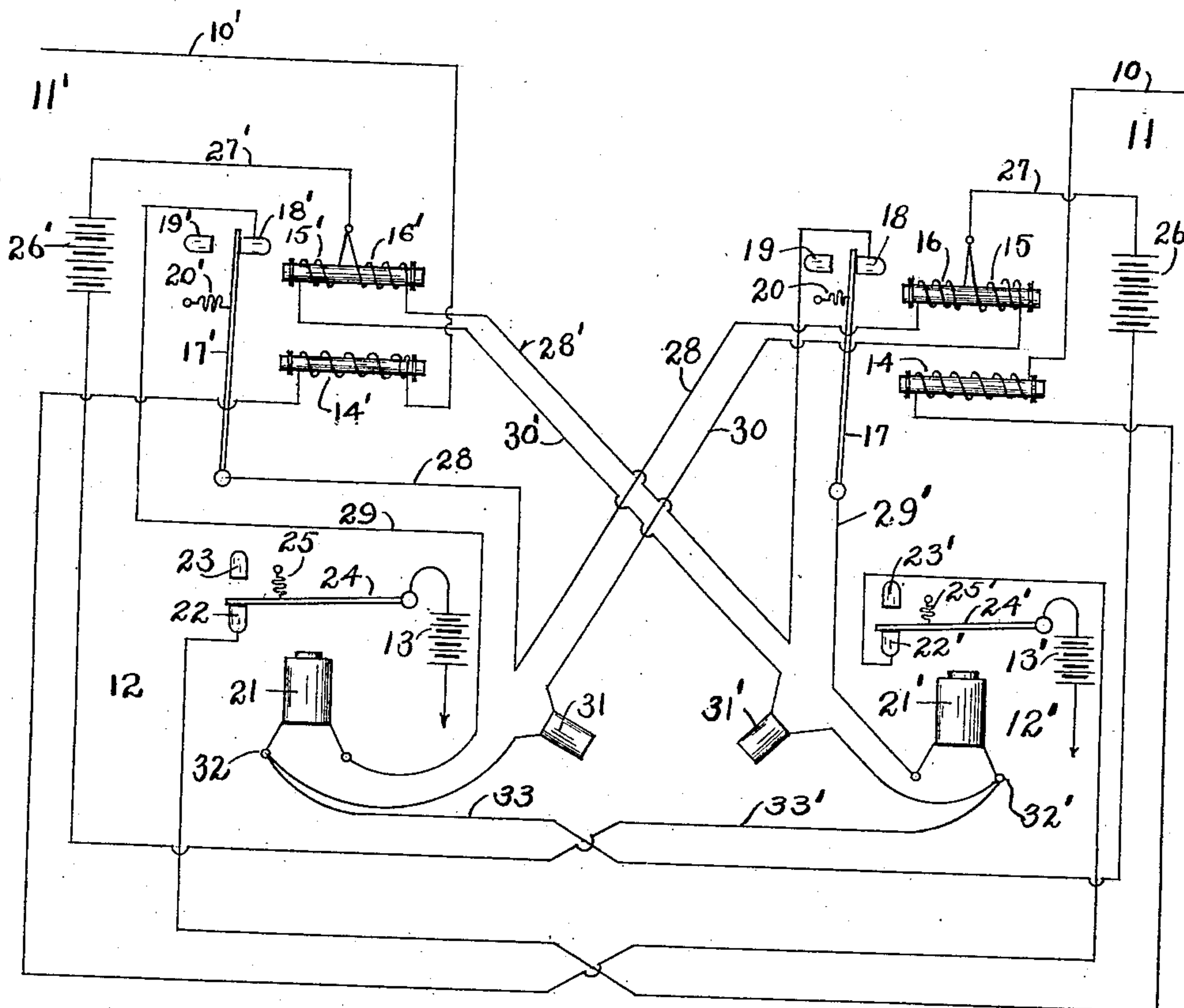


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TELEGRAPH REPEATER.  
APPLICATION FILED APR. 30, 1908.

914,877.

Patented Mar. 9, 1909.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

GEORGE L. RAWDON, OF CLEVELAND, OHIO.

## TELEGRAPH-REPEATER.

No. 914,877.

Specification of Letters Patent.

Patented March 9, 1909.

Application filed April 30, 1908. Serial No. 430,035.

*To all whom it may concern:*

Be it known that I, GEORGE L. RAWDON, a citizen of the United States of America, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Telegraph-Repeaters; and I hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

This invention relates to automatic telegraph repeaters and is designed as an improvement over the repeater shown in patent to Weiny, 479,178, July 19, 1892.

