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M. C. MENGIS.

MEANS FOR AUTOMATICALLY REVIVING EXHAUSTED TELEPHONE PULSATIONS.

(Application filed Aug. 31, 1899.)

(No Model.)

Fig. 1.

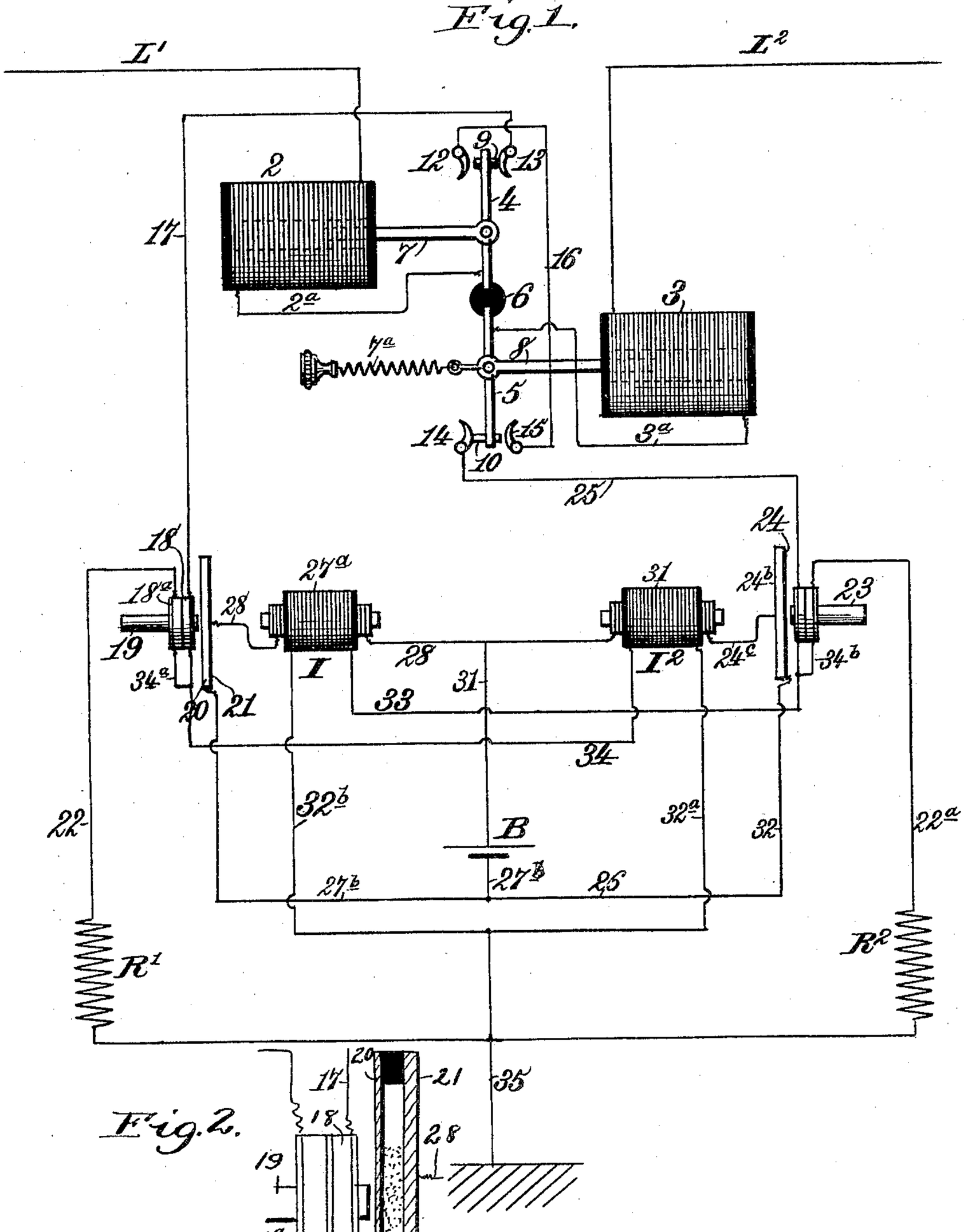
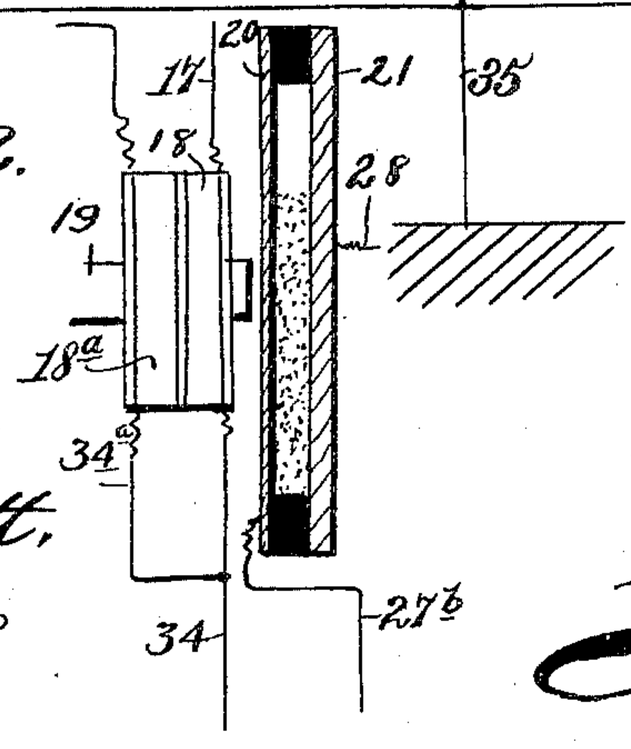


