operator inserts the answering plug P into line jack J of the calling subscriber, current will flow from battery h to ground and return by line cut-off relay L, sleeve of jack J, sleeve p² of the plug, and the winding of relay Q, thus cutting off the line battery. At the same time current will flow from battery h, conductor 5, tip of plug P, tip spring of jack J, line conductor 2, motor armature m¹, telephone instruments, line conductor 1, sleeve spring of jack J, sleeve contact p¹ of plug P and return to battery by conductor 6. During this connection, the direction of current flow is such as to rotate the armature at motor M in its backward direction, that is, such direction that pawl d² carried on disk D will travel idly over registering disk d¹ and the meter will not be operated. Having ascertained the number of the subscriber wanted, for instance subscriber B, calling plug P¹ is inserted in the jack J¹ of that subscriber. When subscriber B removes his receiver from the hook and thus completes the through talking circuit with the calling subscriber A, current will flow in the same direction as current flowing in the line of subscriber A from battery h, conductor 5, tip of plug P¹ through the subscriber's instruments and meter motor, contact p¹ of plug P¹, and return to battery by conductor 6. It will be observed that this circuit includes the windings of tip calling relay O, and upon its completion this relay is energized to attract its armature and at the same time closes the contact o. The closing of this contact o completes the energizing circuit of reversing relay I as follows: from battery h to ground, contact o of relay O, winding of reversing relay I and return to battery. The first effect of the energization of relay I is to attract its armature i¹ and thereby close a holding or locking circuit through the winding of relay I as follows: battery h to ground, extra contact q of relay Q, conductor 7, armature i¹, winding of relay I and return to battery. This circuit will remain complete through the contact q until the answering plug P is removed from its jack. The energization of relay I next attracts its armature i, this attraction occurring after that of the armature i¹ on account of the adjusted tensions of the two springs s and s¹. The attraction of armature i reverses the flow of current from battery h to conductors 5 and 6, and consequently to both

lines of the connected subscribers, thereby reversing the direction of rotation of the motors of both meters and causing them to operate both meters to register the time of the conversation. When the conversation is completed and the operator removes the plugs from the jacks, or rather removes the answering plug P from jack J, the holding circuit of reversing relay I is opened at contact *g* by the deenergization of relay Q, and both armatures *i* and *i*¹ return to their initial positions.

Other means may be provided to cause the proper sequence of operation of armatures *i* and *i*¹ of relay I, as by positioning the armature *i*¹ or an extension thereof so as to lock the armature *i* until after the attraction of armature *i*¹ as indicated in Fig. 4.

Many changes may be made in the details of construction and circuit connections without departing from the spirit of my invention. For instance, the invention is not limited to the particular type of cord circuit shown and may be adapted to other circuits by making slight changes readily apparent to those skilled in the art.

Having thus described my invention what I claim and desire to secure by Letters Patent is—

30 1. In a telephone system, a plurality of subscribers' stations connected by suitable line circuits with a central office, a meter at each of two of said subscribers' stations comprising a registering mechanism, an electric motor connected to the line circuit and arranged to operate said registering mechanism upon the flow of current in a given direction only in said line circuit, means controlled by the operator at central for supplying current initially in the opposite direction to said line, and means operative when a through talking connection with a second subscriber's station is completed to reverse the flow of current and operate both meters.

2. In a telephone system, subscribers' stations connected by suitable line circuits with a central office, a meter at said subscribers' stations comprising a registering mechanism, a reversible electric motor connected to line and arranged to operate said registering mechanism upon the flow of current in a given direction only, connecting means for said lines at said central office arranged to supply current initially to said lines in a direction to operate said motors in the direction so as not to drive said registering mechanism, and means operative when a through talking connection between subscribers is completed to reverse the flow of current to both meter motors to operate both meters.

3. In a telephone system, subscribers' stations connected by suitable line circuits with a central office, a meter at each of said sub-

scribers' stations comprising a registering mechanism; a reversible electric motor connected to line and arranged to operate said registering mechanism upon the flow of current in a given direction only, and means at said central station for supplying current initially to two connected lines in a direction to operate said motors in a direction so as not to drive said registering mechanism and then reverse the flow of current upon the completion of a through talking connection between said subscribers.

4. In a telephone system, subscribers' stations connected by suitable line circuits with a central office, a meter at said subscribers' stations comprising a registering mechanism, a reversible electric motor connected to line and arranged to operate said recording mechanism upon the flow of current in a given direction only, a cord circuit for said lines at said central office, a source of current connected to said cord circuit to supply current initially in a direction to operate said motors so as not to drive said registering mechanism, and a relay controlled by the completion of the through talking circuit between two subscribers to reverse the flow of current in both lines and operate said meters.

5. In a telephone system, calling and called subscribers' stations connected by suitable line circuits with a central office, a meter at each of said stations comprising a registering mechanism and a reversible electric motor connected to line and arranged to operate said registering mechanism upon the flow of current in a given direction only, a cord circuit at said central office for connecting said subscribers and arranged to supply current to said lines in a direction to operate said motors so as not to drive said registering mechanism, a relay for reversing the direction of said current, and a second relay operative when the called subscriber answers to close the energizing circuit of said reversing relay.

6. In a telephone system, calling and called subscribers' stations connected by suitable line circuits with a central office, a meter at each of said stations comprising a registering mechanism and a reversible electric motor connected to line and arranged to operate said registering mechanism upon the flow of current in a given direction only, a cord circuit at said central office for connecting said subscribers and arranged to supply current to said lines in a direction to operate said motors so as not to drive said registering mechanism, a relay for reversing the direction of said current when the called subscriber answers, and a holding circuit for said relay closed by one of its contacts and complete until said cord circuit is disconnected from the calling subscriber's line circuit.

7. A connecting circuit for telephone lines comprising suitable terminals, meters associated with the lines, a source of energy connected to said circuit, and a relay arranged to reverse said connection when a through talking circuit between two subscribers is completed whereby the meters may be operated.

8. A connecting circuit for telephone lines comprising suitable terminal plugs, meters associated with the lines, a source of energy connected to said circuit, a relay for reversing said connection whereby the meters may be operated, a supervisory relay connected to the tip of the calling plug, and contacts controlled by said supervisory relay for completing the circuit of said battery through said reversing relay.

9. A connecting circuit for telephone lines comprising suitable terminals, time period recording meters associated with the

lines, a source of electric energy operatively connected to said circuit, and means for reversing said connection when a through talking circuit between two subscribers is completed whereby the meters may be operated.

10. A connecting circuit for telephone lines comprising suitable terminal plugs, time period recording meters associated with the lines, a source of electric energy operatively connected to said circuit, and means for reversing said connection whereby the meters may be operated, such reversing means being under the control of one of the connected subscribers.

In testimony whereof I affix my signature in presence of two witnesses.

RAY H. MANSON.

Witnesses:

S. J. ROBERTS,
S. P. KINGSTON.