

July 30, 1929.

J. A. EYSTER

1,722,283

TELEGRAPH SYSTEM

Filed May 24, 1928

2 Sheets-Sheet 1

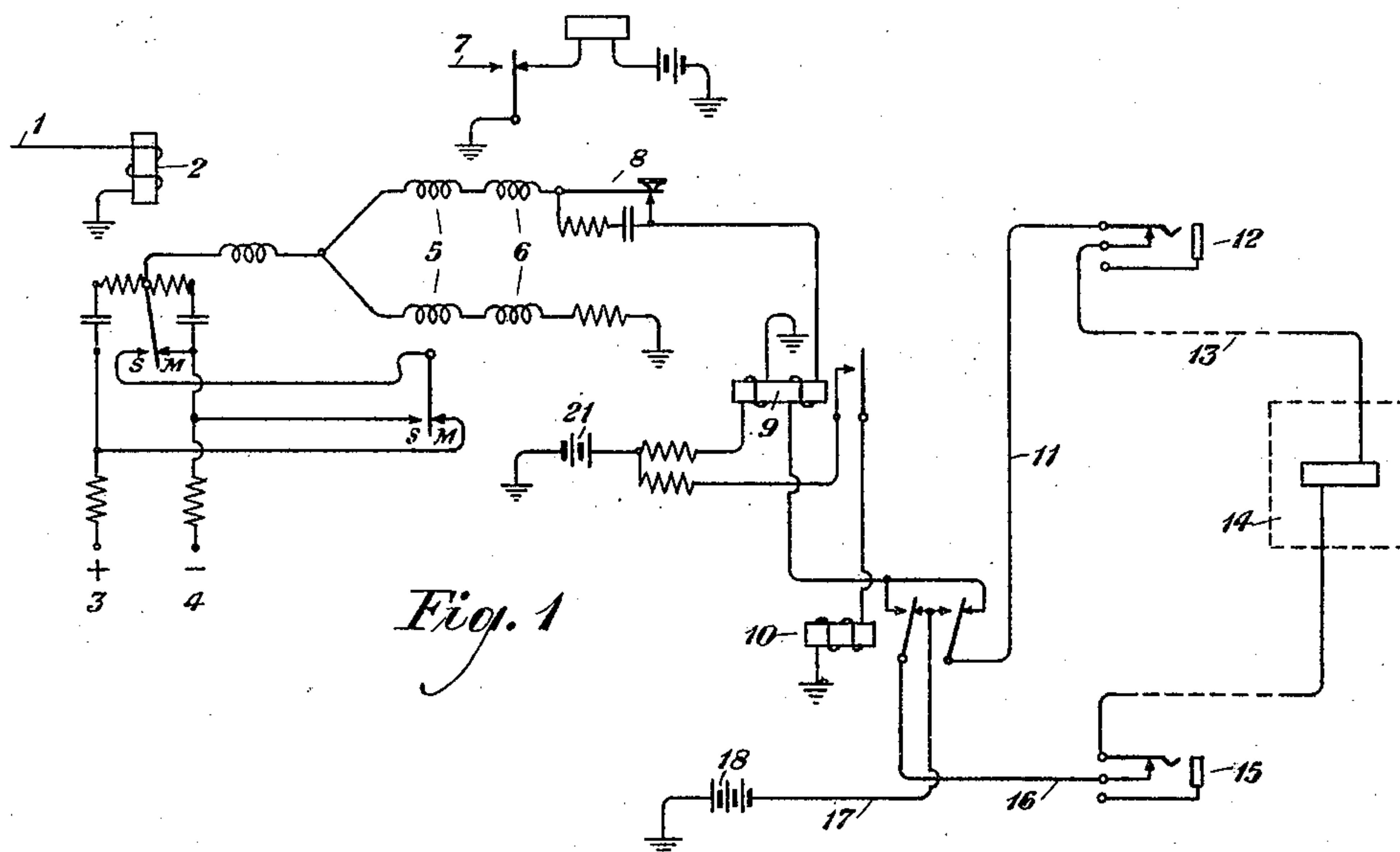


Fig. 1

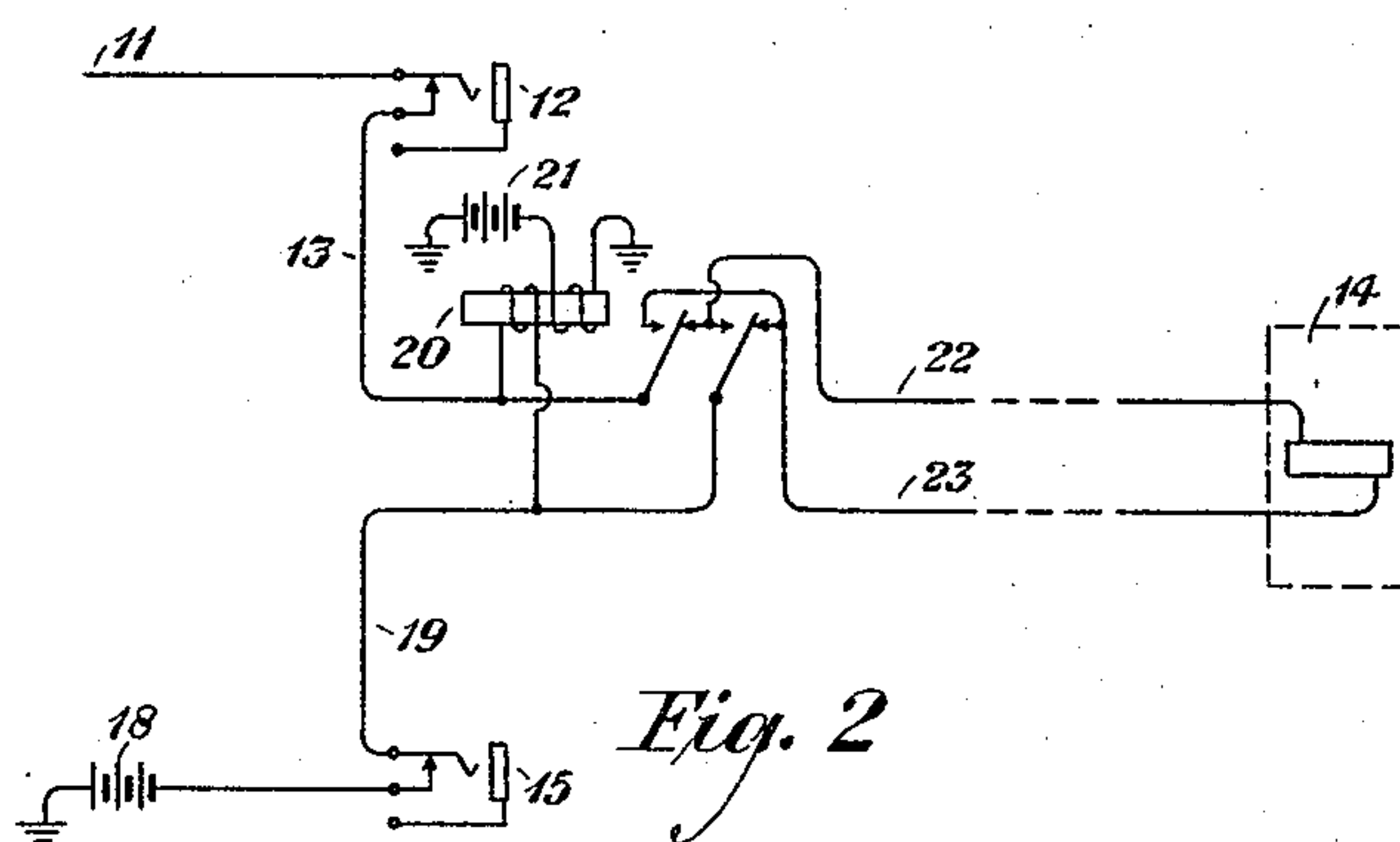


Fig. 2

INVENTOR
J. A. Eyster