Fig. 2.



Witnesses,
Robert Ewett,
W. B. Keeler

Inventor.
Morris C. Mengis.
By James L. Norris.
Atty.

UNITED STATES PATENT OFFICE.

MORRIS C. MENGIS, OF SHEEPSHEAD BAY, NEW YORK.

MEANS FOR AUTOMATICALLY REVIVING EXHAUSTED TELEPHONE PULSATIONS.

SPECIFICATION forming part of Letters Patent No. 682,332, dated September 10, 1901.

Application filed August 31, 1899. Serial No. 729,107. (No model.)

To all whom it may concern:

Be it known that I, MORRIS C. MENGIS, a citizen of the United States, residing at Sheepshead Bay, State of New York, have invented new and useful Improvements in Means for Automatically Reviving or Reinforcing Partially-Exhausted Pulsations upon a Telephone-Line, of which the following is a specification.

My invention relates to means for automatically reviving or reinforcing partially-exhausted pulsations upon a telephone-line.

It is my purpose to provide means of comparatively simple construction whereby the electric pulsations thrown upon a line-wire by the transmitter of a telephone may be automatically revived or increased in strength at any point or points where said pulsations have become so weak by having traveled to their operative limit as to be unable to produce audible or intelligible sounds in the telephone-receiver at a distant point.

It is my purpose to provide a simple and economical organization, which will be capable of automatic reinforcing action upon pulsations traveling in both directions, whereby said pulsations shall be again thrown upon the line with greatly-increased energy or operative force.

I aim also to provide a reinforcing apparatus which will automatically cut out the magneto-call generator from the circuit which includes the reinforcing apparatus.

The invention consists in the novel parts and combination of parts hereinafter fully explained and then particularly pointed out and defined in the claims.

For the purposes of the following description reference is had to the accompanying drawings, in which—

Figure 1 is a diagram showing the circuits and arrangements of parts of my invention. Fig. 2 is a detail view of one of the microphones.

