

(No Model.)

C. W. McDANIEL.
TELEPHONE CIRCUIT AND APPARATUS.

No. 539,142.

Patented May 14, 1895.

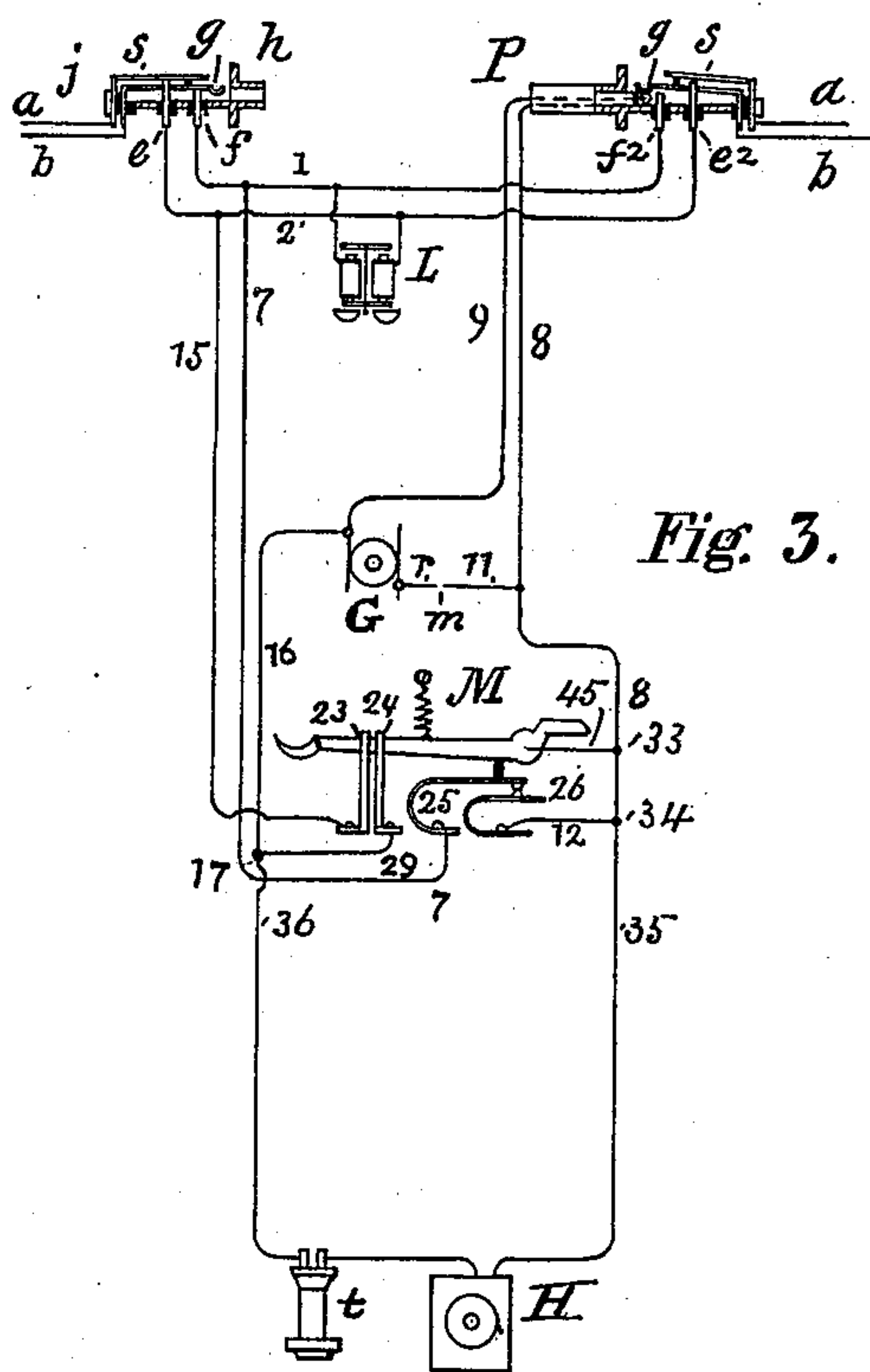
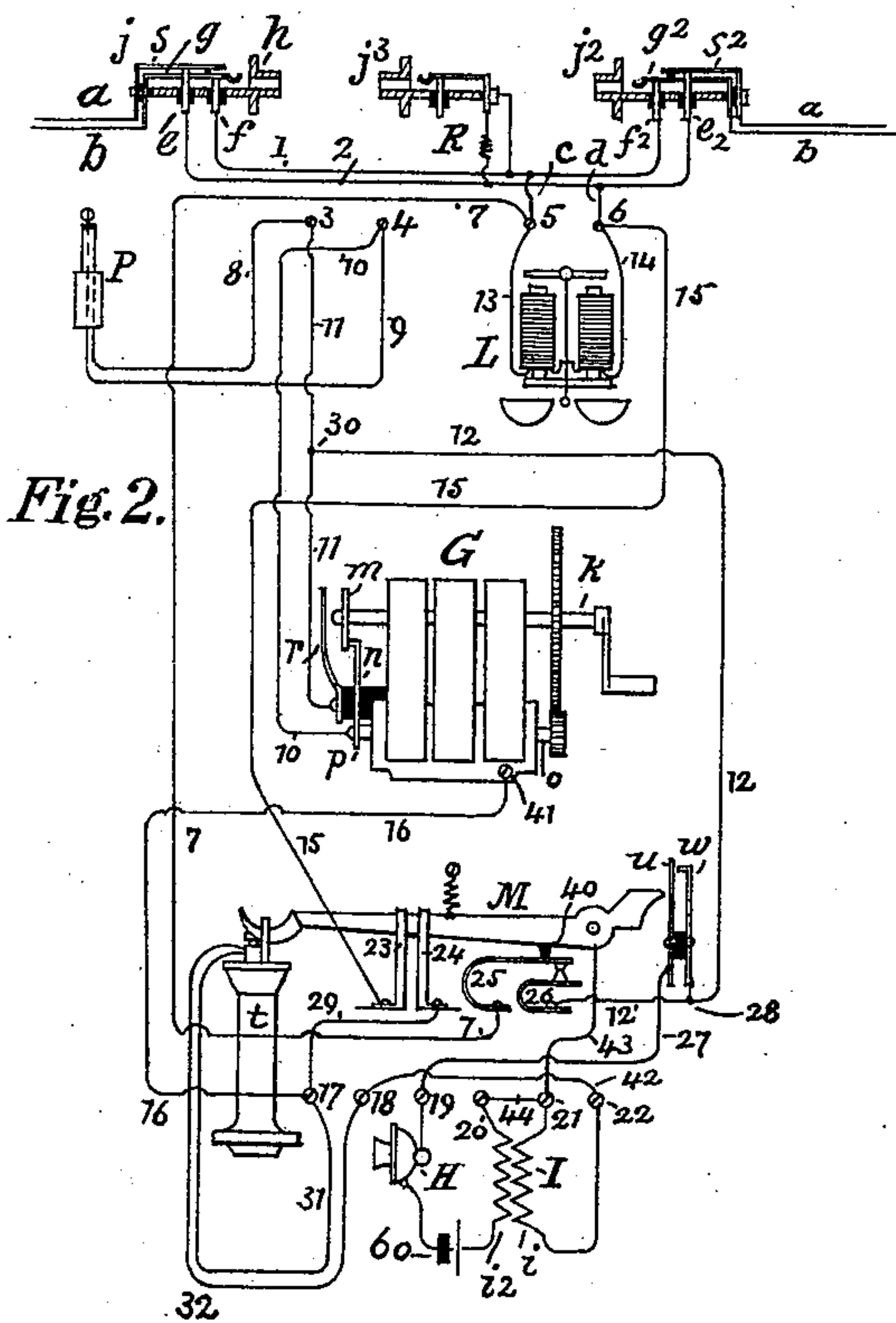