BY *Geo. H. Coe*
ATTORNEY

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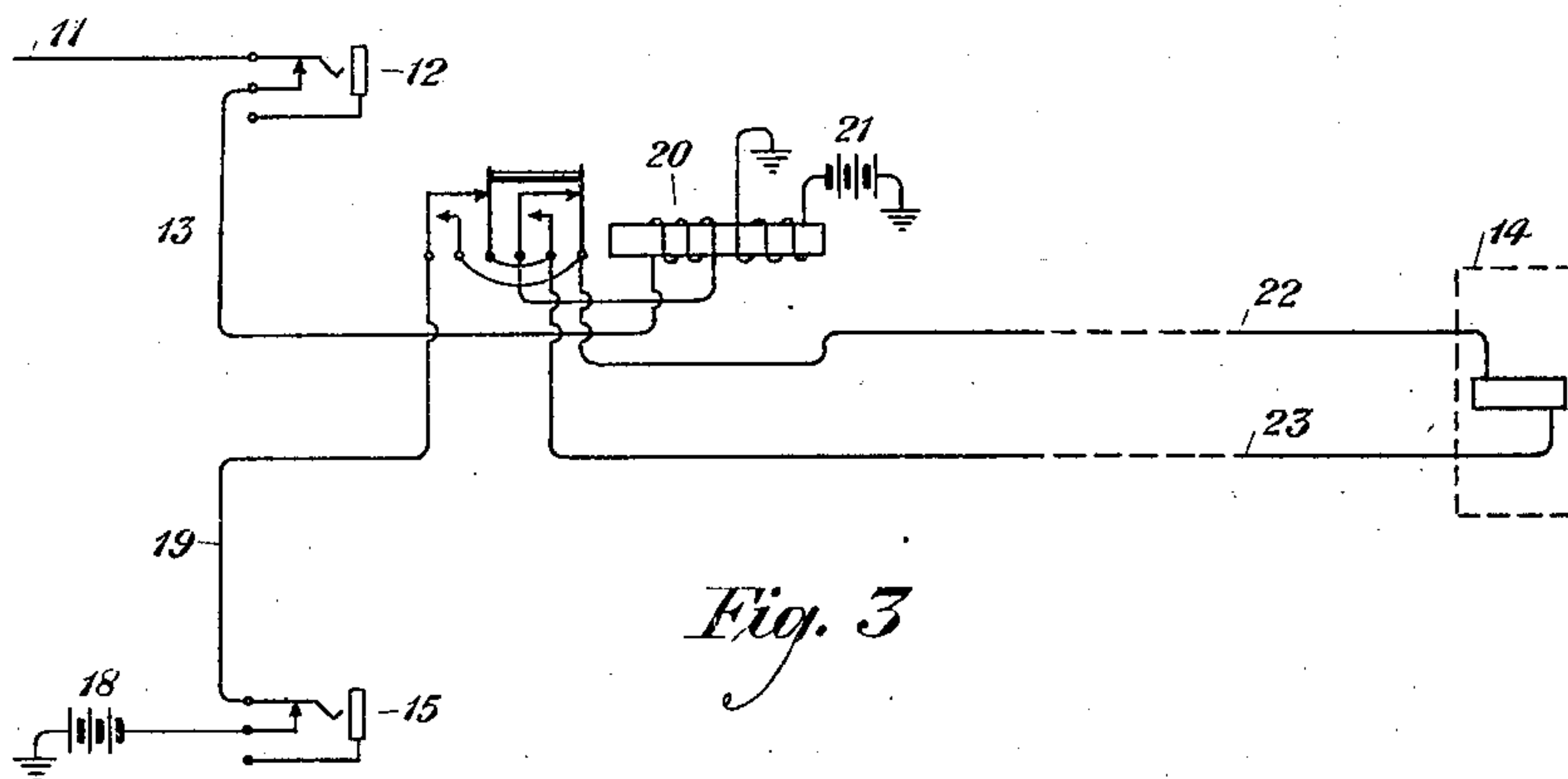