The reference characters L′ and L² indicate parts of a telephone-line looped into a repeating station. The wire L′ leads to a solenoid 2, while L² goes to a like solenoid 3. These solenoids are on opposite sides of a centrally-pivoted lever consisting of two parts 4 and 5 of conducting material connected together by a central section 6 of insulating material. The core 7 of the solenoid 2 is connected to the part 4 of the lever, and the core 8 of the solenoid 3 on the other side is connected to the part 5. A light spring 7ª acts upon one of the two parts of the lever in a direction contrary to the pull exerted by the cores of the solenoids when the coils are magnetized, and said lever is held by this spring in its normal position, with a contact 9 on the part 4 pressed against a contact 13 and a contact 10 on the part 5 against a contact 14. The tendency of the solenoids when energized is to so displace the lever as to cause the contacts 9 and 10 to break engagement with the contacts 13 and 14 and make engagement with two contacts 12 and 15, connected together by a wire 16. The terminal of the solenoid 2 connects with part 4 of the lever by a wire 2ª, and the terminal of the solenoid 3 has a like connection with the part 5 of the lever by a wire 3ª. From contact 13 a wire 17 leads to one of two coils 18 on the core 19 of a telephone-receiver, said two coils being wound in opposite directions. From said coils a wire 34 goes to the secondary 31 of an induction-coil I², and from said secondary a wire 32ª goes to a ground connection 35. A wire 34ª goes from the wire 34 to the second of the two coils 18ª on the core 19, and from said coil a wire 22 leads to a resistance R′ and thence to the ground connection 35. The two coils 18 and 18ª on the core 19 being wound oppositely will neutralize each other when current flows through both from the inside—that is, from the point 34ª and out—but not vice versa. From contact 14 a wire 25 leads to one of two coils on a core 23, said coils being oppositely wound, like those described above. From the second of these coils a wire 33 goes to the secondary 27ª of an induction-coil I, and from the latter a wire 32ᵇ goes to the common ground connection 35. From the second coil on the core 23 a wire 22ª is led to a resistance R² and thence to the ground-wire 35.

In front of one of the receiving devices is a microphone-transmitter, which is conventionally shown as consisting of two diaphragms 20 and 21, each constructed of a different material, with carbon interposed between them. The diaphragm 21 is of non-magnetic material and is sufficiently thicker,

and therefore more rigid, than the diaphragm 20 to insure a microphonic action, while the diaphragm 20 is constructed of iron or other suitable metal. From the diaphragm 21 a wire 28 leads through the primary of induction-coil I, thence through a battery B, and from the latter by a wire 27^b to the other diaphragm 20. In front of the other receiver is a similar microphone, having one of its diaphragms 24^b connected by a wire 24^c with the primary of the induction-coil I^2 and from the latter through the wire 31 to battery B. From the second diaphragm 24 lead the wires 32, 26, and 27^b to the other pole of battery B. The resistance R′ is substantially equal to the resistance of the line L′, and R^2 to the resistance of line L^2, for a purpose presently explained.

The operation is as follows: The spring 7^a acting upon the parts 4 and 5 of the lever, as described, conversational currents will traverse the solenoids 2 and 3 without affecting said lever, the circuit over line L′ being through solenoid 2, wire 2^a, lever part 4, contact 13, wire 17, the coil 18 on core 19, wire 34, secondary 31, and wires 32^a and 35 to ground. These currents will not flow in any material degree over wire 34^a and the second coil 18^a on core 19, because the resistance R′ is greater than the resistance along the circuit just traced, and core 19 will therefore be magnetized by only the coil 18. The impulses produced will thus affect the diaphragm 20 and alter the resistance of the battery-circuit 28 and 27^b, which includes the primary of the induction-coil I. The pulsations in said primary will be reproduced in the secondary, but with much greater electromotive force, which will pass to ground on one side over wires 32^b and 35 and over wire 33 to the point where wire 34^b branches off, at which point the current will divide and pass equally through both the coils on the core 23, one half going to line L^2 over wire 25, contact 14, lever part 5, wire 3^a, and solenoid 3, and the other half going to earth through the resistance R^2. The latter being equal to the resistance of L^2, this division of the current is obtained, and as the equal divisions pass through the oppositely-wound coils on the core 23 they produce no effect upon the diaphragm of the microphone. The repeating operation in the opposite direction over line L^2 can easily be understood from this description, as it is a repetition of the steps explained. It will be observed that since the current from the secondary of either induction-coil I or I^2 is split and divided between two circuits, one of which includes the line, while the other contains a resistance equal to the line, the wire on the secondary of each induction-coil must have twice the number of turns that would be required if the current traversed the line only, and this is found in practice to be the fact.