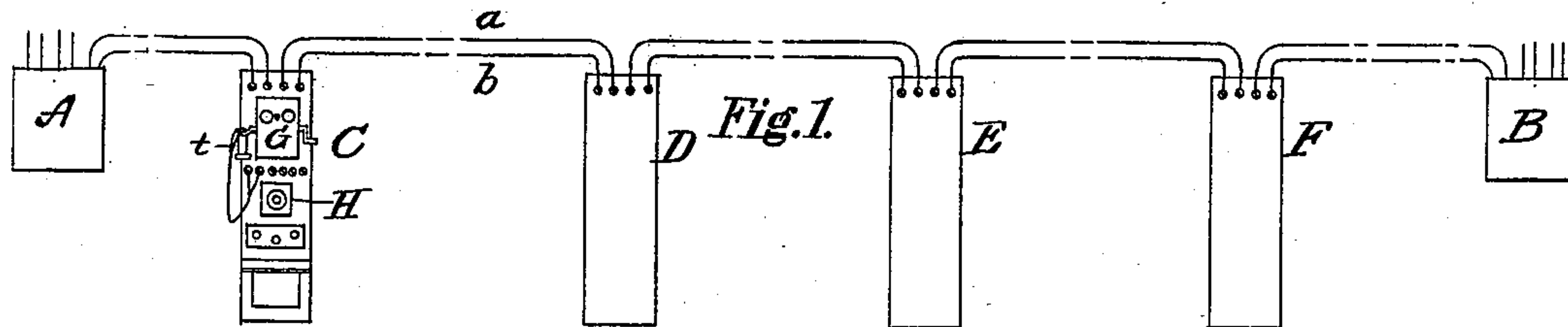
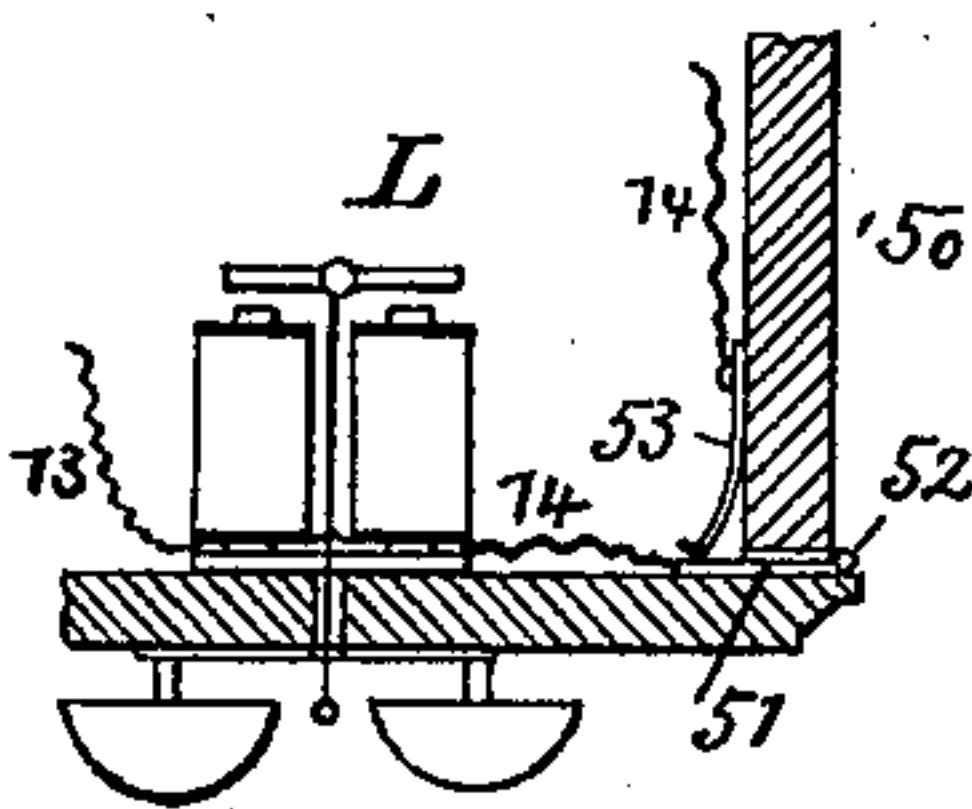