Fig. 3

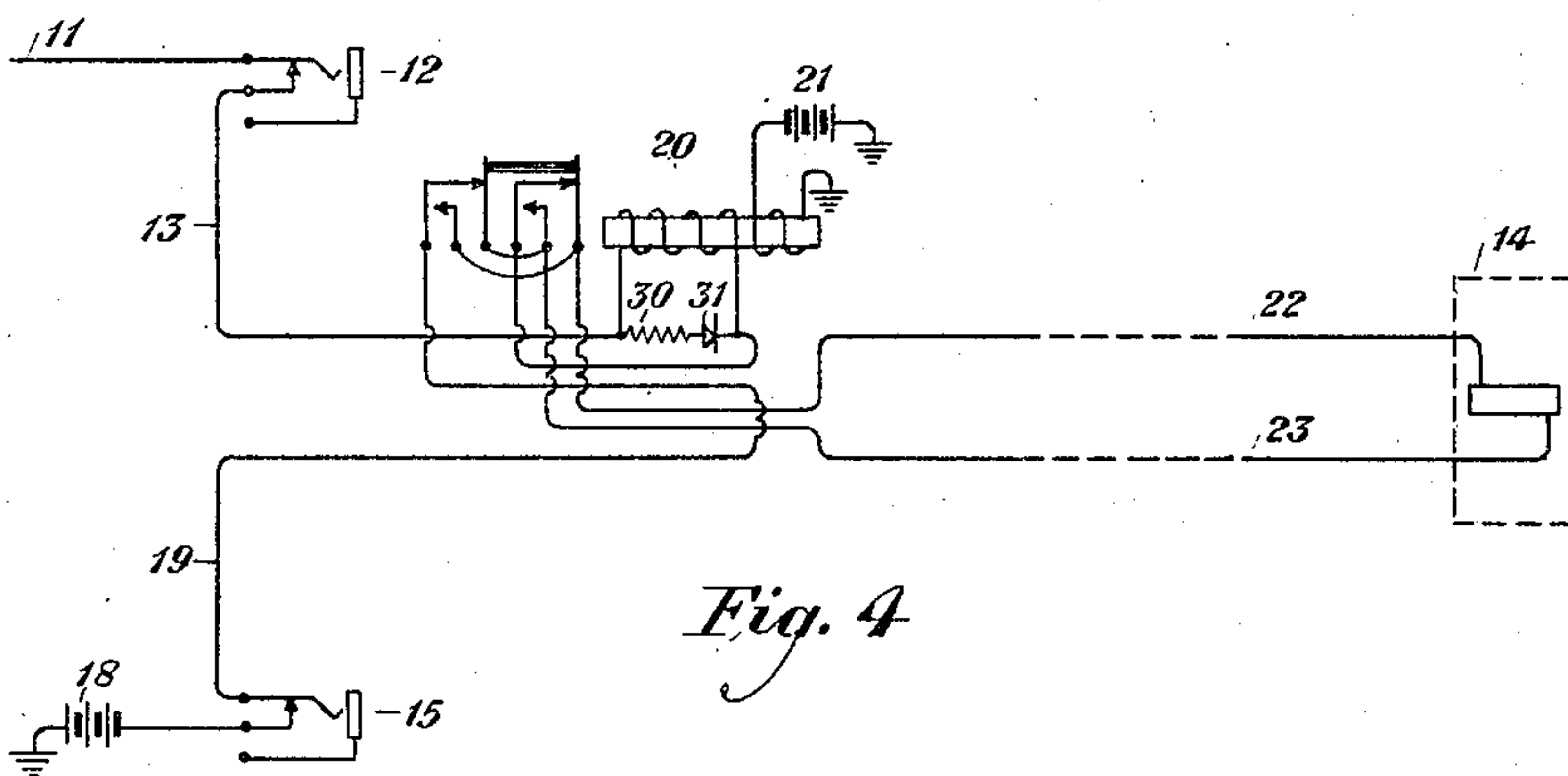


Fig. 4

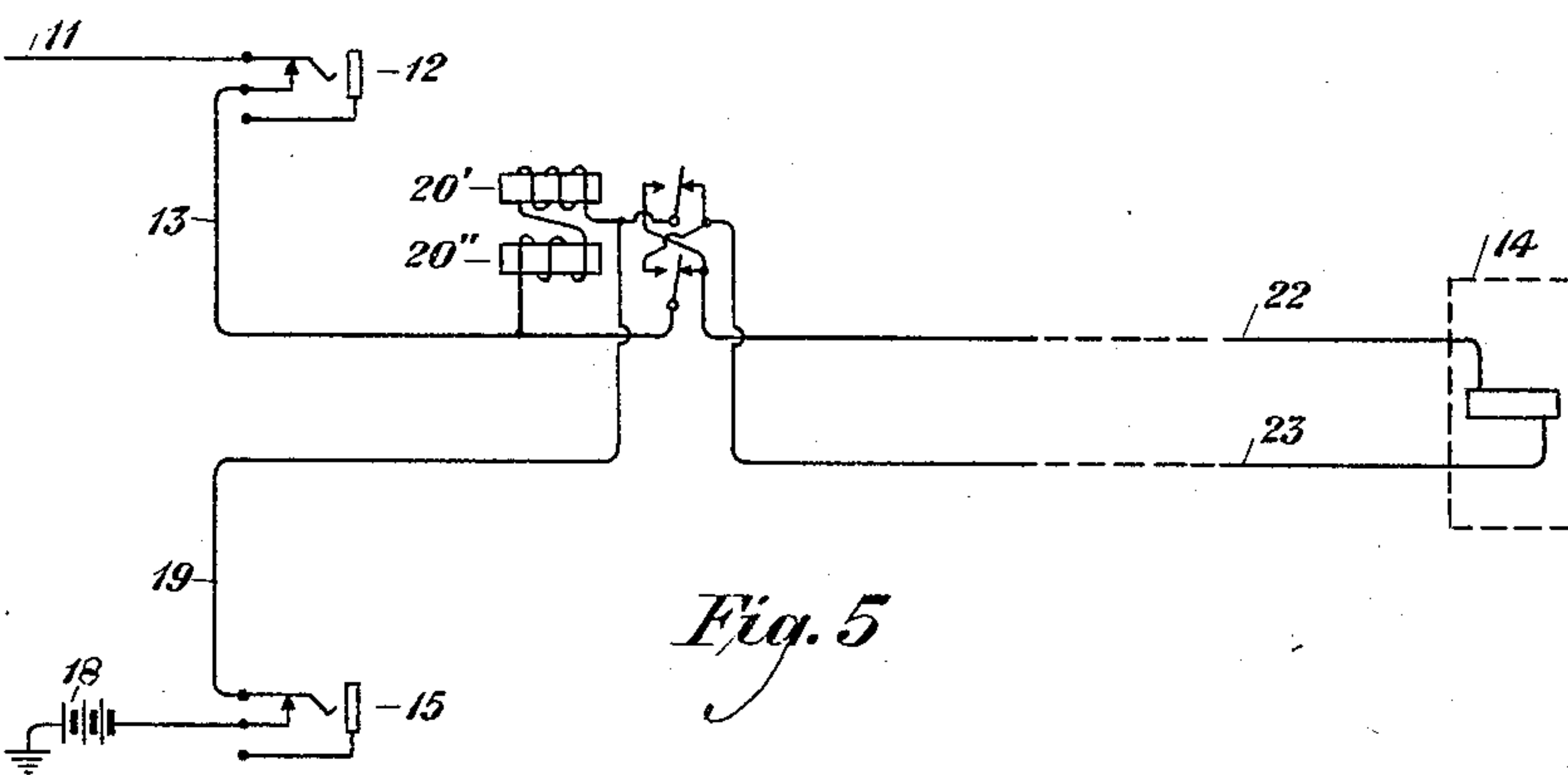


Fig. 5

INVENTOR
J. A. Eyster
BY *Geo. Folke*
ATTORNEY

UNITED STATES PATENT OFFICE.

JAMES A. EYSTER, OF RIVER EDGE, NEW JERSEY, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

TELEGRAPH SYSTEM.

Application filed May 24, 1928. Serial No. 280,259.

This invention relates to telegraph systems, and more particularly to improvements in telegraph line terminal circuits for automatically maintaining a constant direction of current flow in the subscriber's loop regardless of the direction of current supplied to it at the central office.

