Dec. 16, 1924. 1,519,202

J. HERMAN

TELEGRAPH SYSTEM

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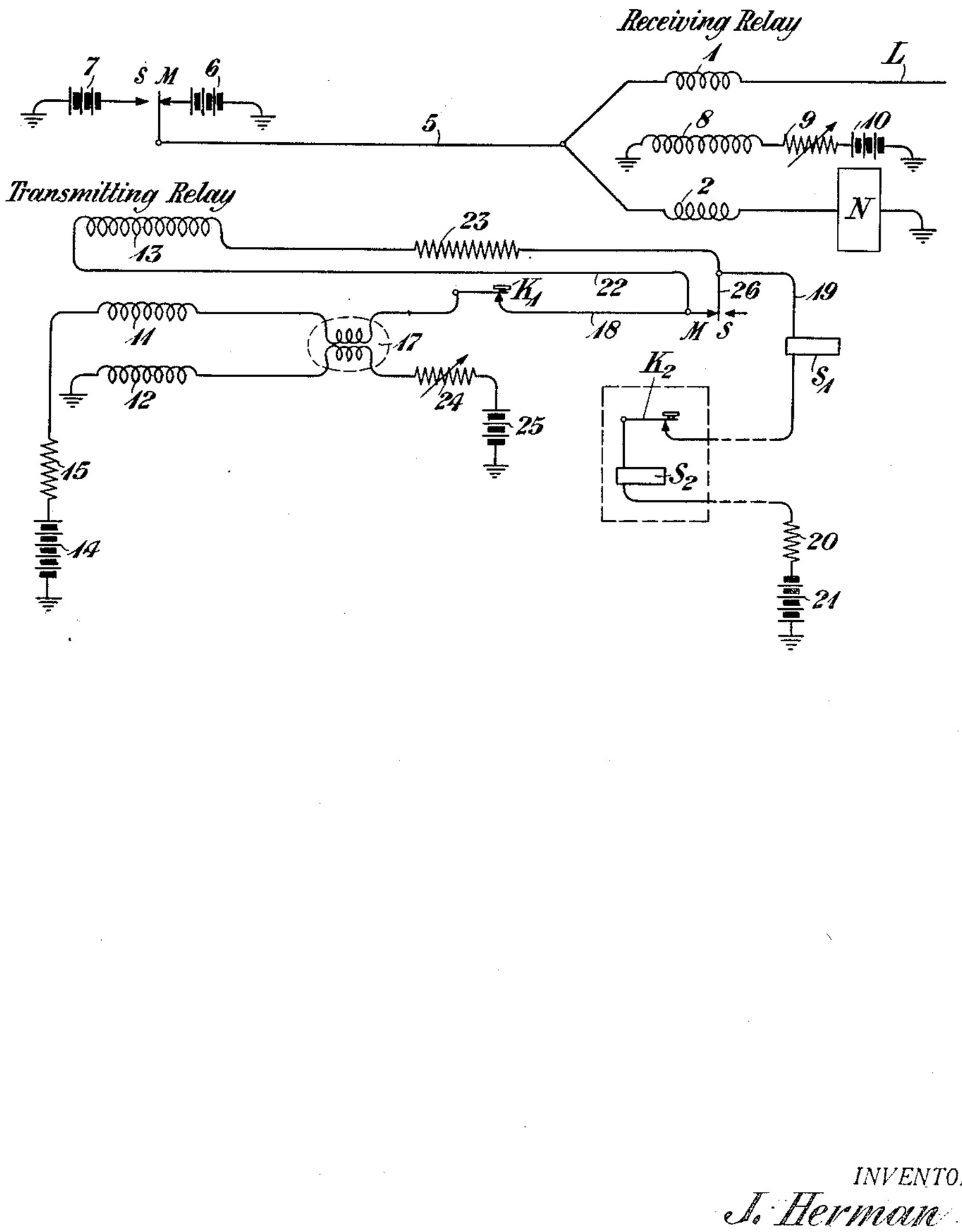

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TELEGRAPH SYSTEM.

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To all whom it may concern:

Be it known that I, JOSEPH HERMAN, residing at New York, in the county of New York and State of New York, have invented certain Improvements in Telegraph Systems, of which the following is a specification.

This invention relates to improvements in duplex telegraph sets.

One of the novel features of the arrangements of the invention consists in the provision of a separate winding on the transmitting relay, this winding being connected across the armature and marking contact of the receiving relay to serve as a holding winding in half duplex operation. This feature makes it possible to eliminate the use of an auxiliary or control relay for operating the holding winding as is the practice in former arrangements. A further advantage of the arrangements of the invention over prior arrangements is that there is no delay in transmitting a "break" signal as the subscriber's key controls both loop and holding windings of the transmitting relay, whether the receiving relay is on its marking or spacing contact, while in prior arrangements the transmitting relay was under the subscriber's control only when the receiving relay was on its marking contact. An additional novel feature of the invention consists in the use of a double-wound milli-ammeter in the loop and biasing circuit of the transmitting relay to obtain unbiased operation of the transmitting relay. This arrangement permits accurate adjustments to be made of the loop and biasing currents in connection with the polar operation of the transmitting relay. Furthermore, it has the advantage that the loop and biasing circuits are kept separate so that several telegraph sets may be connected in series for three-way operation. In general the arrangements of the invention present the advantage that it utilizes fewer relays than former arrangements and accordingly gives more efficient and simpler operation with less maintenance. Other features and advantages of the invention will appear more fully from the detailed description hereinafter given.

