No. 741,847. PATENTED OCT. 20, 1903.

D. F. STAKES.

TELEPHONE SYSTEM.

APPLICATION FILED NOV. 17, 1902.

NO MODEL.

FIG. I.

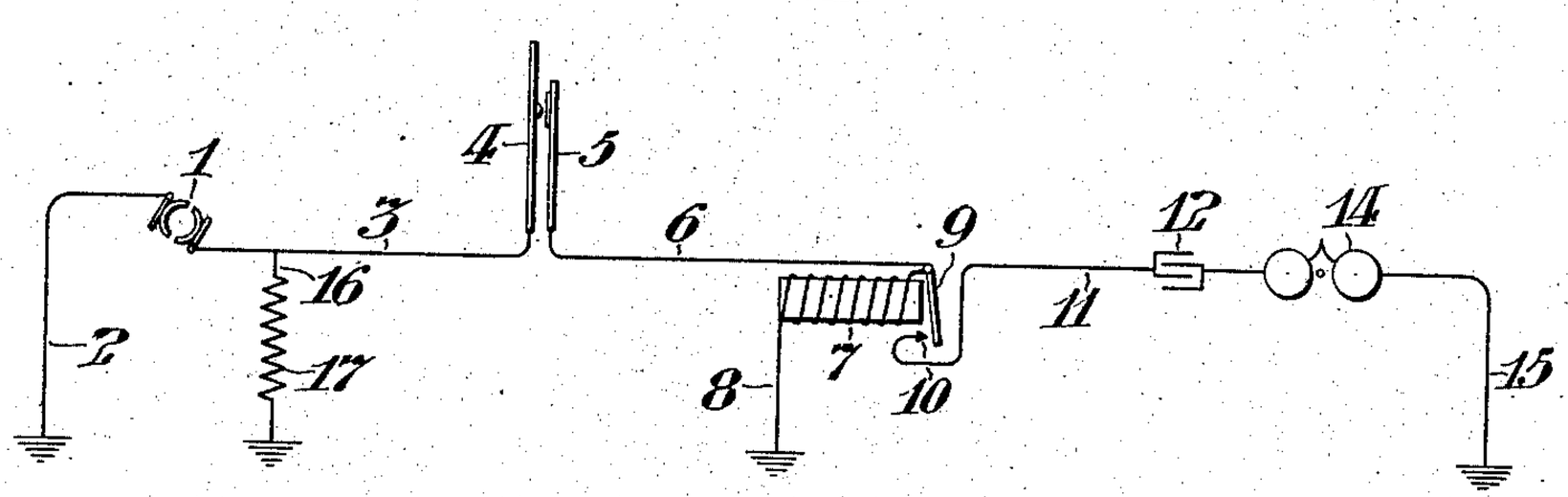
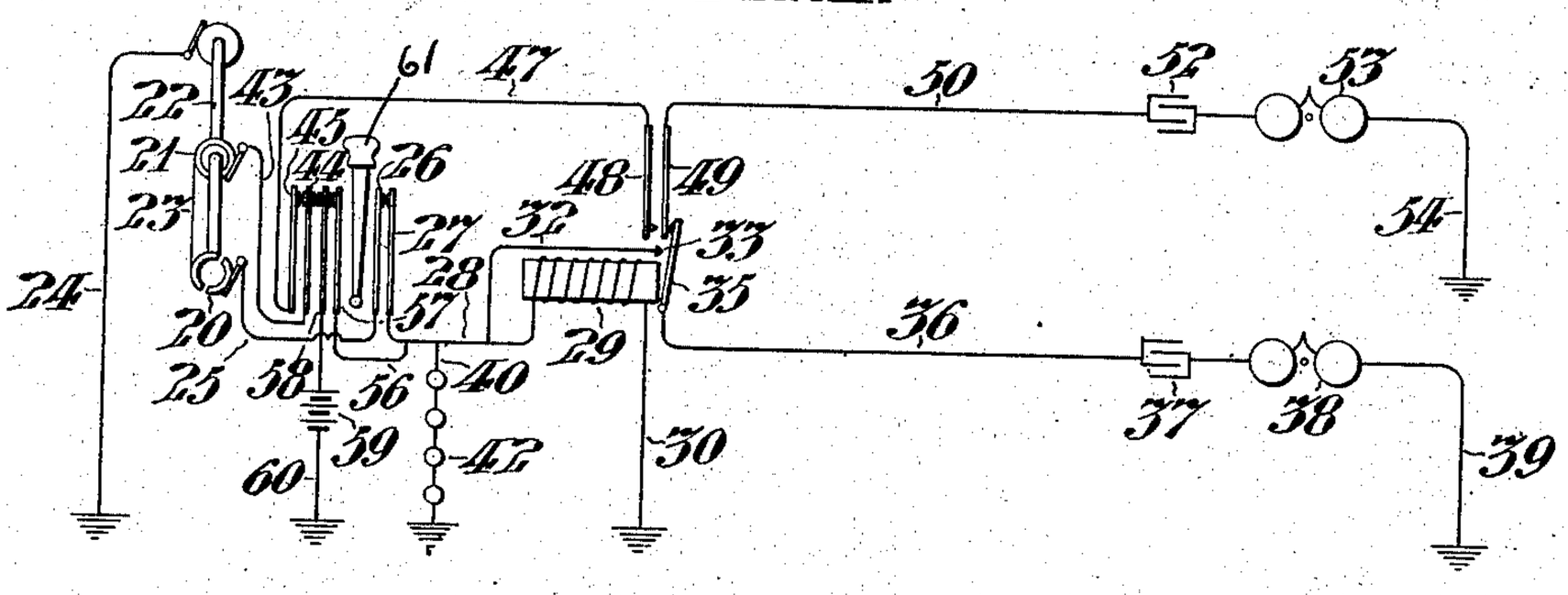