The reversal of direction of current flow in a telegraph subscriber's loop is often objectionable, particularly in instances wherein printing telegraph equipment is included in the loop circuit. This may be due to the fact that the printing telegraph equipment may include polar relay apparatus and, therefore, the reversal of the loop current would leave the printer in the spacing condition, or in a condition unresponsive to signals. Other types of apparatus in a subscriber's loop dependent in operation upon current of a certain polarity would obviously be adversely affected by a reversal in the direction of the loop current.

In the arrangements of this invention, relay means are provided associated with the telegraph line terminal which, in response to a reversal of direction of the current in the loop circuit, will automatically reverse the loop circuit connections at the central office so that the direction of current flow therethrough will be the same as previously. The utilization of the arrangements of the invention will eliminate the present necessity of the subscribers informing the repeater attendant when the loop circuit has been set up with an improper connection so that the polarity of the current is wrong. The arrangements of the invention will also eliminate the necessity for the repeater attendant to determine which is the proper polarity for the loop current as has been found necessary in setting up two terminal repeaters to act as an intermediate repeater with loops. The arrangements of the invention will furthermore prevent the possibility of signals being sent for a period of time from the central office while the subscriber's apparatus is in a condition unresponsive thereto. Other objects and features of the invention will appear more fully from the detailed description thereof herein-after given.

The invention may be more fully understood from the following description, together with the accompanying drawing in

the Figures 1, 2, 3, 4 and 5 of which the invention is illustrated. Similar reference characters have been utilized to denote like parts in all of the figures.

In Fig. 1 is shown a section 1 of a telegraph line terminating at a central office and controlling the receiving relay 2. The spacing and marking contacts of the receiving relay are shown associated with the sources of current of opposite polarity 3 and 4. A break relay 5 and a sending relay 6 are shown. The sending relay 6 controls a short circuit 7 to be closed across the output of the oscillator of carrier frequency utilized for sending. This apparatus is not shown. A key 8 may be included in the circuit. As the above described apparatus is well known in the art, no further description thereof will be given.

The telegraph line terminal apparatus includes a number of jacks of which the jacks 12 and 15 are illustrated. Associated with the line at the central office are the relays 9 and 10. Relay 9 is a differential relay with one circuit closing contact which controls the relay 10. Relay 10 is a single winding relay with two transfer contacts. One of the windings of the differential relay 9 is included in series in the loop circuit. The other winding of relay 9 acts as a polarizing winding and is energized continuously by an outside source of potential, such as battery 21. The contacts of relay 10 are connected into both sides of the loop circuit in such a way as to reverse its polarity when the relay 10 operates. The loop circuit will also include a battery 18 and apparatus 14 at a subscriber's station. The apparatus 14 may, for example, be printing telegraph apparatus including polar relays or the apparatus 14 may be any apparatus depending for its operation upon current of a certain polarity in the loop circuit. It is obvious that if for any reason the polarity of battery 18 should be reversed, the apparatus 14 would not function properly.

The operating, holding and releasing values of the circuits for relay 9 are so chosen that the arrangements will operate as follows. With normal current in the loop in the normal direction, the effects of the two windings of the differential relay 9 will neutralize each other and the relay 9 will remain normal and unoperated. The relay 10 will also remain normal and the direction of cur-

rent flow through the loop will be normal. If the loop current falls to zero, the current in the polarizing winding, although tending to operate relay 9, will not do so because, un-
 5 aided, it is not strong enough. If, however, the current supplied to the loop is reversed and approximately normal in amount, its effect will aid that of the polarizing wind-
 10 The closing of its contact will operate relay 10 which will reverse the connections of the loop circuit. In doing this, it is pointed out that it will momentarily open the loop cir-
 15 cuit, but this will not cause the differential relay 9 to release because the current in the polarizing winding is strong enough to hold it in the operated position. If, after opera-
 20 tion of the loop with reversed current, the current should fall to zero, the differential relay 9 will not release for the same reason; but, if after operation of the loop with re-
 25 versed current, the current should be made to flow in the normal direction and in approximately normal amount, the effect of the differential winding will be neutralized suf-
 30 ficiently to allow the differential relay 9 to release. This will release relay 10 and re-store the loop to its normal polarity.