Fig. 4.



Attest.

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UNITED STATES PATENT OFFICE.

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TELEPHONE CIRCUIT AND APPARATUS.

SPECIFICATION forming part of Letters Patent No. 539,142, dated May 14, 1895.

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To all whom it may concern:

Be it known that I, CHARLES W. McDANIEL, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain Improvements in Telephone Circuits and Apparatus, of which the following is a specification.

One important branch of the telephone business consists in the construction and maintenance of long lines or circuits extending between towns and cities terminating at each end in a central station or exchange. When such circuits are of considerable length, they pass through intervening towns or way stations into which they are looped, or connected so that communication may be made to and from the central stations at each terminus of the circuit from and to any way station, and from one way station to another.

My invention relates to such circuits and to the apparatus located at the way stations connected thereto, whereby a substation at either end of the circuit may be in conversational connection with the central office nearest thereto, and whereby two way stations centrally located in the circuit may at the same time be conversing with each other.

In carrying out the invention, I provide at each way station the usual telephone apparatus associated with a telephone substation with such additions thereto as are necessary to the working thereof.

The main circuit, consisting of two conductors loops into each way station through two looping jacks or sockets in series, and branches extend therefrom to the telephones and magneto bell box connections. A testing jack or socket with a resistance coil is bridged in between the looping jacks across the circuit conductor continuations, and in another permanent bridge is a high resistance call bell.

The looping jacks are constructed with two parallel springs insulated from each other. The tip springs are connected to one of the circuit conductors and to each other through their contacts. The second springs are connected to the second circuit conductor and to each other through their contacts; and each

second spring is also in connection with the metal frame of the jack.

The generator and telephone circuits are in series, the generator however being normally shunted. This circuit terminates in a double conductor cord and plug and is independent of the ringer or bell circuit, and when the plug is inserted in either of the looping jacks the main circuit is transferred to the contacts of the plug leaving the call bell behind in the opposite direction, so that the bell can only ring from a station on the opposite side from which the circuit is being used; and a station can ring its own bell only when the plug is in the test jack.

A way station may be signaled from either central office but to call the central stations or another way station, it is necessary to insert the plug into one of the looping jacks (which one depends upon the side of the line the station to be called is located) in order to connect in the magneto generator, to send a signaling current, and to use the telephones. When the plug is so inserted into a jack, the telephone and generator circuits are shunted, and a circuit extends through to the second jack, but when the generator crank is rotated the generator is automatically bridged in and a current sent to the plugged side of the circuit; and when the telephone is removed from its hook switch, the conductors to the second jack are opened thereby and the telephones are included in circuit through the plug, with the called station.

The called or responding station, in answering, inserts the home plug into the test jack or in either of the looping jacks to ascertain from which side of the line the call comes, and then inserts the plug in the proper jack, or the one on the side toward the calling station. Before plugging in to call a station, to prevent annoyance at any station by sending to line a current from the generator, it is desirable to insert the plug into the testing jack to ascertain the condition of the circuit. Even if the plug is carelessly left in the jack, hanging the telephone on the hook switch completes a circuit through the way station.

The call bell is placed as usual on the door

of the magneto generator box, and as it is desirable in testing the line to switch out the call bells, I provide means for automatically doing this.

5 To more specifically indicate the invention, reference is had to the drawings, in which—

Figure 1 represents a circuit consisting of two conductors extending between two central stations or exchanges A and B, which
10 may be located many miles apart, to which circuit way-stations C, D, E, and F are connected, each way-station being provided with a complete telephone outfit embodying my invention, as indicated at C. Fig. 2 is a diagram
15 of the circuits and apparatus at each way-station. Fig. 3 is a diagram to indicate in a simple manner the changes of circuits made by the apparatus in securing a connection with another station, and Fig. 4 shows a
20 means of switching the call-bell from circuit.

a and *b* represent the two conductors of a long telephone circuit extending between central stations or exchanges A, and B, and C, D, E, and F, represent way stations into which the
25 circuit is looped or extended; the conductor *a*, uniting with the upper spring *s*, of jack *j*, and continuing by its contact *e* and wire 2 to contact *e*² of jack *j*², and from the spring *s*² to line; while the conductor *b* unites with spring
30 *g* of jack *j* and from its contact *f* continues by wire 1 to contact *f*² of jack *j*² and from the spring *g*² to line.