FIG. II.



WITNESSES:

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No. 741,847. Patented October 20, 1903.

UNITED STATES PATENT OFFICE.

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TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 741,847, dated October 20, 1903.

Application filed November 17, 1902. Serial No. 131,640. (No model.)

To all whom it may concern:

Be it known that I, DAVID FRANKLIN STAKES, of No. 334 Earlham Terrace, Germantown, Philadelphia, Pennsylvania, have invented certain new and useful Improvements in Telephone Systems, whereof the following is a specification, reference being had to the accompanying drawings.

My invention relates to a telephone system including a condenser arranged to be charged with pulsating current to operate a station-signal.

My improvements may be employed with particular advantage in a system comprising a central station wherein switch-relays, respectively assigned to subscribers' lines, are grouped together and controlled by the central-station operator to connect any selected subscriber's line with the signaling-current generator. In such a system as ordinarily arranged the condensers are discharged through ground connections respectively local to the individual relay-coils, and owing to the inductance of said coils the relay-armatures are uselessly vibrated during the operation of signaling. Such vibration of the relay-armatures is objectionable in that it lessens the effect of the current for ringing purposes, tends to erode the relay-contacts by the sparking of the current, and produces an incessant chattering noise in the central-station room containing the relays.

It is the object of my invention to prevent the useless vibration of the relay-armatures and the objectionable results above specified by providing a better path for the discharge of the condensers than is afforded by the ground connections local to the relays. As hereinafter described, said better path for the discharge of the condensers comprises a shunt or bridge circuit connecting opposite sides of the main circuit between the generator and the relays and including a non-inductive resistance preferably, but not necessarily, exceeding that of a single relay-coil.

My invention comprehends the various novel features of construction hereinafter more definitely specified and claimed.

In the accompanying drawings, Figure I is a diagram showing a single telephone signaling-circuit connecting a central station and a subscriber's station and arranged to signal with pulsating current. Fig. II is a diagram similar to Fig. I, but showing two party subscribers' stations in connection with a central station, one of said party stations being arranged to be signaled with pulsating current and the other with alternating current.

Referring to Fig. I, the pulsating-current generator 1 is located at the central station and provided with the ground connection 2. Said generator is connected by the wire 3 with the switch-contact 4, opposed to the switch-contact 5, and the latter is connected by the wire 6 with the relay-coil 7, provided with the ground connection 8. The relay-armature 9 is arranged to connect with the contact 10 and establish the circuit through the line 11 to the condenser 12 when said coil 7 is energized. Said condenser is located at the subscriber's station and is connected with the subscriber's signal-bell 14, provided with the ground connection 15. Between said source of pulsating current 1 and the relay-coil 7 I provide the wire 3 with the ground connection 16, which bridges the opposite sides of the circuit. Said bridge 16 includes the non-inductive resistance medium 17, which is preferably of greater resistance than the relay-coil 7, but affords a better path for the discharge of the condenser 12. It is to be understood that the arrangement aforesaid is such that the relay-coil 7 and ground connection 8 afford a better path for a direct pulsating current than the bridge 16, including the resistance 17; but when such a current is modified by the discharge of the condenser 12 the bridge 16, including the resistance 17, being non-inductive, offers a better path for the discharge than the inductive coil 7 and ground connection 8.