The invention may be more fully understood from the following description thereof together with the accompanying drawing in the figure of which is illustrated a circuit diagram of the arrangements of the invention.

In the drawing are shown two polar relays, one for transmitting and the other for receiving. The receiving relay has two balanced windings 1 and 2 connected differentially to the real and artificial lines L and N so as to be unaffected by outgoing signals. A third winding 8 is provided used in connection with a local battery 10 and a variable resistance 9 and forms a means for biasing the relay to counteract difference in ground potentials and unbalance of battery potentials at the distant station. The armature 26 and marking contact M of the receiving relay are connected in series with the local subscriber's loop circuit and repeat incoming signals from the line to the loop. The loop circuit is traced as follows: from ground and battery 14, resistance 15, winding 11 of the transmitting relay, one of the windings of the milli-ammeter 17, key K_1, conductor 18, marking contact M and armature 26 of the receiving relay, conductor 19, sounder S_1, through key K_2 and sounder S_2 of the subscriber's set, resistance 20, to battery 21 and ground.

The transmitting relay is similar to the receiving relay and has two balanced windings 11 and 12. Winding 11 is connected into the subscriber's loop circuit and winding 12 is included in a biasing circuit comprising battery 25, variable resistance 24, one of the windings of the milli-ammeter 17 and winding 12. The transmitting relay is also provided with a third winding 13. This winding consists of a large number of turns connected in series with a suitable resistance 23 and is bridged across the armature 26 and marking contact M of the receiving relay. This winding provides the "holding" feature in half duplex operation. Associated with the transmitting relay are shown the oppositely poled batteries 6 and 7, the marking and spacing contacts, and the armature controlled by the transmitting relay and connected by conductor 5 to the line and artificial line. As this sending arrangement is well known no further description thereof will be given.

With the above arrangement incoming signals from the line L will operate the receiving relay and, therefore, open and close the loop circuit. With the armature of

the receiving relay on its marking contact M the loop circuit is closed directly therethrough and the holding winding 13 is short-circuited. The normal current flowing in this circuit through the winding 11 of the transmitting relay is sufficient in magnitude to hold this relay on its marking contact. This current may in actual practice be approximately 60 milli-amperes. When the receiving relay operates to the spacing contact, the holding winding 13 and resistance 23 are connected in series with the loop circuit, causing the current to drop to 2 or 3 milliamperes. Owing to the large number of turns on the holding winding 13 this current is sufficient to hold the transmitting relay on its marking contact. but all the other relays in the loop circuit will be released. During the process of transmitting into the line the armature of the receiving relay will be on its marking contact M and accordingly the holding winding 13 will be short-circuited thereby, so that opening and closing the loop circuit by means of one of the keys K_1 or K_2 will operate the transmitting relay as well as all other relays in the loop circuit.

It is pointed out that the arrangements of the invention present an important advantage over former systems by connecting the holding winding in this manner in that a "break" signal can be initiated instantly without regard to the position of the receiving relay armature. This is not the case with former arrangements employing an auxiliary "control" or "break" relay, since these relays maintain the current through the holding winding until a marking signal is received. In the arrangements of the invention, however, opening the loop circuit by means of a key will also release the holding winding whether the receiving relay is on the marking or spacing contact.

In order to secure unbiased operation of the transmitting relay a double wound milliammeter 17 is connected differentially into the loop and biasing circuits and the currents are adjusted until the meter gives equal and opposite deflections with the loop open and closed. This will produce the same result as is obtained in former arrangements of metallic telegraph loops. It has the advantage, however, that the loop and biasing circuits are kept separate thereby permitting the connection of a number of loop circuits in series when it is desired to transmit over more than one line. It is pointed out that the arrangements of the invention might be converted into a full duplex set by supplying switching arrangements to open up the holding winding and connect separate loops to the transmitting and receiving relays. The fact that the same number of relays are used for full and half duplex operation would mean a considerable saving in apparatus.

While the invention has been illustrated in certain specific arrangements which are deemed desirable it is understood that it is capable of embodiment in many and widely varied forms without departing from the spirit of the invention as defined in the appended claims.

What is claimed is:

1. A telegraph set comprising a receiving relay and a transmitting relay, a loop circuit including an operating winding for said transmitting relay and adapted to be closed over the armature and marking contact of said receiving relay, and a holding circuit including a holding winding for said transmitting relay and a resistance, said holding circuit being connected to the armature and marking contact of said receiving relay whereby said circuit will be short-circuited when said loop circuit is closed at said armature and marking contact and will be connected serially with said loop circuit when said loop circuit is opened at said armature and marking contact.

2. A telegraph set comprising a receiving relay and a transmitting relay, a loop circuit closed over the armature and marking contact of said receiving relay, and a holding circuit for said transmitting relay, said holding circuit being connected across the armature and marking contact of said receiving relay.

3. A telegraph set comprising a receiving relay and a transmitting relay, a loop circuit closed over the armature and marking contact of said receiving relay, a holding circuit for said transmitting relay, said holding circuit being connected across the armature and marking contact of said receiving relay, a biasing circuit for said transmitting relay, and a current measuring device associated with said holding circuit and said biasing circuit.

In testimony whereof, I have signed my name to this specification this 18th day of February, 1922.

JOSEPH HERMAN.