Bridged in between the wires 1 and 2 is an open jack *j*³ with a high resistance coil *R* in
35 one of its branches. From the wires 1 and 2 branches *c* and *d* extend respectively to the screw posts 5 and 6 between which the ringer or call bell *L* is permanently bridged in. A wire 7 extends from screw post 5 to the foot
40 of the spring 25 whose free end rests under the insulated pin 40 of the hook switch *M* and also has contact with the free end of a similar spring 26, from whose foot a wire 12 extends to the spring *w*. A wire 15 extends
45 from screw post 6 to the foot of spring 23 in normal contact with the hook switch.

P is a double connecting plug with its tip connected to screw post 4 by wire 9, and its sleeve connected to screw post 3 by wire 8.
50 From the screw post 4 a wire 10 connects to the rigid end of spring *p* of the generator *G* which is in normal contact with the ring *m* on the crank shaft *k*, the circuit continuing by the metal part of the generator to screw 41 and wire 16 to screw post 17, from whence
55 one wire 29 extends to the foot of spring 24 in normal contact with the hook switch, and another wire 31 goes to the telephone receiver *t* and by wire 32 to screw post 18; a wire 42 extending therefrom to screw post 22, between
60 which and screw post 21 the secondary helix *i* of induction coil *I* is connected. A wire 43 connects the screw post 21 with the hook switch; and a wire 44 connects screw post 21 with post 20, between which and the post 19 is included the primary helix *i*² of induction

coil *I*, battery 60 and telephone transmitter *H*. From post 19 a wire 27 extends to spring
70 *u*. A wire 11 connects the post 3 with the spring *r* of the generator and from a point 30 on said wire there extends the continuation of wire 12 to the point 28.

It will be seen that the ringer or call bell *L* can be rung from a distant station, in a manner well understood, it being always bridged
75 in between the circuit conductors; but when a substation initiates a call, the plug *P* has to be inserted into jack *j* or *j*² it depending upon whether the station wanted is on the right or
80 left side of the calling station, in order to introduce the generator *G* into the circuit. The effect of this is seen clearer in Fig. 3, where the plug is inserted into the jack *j*². The tip of the plug raises the two springs *s* and *g* from
85 their contacts *e*² and *f*², the latter spring making contact with the tip and transferring the circuit of conductor *b* from wire 1 to wire 9 of the plug cord, the circuit from conductor *a*
90 now continuing from the frame of the jack to the sleeve of the plug to wire 8. The main circuit being thus severed by the insertion of the plug into the jack *j*², a new circuit is at the same time established through the way
95 station, and is traced from conductor *a*, sleeve of plug, wires 8 and 12, springs 26 and 25, wire 7 to conductor 2, to the opposite portion of conductor *a*; returning by conductors *b* and 1, wire 15, spring 23, hook switch *M*, spring
100 24, wires 29 and 16, around the shunted generator *G*, wire 9, tip of plug to conductor *b*.

When the hook switch is depressed there is a bridge from points 33 and 17, in the conductors of the through circuit, by means of
105 wire 45, hook switch *M*, spring 24 and wire 29, shunting another circuit to the said points, consisting of the wires 35 and 36, including the telephones *t* and *H*.

Rotating the crank of the magneto generator causes the ring *m* to leave spring *n* and
110 make contact with the spring *r*, thus introducing the coils of the generator into the circuit in a well known manner, and a current is sent, see Fig. 3, from one side through the shunt *r* and *m*, (now closed,) wires 11 and 8,
115 sleeve of plug, to frame of jack and conductor *a*; to the called station; the return being by conductor *b*, tip of plug, and wire 9 to the other side of the generator. Portions of the current will go out by wires 8 and 16 but will not be effective at any station, the main current
120 going as indicated.

When the telephone *t* is removed from its hook switch the latter rises and opens the
125 shunts closed by the springs 23 and 24, and between springs 25 and 26, leaving the telephones in a clear circuit, from conductors *a*, sleeve of plug, wires 8, 35, 36, 16 and 9, and tip of plug to conductor *b*.

By means of the hook switch, when the telephone is thereupon, each conductor *a*, *b*, has
130 a circuit through the way station and magneto bell, and removing the telephone opens

these conductors; so that by means of the plug P and the hook switch the said conductors are completely severed while the telephone is off the hook for conversation, the ringer L only being in circuit on the cut off side; and when the telephone is replaced upon the hook switch a through circuit is again established, so that if the plug is left in its socket the main circuit can be used.