For calling substations or the exchange currents of much higher potential are used, and as it is not desirable that these should traverse the repeating apparatus I have provided the arrangement of solenoids, contacts, and separate conducting parts 4 and 5 of the lever. The currents referred to will energize the solenoids 2 and 3 sufficiently to displace the lever, and thereby remove the contacts 9 and 10, carried by the parts 4 and 5, respectively, off the fixed contacts 13 and 14 and upon the contacts 12 and 15, which are connected by wire 16. This gives a circuit for the high-tension currents from line L^2 through the solenoid 2, wire 2^a, lever part 4, contact 12, wire 16, contact 15, lever part 5, line 3^a, solenoid 3, and line-wire L^2.

In the foregoing description I have referred to the coils 18 and 18^a, surrounding the core 19, as being wound in opposite directions, with the wire 22 leading from the coil 18^a to ground through the resistance R′. While this is the preferred form of my invention, it will be obvious that upon some lines a single coil may be employed upon the core 19 instead of a plurality of coils wound in opposite directions. When this is done, of course the ground connection 22 and 35, with the resistance R′ therein, will be dispensed with. It will also be understood that the construction and arrangement of parts shown in the drawings represent but one embodiment of my invention. Various changes in the details and arrangements of these parts may be made without departing from the nature or spirit of my invention. I therefore do not care to be limited to the precise construction and arrangement shown, except as defined by the claims.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. In a telephone system, the combination with a line-wire, of two microphones, two magnets, one for each microphone, each having two opposite windings, one connected to said line, two induction-coils, the primaries thereof being in connection with a battery, and each secondary being connected to both the windings upon the magnet of one of the microphones, an earth connection for the second winding on each magnet, and a resistance in each equal to the resistance of the line, substantially as described.

2. In a telephone system, the combination with two similar microphones and induction-coils, of a battery connected to the primaries of the latter, magnets having each two windings in opposite directions connected to the secondary windings of the induction-coils and through the latter to earth, and an incoming and outgoing telephone-line, each connected to one of the windings of said magnets, substantially as described.

3. In a telephone system, the combination with a reinforcing apparatus, of a switch consisting of two conducting portions pivoted on a central insulation, a solenoid on each side having cores connected to said portions, a connection from the second terminal of each solenoid to one of the conducting portions of

the switch, contacts between which the latter vibrate, a connection between two of said contacts, a spring normally pressing the switch against the two remaining contacts, and an incoming and outgoing line connected to the first terminals of the respective solenoids, substantially as described.

4. In a telephone system the arrangement described for ringing up substations without cutting in a reinforcing-station, which consists of a pivoted switch having conducting portions on opposite sides of its pivot, two contacts on alternately opposite sides of the two parts of said switch, a wire connecting said contacts, two alternately-arranged contacts each connected to the reinforcing apparatus, a spring normally holding the two parts of the switch against the latter contact and out of touch with the first two named, two solenoids arranged on the same sides of the switch as said first-named contacts, their cores being connected to the conducting parts of said switch, and a line-wire looped into said reinforcing-station, and connected to the terminals of the solenoids, substantially as described.

5. In a telephone system, the combination with a microphone, of a receiver, one of the diaphragms of said microphone constituting the diaphragm of said receiver, and said receiver comprising a core having two oppositely-wound coils thereon, a second microphone, and a second receiver comprising a core having two oppositely-wound coils thereon, one only of the coils of said magnets being traversed by the incoming current and both being traversed by the outgoing current.

6. In a telephone-repeater, a combined receiver and transmitter, the magnet of the receiver comprising two oppositely-wound coils, one only of which is traversed by the incoming current and both of which are traversed by the outgoing current.

7. In a telephone-repeater, a microphone and a receiver having a common diaphragm, the magnet of the receiver comprising a core and two oppositely-wound coils thereon, a line connection with one of said coils and a ground connection, containing a resistance, with the other of said coils, the first of said coils being traversed by the incoming current, and both of said coils being traversed by the outgoing current, which outgoing current is thereby divided, part of the same passing to the line and the other part to said ground connection containing said resistance.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

MORRIS C. MENGIS.

Witnesses:
S. VAN WYCK,
GEORG KIRKEGAARD.