One of the objects of the present invention is to simplify and cheapen the repeater by eliminating a number of the parts including two local circuits and as many sets of batteries and one break point of each repeating sounder.

A further object is to increase the efficiency and the rapidity with which signals or messages are repeated or transmitted from one line to the other.

In carrying out my invention I employ in the main receiving relays differential magnets for keeping the break point of one relay intact while the signal or message is being transmitted to the corresponding main line, and arrange the local circuit connections in such a manner that the break point of one relay controls the circuit of the repeating sounder and also one coil of the differential magnet of the other relay. I employ merely two local circuits, each having two legs or branches, one of which contains one coil of the differential magnet of one relay, the break point of the opposite relay, and the coil of a repeating sounder, and the other of which contains the other coil of the differential magnet of the first relay and if desired a resistance sufficient to equalize the resistance of the two legs or branches or to cause the resistance to have a fixed or desired ratio.

With this construction and arrangement a less number of local circuits, batteries and break points is required than with the repeater shown in the above patent, and consequently the efficiency and the rapidity of transmission is increased.

My invention may be further briefly summarized as consisting in certain novel combinations and arrangements of parts which will be described in the specification and set forth in the appended claims.

In the accompanying drawing which shows somewhat conventionally my improved telegraph repeater and the various electrical connection, 10 represents one main line which for the sake of convenience I shall call the east line, 11 the main receiving relay, 12 the repeating sounder, and 13 the main battery of the east line. Likewise 10' represents the other main line which I shall call the west line, 11' the main receiving relay, 12' the repeating sounder and 13' the main battery of the west line.

The main receiving relay 11 is provided with a main electro magnet including a coil 14 in the east line, a differential magnet consisting of two oppositely wound coils 15 and 16 which form a part of a local circuit controlled in part by the opposite relay 11' as will be explained, a pivoted armature lever 17 and a contact point 18 and a stop 19. A spring 20 connected to the armature lever 17 tends to pull the latter away from the contact point 18. The repeating sounder 12 is provided with an electro magnet including a coil 21 which as will be explained is in a local circuit with coil 16 controlled by the relay 11', a contact point 22 and a stop 23 and a pivoted armature lever 24 which is connected to the main battery 13 and to the ground. A spring 25 connected to the armature 24 tends to pull the latter away from the contact 22. Likewise the main receiving relay 11' is provided with a main electro magnet including a coil 14' in the west line, a differential magnet consisting of two oppositely wound coils 15' and 16' which as will be explained are in another local circuit controlled in part by relay 11, a pivoted armature lever 17' and a contact point 18' and a stop 19'. A spring 20' connected to the armature lever tends to pull the latter away from the contact point 18'. The repeating sounder 12' is provided with an electro magnet including a coil 21' located in the local circuit with coil 16' controlled by the relay 11, a contact point 22' and a stop 23' and a pivoted armature lever 24' which is connected to the main battery 13' and to the ground. A spring 25' connected to the armature lever 24' tends to draw the latter away from the contact 22'.

I shall now describe the two local circuits which I employ in my repeater. The one local circuit is provided with a battery 26 which is connected by a conductor 27 to a point at which the circuit divides and to the two coils 15 and 16 of the differential mag-



net, which coils are in parallel to each other or in opposite legs of the divided circuit. The coil 16 is connected by a conductor 28 to the armature lever 17' of the main receiving relay 11' and the contact point 18' of the same relay is connected by a conductor 29 to one terminal of the coil 21 of the repeating sounder 12. The coil 15 of the differential magnet of relay 11 is connected by conductor 30 and a resistance 31 which will be explained later, to the opposite terminal 32 of the coil 21 of the repeating sounder 12, at which point the two legs of the divided circuit again meet. This local circuit is then completed by a conductor 33 which connects the terminal 32 of the coil 21 to the opposite pole of the battery 26. The other local circuit is provided with a battery 26' which is connected by a conductor 27' to a point where this local circuit divides and to the two coils 15' and 16' of the differential electro magnet. The coil 16' is connected by a conductor 28' to the contact point 18 of the relay 11, and the armature lever 17 of the same relay is connected by a conductor 29' to one terminal of the coil 21' of the repeating sounder 12'. The coil 15' of the differential magnet of the relay 11' is connected by a conductor 30' and a resistance 31' to the opposite terminal 32' of the coil 21' of the repeating sounder 12' at which point the two legs of the divided circuit meet. The circuit is then completed to the opposite pole of the battery 26' by a conductor 33'.