The apparatus indicated in Fig. I is operated as follows: It being desired to operate the subscriber's bell 14, a central-station operator closes the switch-contacts 4 and 5, and thus establishes a circuit from the generator 1 through the wires 3 and 6, coil 7 to ground, through wire 8. Said coil 7 being thus energized, the armature 9 makes contact with the switch-point 10 and part of the pulsating cur-

rent is delivered to the condenser 12. As before noted, under conditions known to the prior art said condenser would discharge back through the line 11, armature 9, and coil 7 to ground intermittently, thus causing the armature 9 to vibrate uselessly. However, the non-inductive path 16 and 17 being included in the circuit, the discharge of the condenser 12 is effected through the line 11, armature 9, line 6, contacts 5 4, line 3, and bridge 16 to ground without releasing the armature 9. Said armature 9 being retained in contact with the switch-point 10 during the discharge of the condenser 12, the aforesaid operation of signaling is noiseless, as far as the apparatus in the central station is concerned, the full current is effective for signaling, and the relay-contacts are not eroded.

Fig. II shows the application of my improvements to a two-party line comprising means to signal one party with pulsating current and the other party with alternating current, as follows: In Fig. II, I employ a generator or generators comprising a source of pulsating current 20 and a source of alternating current 21, conveniently coupled on a common shaft 22 by the conductor 23 and provided with a common ground connection 24. The pulsating-current generator 20 is connected by the wire 25 with the switch-terminal 26, opposed to the switch-terminal 27, and the latter is connected by the wire 28 with the relay-coil 29, provided with the ground connection 30. The wire 32 extends from the wire 28 to the switch-terminal 33, and the latter is opposed to the relay-switch armature 35, connected with the line 36, leading to the subscriber's condenser 37. Said condenser 37 is connected with the subscriber's bell 38 and provided with the ground connection 39. Between said source of pulsating current 20 and the relay-coil 29 I provide the wire 28 with the ground connection 40, which bridges the opposite sides of the circuit. Said bridge 40 includes the non-inductive resistance medium 42, which latter may conveniently consist of an incandescent lamp or lamps and preferably of greater resistance than the relay-coil 29, but affording a better path for the discharge of the condenser 37. The alternating-current generator 21 is connected by the wire 43 with the switch-terminal 44, opposed to the switch-terminal 45, connected by the wire 47 with the relay switch-terminal 48, which is opposed to the relay switch-terminal 49. Said switch-terminal 49 is connected by the line-wire 50 with the subscriber's condenser 52, and the latter is connected with the subscriber's bell 53, provided with the ground connection 54. The apparatus for signaling the subscriber's bell 53 also includes the wire 56, extending from the wire 28 to the switch-terminal 57, opposed to the switch-terminal 58, which latter is connected with the battery 59, provided with the ground connection 60. The operator may ring either of the bells 38 or 53 by swinging the key 61 to the right or left, as follows: It being desired to ring the subscriber's bell 38, the central-station operator shifts the key 61 toward the right-hand side of Fig. II, and thus connects the terminals 26 27 and establishes a circuit from the generator 20 through the wire 25, contact 26, contact 27, wire 28, relay-coil 29, ground connection 30, ground connection 24, and cross connection 23 to the generator 20. The terminals 48 and 49 are also connected, but without effect upon the circuit. The coil 29 being thus energized, the switch-armature 35 is drawn into contact with the switch-terminal 33 and the circuit established from the wire 28 through the wire 32, switch-terminal 33, armature 35, and wire 36 to the condenser 37, which operates the bell 38. Said condenser 37 is discharged through the wire 36, armature 35, switch-terminal 33, wire 32, wire 28, and ground connection 40, including the resistance medium 42 and without causing said armature 35 to vibrate. When it is desired to signal the subscriber's bell 53, the central-station operator shifts the key 61 toward the left-hand side of Fig. II, thus connecting the terminals 57 and 58 and establishing a circuit from the battery 59 through said contacts 58 57, wire 56, wire 28, relay-coil 29, ground connection 30, and ground connection 60 back to the battery 59. The relay 29 being thus energized, the armature 35 connects the terminals 48 49 (from which the armature is insulated) and establishes the circuit from the alternating-current generator 21 through the terminals 44 45 (which have been connected by the key 61) and through the wire 47, terminals 48 49, and wire 50 to the condenser 52, which operates the subscriber's bell 53 without disturbing the armature 35 of the relay-coil 29, which latter remains energized by the current from battery 59 during the operation of ringing bell 53.