To prevent the annoyance of ringing when the telephone may be at the ear of a person at a way station, I have added the testing jack j^3 provided with a high resistance coil R at one side to prevent short circuiting the main circuit, so that the plug may be inserted therein and the operator listen in to learn if any one is talking.

In testing the circuit, it is desirable that the call bells shall be switched out, and in Fig. 4, I show means for doing this.

50 represents a side of the box, and 51 a portion of its door or cover to which the call bell is attached as usual.

52 is a hinge connecting the cover with the box. One leaf of the hinge is wider than its mate and to this a wire 14 from one side of the call bell helices is connected, the wire 13 from the other side of the helices connecting directly with one of the line conductors. A spring 53 screwed to the inner surface of the box 50, carries the other part of the wire 14, connected to the remaining circuit conductor, and is arranged to come in contact with the wide leaf of the hinge when the door is closed, and to separate therefrom when the door is opened, and sever the bridge in which the bell is connected.

Having fully described my invention, I claim—

1. A telephone circuit entering and extending through a plurality of way stations, in series, in each of which the circuit passes through two double spring jacks between which branches extend from each circuit conductor to a high resistance call bell in a permanent bridge; and other branches extending from the said conductors to the open terminals of a connecting plug; whereby when the said plug is inserted into one of said jacks the circuit conductors are opened at the said jack and transferred through the said plug terminals to the other jack, a new circuit through the way stations being established, through the telephone switch.

2. A telephone circuit entering and extending through a plurality of way stations, in series, in each of which the circuit passes through two double spring jacks between which branches extend from each circuit conductor to a high resistance call bell in a permanent bridge; and other branches extending from the said conductors to the open terminals of a connecting plug; whereby when the said plug is inserted in one of said jacks the circuit conductors are opened at the said jack and transferred through the said plug

terminals to the other jack, a new circuit through the way station being established, and the call bell left in a shunt or parallel circuit.

3. A telephone circuit to which are connected a plurality of way stations, in series, in each of which the circuit passes through two spring jacks, between which branch conductors extend from each circuit conductor to the open terminals of a connecting plug, adapted to be inserted in one of said jacks and to transfer the main circuit through its own conductors; a normally shunted magnetogenerator in one of said branch conductors, provided with an automatic shunting device, whereby when the said plug is inserted into one of said jacks and the crank of the generator rotated the generator is included between the branch conductors.

4. A telephone circuit to which are connected a plurality of way stations, in each of which the circuit passes through two double spring jacks, between which branch conductors extend from each circuit conductor to the open terminals of a connecting plug adapted to be inserted into one of said jacks and to transfer the main circuit through its own conductors; telephones in a normal shunt circuit between said branch conductors; a telephone support or hook switch normally operating to close each of said branch conductors and to shunt said telephones.

5. A main telephone circuit entering and extending through a plurality of way stations in series, in each of which the circuit passes through two double spring jacks, between which branch conductors extend from each of the circuit conductors to the open terminals of a connecting plug; and telephones in a circuit between said branch conductors and in shunt or parallel thereto when the receiving telephone is upon its supporting hook switch; and means for severing the said main circuit on either side of a way station and for switching the telephones into one side of said severed circuit, consisting of inserting the connecting plug into one of the spring jacks, and in removing the telephone from the hook switch.

6. A main telephone circuit entering and extending through a plurality of stations in series, in each of which the circuit passes through two double spring jacks, branch conductors from the said circuit conductors including a high resistance call bell; a test jack in a bridge between the said circuit conductors; and a testing circuit including telephones and a double connecting plug; whereby upon the insertion of the plug into the test jack the testing circuit is bridged into the main circuit.

7. A main telephone circuit extending between two central stations, and connecting into and extending through a plurality of intervening way stations in series, in each of which the circuit passes through two double spring jacks between which branch conduc-

tors extend from each circuit conductor to include in a parallel circuit with the main circuit a high resistance call bell located upon the door of a magneto generator box a portion of said parallel circuit being through a spring and hinge of the said door; whereby upon opening the said door the parallel circuit is broken.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 11th day of March, 1895.

CHARLES W. McDANIEL.

Witnesses:

H. W. BELLARD,
S. C. PETTIT.