It will be seen from the above description that one coil of each differential magnet is in one leg or branch of a divided circuit which includes also the break point of the opposite main receiving relay and the coil of one of the repeating sounders. As it is essential that the magnetizing effects of the two oppositely wound coils be the same, it is necessary, if the two coils have the same number of turns, that the resistances of the two legs of the divided circuit be equal. I have therefore included in the leg of the circuit containing the other coil of the differential magnet an artificial resistance sufficient to bring about this result. If the two oppositely wound coils have different numbers of turns the resistances may be made such as to produce the proper division of current through the two legs.

Under normal conditions and when neither line is in use both local circuits are closed, the armature lever of each main receiving relay being held onto the corresponding contact point against the tension of the spring, by the magnetizing effect of the main magnet coil, the magnetizing effects of the oppositely wound coils being *nil*, as one coil neutralizes the other. If the operator on the east line opens the east line, the armature lever 17 will be pulled away from the contact point 18 by the spring 20, opening the branch or leg

of the local circuit containing the coil 16' and the coil 21' of the repeating sounder 12', which permits the spring 25' of the repeating sounder to draw the armature lever 24' away from the contact point 22', thus opening the circuit of the west line and causing the signal to be transmitted thereto. Although the west line is opened, the armature lever 17' will not be drawn away from the contact point 18' for the reason that as soon as the coil 16' was rendered ineffective or cut out of service, the other coil 15' in the other leg or branch of the divided circuit holds the armature lever 17' in place and prevents the opposite local circuit from being opened. As soon as the east line is closed the armature lever 17 will immediately be brought into contact with the contact point 18 again restoring or completing that branch of the divided circuit including the coil 16' and 21' of the repeating sounder 12'.

When the signal is to be transmitted from the west line to the east line and the west line is opened by the operator, the armature lever 17' will be drawn away from the contact 18' causing the leg or branch of the divided circuit including the coil 16 of the differential magnet of the main relay 11, and the coil 21 of the repeating sounder 12, to be opened, thereby causing the opening of the east line and causing the signal to be repeated or transmitted thereto. At the same time however that the east line is opened and the coil 16 is cut out of operation, the branch of the local circuit containing the coil 15 of the differential magnet of the main relay 11 is intact permitting the coil 15 by its magnetizing effect to hold the lever 17 of the relay 11 in place and preventing one branch of the opposite local circuit being broken.

I do not desire to be confined to the exact arrangement of parts or exact circuit connection shown, but aim in my claims to cover all modifications which do not involve a departure from the spirit and scope of my invention.

What I claim is,—

1. In a telegraph repeater, a pair of main receiving relays, each having a main magnet and a differential magnet, and means whereby the armature of one relay controls directly one coil of the differential magnet of the opposite relay.

2. In a telegraph repeater, a pair of main receiving relays, each having a main coil and two oppositely wound coils, and a local circuit including one of the oppositely wound coils of one relay and the break point of the opposite relay.

3. In a telegraph repeater, a main receiving relay having a main magnet coil and a differential magnet including two oppositely wound coils, a repeating sounder and a divided local circuit, the coil of the repeating sounder and one coil of the differential magnet being in one branch or leg of the divided



circuit, and the other coil of the differential magnet being in the other branch or leg thereof.

4. In a telegraph repeater, a pair of main  
5 receiving relays, a pair of repeating sounders,  
each main receiving relay having a main  
magnet and a differential magnet, one coil of  
the differential magnet of each relay and the  
coil of the repeating sounder being in a local  
10 circuit controlled directly by the armature of  
the other relay.

5. In a telegraph repeater, a pair of main  
receiving relays, each having a main magnet  
and differential magnet, a pair of repeating  
15 sounders, the two coils of the differential  
magnet of each relay being in opposite legs or  
branches of a divided local circuit, the coil of  
a repeating sounder and the break point of  
the opposite relay being in one of said legs or  
20 branches.

6. In a telegraph repeater, a pair of main  
receiving relays, each having a main magnet  
and a differential magnet, a pair of repeating  
sounders, one coil of the differential magnet

of each relay being in parallel with the other 25  
coil, with the break point of the opposite re-  
lay, and with the coil of a repeating sounder.

7. In a telegraph repeater, a pair of main  
receiving relays, each having a main magnet  
and a differential magnet, a pair of repeating 30  
sounders, a pair of local circuits each having  
two legs or branches, one leg or branch of  
each local circuit containing one coil of the  
differential magnet of one relay, the break  
point of the opposite relay and the coil of a 35  
repeating sounder, and the other leg or  
branch of the same local circuit containing  
the other coil of the differential magnet of the  
first relay, and a resistance sufficient to cause  
the proper division of current between the 40  
two legs or branches.

In testimony whereof, I sign the forego-  
ing specification, in the presence of two wit-  
nesses.

GEORGE L. RAWDON.

Witnesses:

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N. L. McDONNELL.