It is to be noted that although I have shown my invention embodied in a telephone system wherein the ground is conveniently utilized for one side of the circuit it is to be understood that my improvements are equally applicable to full metallic circuits employing either pulsating current alone, as shown in Fig. I, or both pulsating and alternating current, as shown in Fig. II. Moreover, it is characteristic of each form of my invention referred to that a bridge-circuit is provided connecting opposite sides of the main circuit and affording a better path for the discharge of the condenser than the path including the relay-coil.

I do not desire to limit myself to the precise arrangement herein set forth, as it is obvious that various modifications may be made therein without departing from the essential features of my invention.

I claim—

1. In a telephone system, the combination with a pulsating-current generator; of a condenser; a relay operative to connect said generator and said condenser; and, a resistance-

bridge connecting opposite sides of the circuit, between said relay and said generator, substantially as set forth.

2. In a telephone system, the combination with a pulsating-current generator; of a condenser; a relay operative to connect said generator and said condenser; a bridge connecting opposite sides of the circuit, between said relay and said generator; and, a non-inductive resistance medium in said bridge, substantially as set forth.

3. In a telephone system, the combination with a pulsating-current generator; of a condenser; a relay operative to connect said generator and said condenser; a bridge connecting opposite sides of the circuit, between said relay and said generator; and a non-inductive resistance medium in said bridge, whose resistance exceeds the resistance of said relay, substantially as set forth.

4. In a telephone system, the combination with a pulsating-current generator; of a ground connection for said generator; a condenser; a ground connection for said condenser; a relay operative to connect said generator and said condenser; and, a ground connection between said generator and said relay, including a non-inductive resistance medium, substantially as set forth.

5. In a telephone system, the combination with a pulsating-current generator; of a ground connection for said generator; a condenser; a ground connection for said condenser; a relay operative to connect said generator and said condenser; and, a ground connection between said generator and said relay, including a plurality of incandescent lamps whose resistance exceeds that of said relay, substantially as set forth.

6. In a telephone system, the combination with means arranged to generate pulsating current and alternating current; of two condensers; circuit connections for the same; a relay, common to the circuits of both of said condensers and operative to supply one of said condensers with pulsating current and the other of said condensers with alternating current, at different times; and, a resistance-bridge between said relay and said generator, connecting opposite sides of the circuit supplied with pulsating current, substantially as set forth.

7. In a telephone system, the combination with a generator of both pulsating and alternating current; of a circuit connection for said generator common to both of said currents; two condensers; circuit connections for said condensers; a relay common to both of said condensers, adapted to respectively supply said condensers with pulsating current and alternating current; a bridge connecting opposite sides of the circuit between said relay and said generator and parallel with the condenser supplied with pulsating current; and, a non-inductive resistance medium in said bridge, exceeding the resistance of said relay, substantially as set forth.

8. In a telephone system, comprising a central station, and two party-lines connected therewith; of a condenser in each of said party-lines; a bell in each of said lines; means arranged to ring one of said bells with alternating current and the other of said bells with pulsating current; a relay operative to establish connection with the respective condensers for charging the same; a bridge connecting opposite sides of the circuit, between said generator and said relay; and, a non-inductive resistance medium in said bridge, substantially as set forth.

9. In a telephone system, comprising a central station and two party-lines connected therewith; of a condenser in each of said party-lines; a bell in each of said lines; a relay common to both of said lines; means to generate pulsating current; means to generate alternating current; a switch-key arranged to ring one of said bells with alternating current and the other of said bells with pulsating current; a battery arranged to energize the relay during the operation of said switch-key to supply the line with alternating current; a bridge connecting opposite sides of the circuit between the current-source and the relay; and, a non-inductive resistance medium in said bridge, substantially as set forth.

In testimony whereof I have hereunto signed my name, at Philadelphia, Pennsylvania, this 13th day of November, 1902.

DAVID F. STAKES.

Witnesses:
JAMES H. BELL,
M. K. TRUMBORE.