In Fig. 2 is shown a modification of the ar-
 30 rangements of Fig. 1. In Fig. 2 certain parts of the telegraph repeater apparatus well known in the art and shown heretofore in Fig. 1 have been omitted. The loop circuit may be traced as follows: conductor 11, con-
 35 tact of jack 12, conductor 13, contacts of relay 20, conductor 22, apparatus 14 in the subscriber's station, conductor 23, contacts of relay 20, conductor 19, contact of jack 15 to battery 18. The relay 20 is a differential re-
 40 lay having one winding bridged across conductors 13 and 19. The relay 20 has another winding which acts as a polarizing winding in connection with battery 21. The operat-
 45 ing, holding and releasing values of relay 20 are similar to those of relay 9 of Fig. 1. It will be seen that if the current in the loop circuit is reversed from normal, the relay will operate and by means of its contacts will transfer the loop circuit connections so that
 50 the current flow through apparatus in the loop at the subscriber's station will be in the normal direction.

In Fig. 3 is shown a modification of the ar-
 55 rangements of Figs. 1 and 2 in that the relay 20 is provided with two sets of make-before-break contacts. These will short-circuit the loop during operation, maintaining current through the relay winding and avoiding the necessity of a second relay.

60 In Fig. 4 is shown a further modification of the arrangements of the invention. In this arrangement, the winding of relay 20 is shunted by a rectifier 31 in series with a re-
 65 sistance 30. A rectifier of the copper oxide contact variety may be utilized in this con-

nection if desired. When current flow in the loop circuit is in such direction that the rec-
 70 tifier interposes but little resistance, only a slight current will flow through the operat-
 75 ing winding of the relay 20. The effect of the holding winding, which is in circuit with battery 21, is in opposition to this. The cur-
 80 rent through the holding winding by itself must not be strong enough to operate the relay 20. When current flows through the
 85 loop in the opposite direction, the rectifier 31 will oppose its flow and all of the current will go through the operating winding and will operate the relay. If this current should
 90 fall to zero, the current in the holding wind-
 95 ing is strong enough to keep the relay oper-
 100 ated. If the current reverses to the first men-
 105 tioned direction, the resistance 30 in series with the rectifier will cause some current to be shunted through the operating winding,
 110 sufficient in amount to neutralize the effect of the holding winding and thereby allowing the relay to release. It will be seen that changes in the polarity of the current in the
 115 loop will cause the operation of relay 20 to reverse the connections of the loop circuit to apparatus at the subscriber's station.

In a further modification of the arrange-
 120 ments of the invention illustrated in Fig. 5, two polar relays 20' and 20'' are shown con-
 125 nected in series across the loop circuit. These polar relays are adjusted so that they will remain on either contact when no current is
 130 flowing in the windings. A reversal of current flow in the loop will effect these relays to
 135 cause a reversal of the connections of con-
 140 ductors 22 and 23, so that the direction of current flow through apparatus 14 will re-
 145 main normal.

While the invention has been disclosed as
 150 embodied in certain specific arrangements which are deemed desirable, it is understood that it is capable of embodiment in many and other widely varied forms without departing
 155 from the spirit of the invention as defined by
 160 the appended claims.

What is claimed is:

1. A telegraph line terminating at a cen-
 165 tral office, a loop circuit for extending said line to apparatus at a subscriber's station,
 170 and means at said central office responsive to a change in the direction of current flow in
 175 said loop circuit for reversing the connec-
 180 tions of said loop circuit at said central office.

2. A telegraph line terminating at a cen-
 185 tral office, a loop circuit for extending said line to apparatus at a subscriber's station,
 190 and relay means at said central office respon-
 195 sive to a change in the polarity of current
 200 flow in said loop circuit for reversing the manner in which the apparatus at the sub-
 205 scriber's station is connected into said loop circuit.

3. A telegraph line terminating at a cen- 130

tral office, a loop circuit for extending said line, a relay at said central office having a line winding associated with said loop circuit and a holding winding in a separate circuit, 5 said windings being arranged to have opposing effects when the loop current is of a definite polarity, and switching means controlled by said relay for reversing the connections of said loop circuit.

In testimony whereof, I have signed my 10 name to this specification this 21st day of May, 1928.

JAMES A. EYSTER.