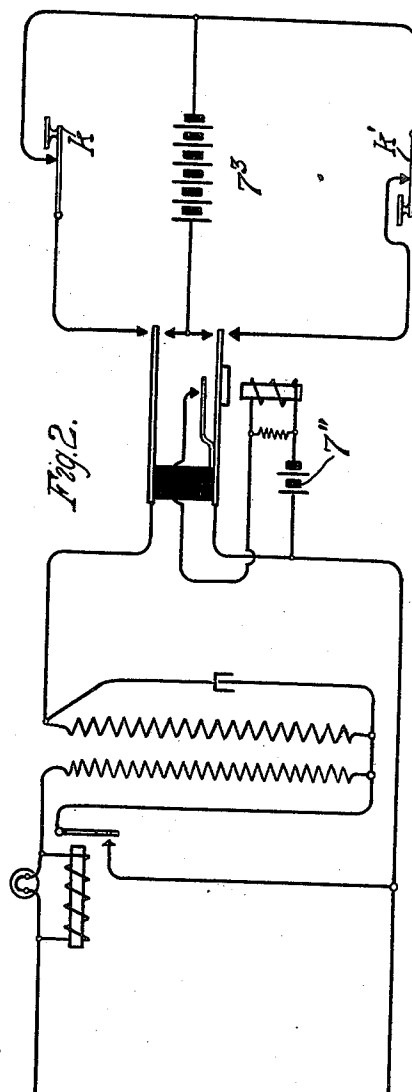
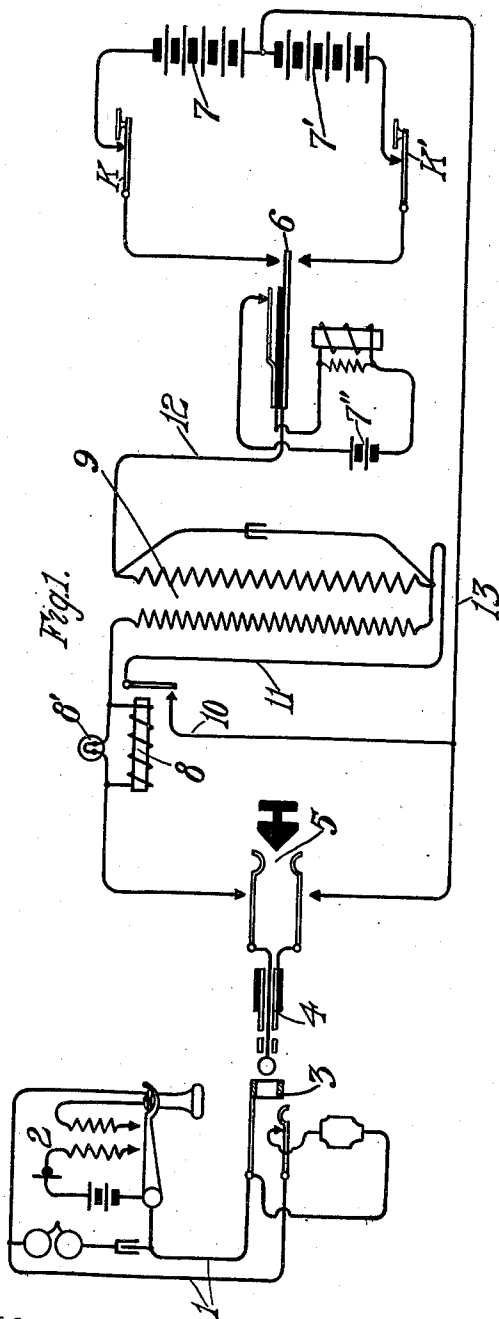


H. N. FARIS.
 TELEPHONE RINGING DEVICE.
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1,008,408.

Patented Nov. 14, 1911.



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UNITED STATES PATENT OFFICE.

HARRY N. FARIS, OF KANSAS CITY, KANSAS.

TELEPHONE-RINGING DEVICE.

1,008,408.

Specification of Letters Patent.

Patented Nov. 14, 1911.

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To all whom it may concern:

Be it known that I, HARRY N. FARIS, a citizen of the United States of America, and a resident of Kansas City, county of Wyandotte, and State of Kansas, have invented a new and useful Improvement in Telephone-Ringing Devices, of which the following is a specification.

My invention pertains to methods and apparatus for generating ringing currents in a telephone central office for the purpose of ringing telephone bells.

My object is to provide a system of current-generating devices which will operate effectively in delivering ringing currents when called upon to do so, and will maintain a condition of readiness for operation during those periods when not called upon for delivery of ringing current, the condition of readiness for action being maintained at a minimum of wasted energy.

My invention is designed primarily for use in connection with current-generating systems on which the prime source of energy is a galvanic battery associated with an inductive transformer, and the method which I use to conserve the energy of the battery when the system is not called upon to deliver ringing current is to open the battery circuit supplying the primary winding of the transformer during the periods when current is not required, and to close the circuit automatically when the ringing current is required.

My system further is such that where the transformer is not required, the bells to be rung may be operated directly from the potential of the ringing battery without the intervention of the transformer. This effects an economy in battery power since high resistance bells may be rung directly by the battery with a very small current by placing the battery terminals conductively upon the conductors of the telephone line to be rung, the consumption of power under this condition being much less than if an inductive relation were set up and the battery allowed to pass current through a low resistance primary winding of a transformer. The means which I use to accomplish this result is embodied in a portion of the current generating equipment, and as a result of such embodiment the current generating equipment acts automatically and as a complete unit, delivering a current suitable for ringing, whatever class of cir-

cuit is provided through which said current may be delivered and acting to maintain itself in a state of readiness to deliver proper current at all times, but with a minimum consumption of energy when a circuit for the delivery of current does not exist.

In my system I provide normally for connecting the battery terminals through a vibrator directly to the keys of the telephone switchboard, and in the connecting wires I provide a switching relay. When the circuit to be rung upon is such that but a small current is taken, the switching relay will not be energized, and under such circumstances the direct battery potential will be satisfactory in the operation of the telephone ringer. When a large current is taken, the switching relay is energized and the ringing system is changed from direct ringing to inductive ringing, the battery then supplying the primary of the transformer and the secondary of the transformer supplying to the line a current suitable for ringing a large number of bridged telephone bells, or any heavy load.

In the accompanying drawings, Figure 1 shows a preferred form and Fig. 2 a modified form of the circuits of my invention.

The divers units of apparatus involved are not necessarily especially designed for use in my invention, and for that reason specific mechanical details are not given, all parts being represented by recognized symbols.

Referring first to Fig. 1, a telephone line is represented at 1 having a substation at 2 and a jack at 3. Connecting plug 4 and ringing key 5 serve to connect the line to the device for generating ringing current which comprises vibrating armature 6, ringing batteries 7 and 7', vibrator battery 7'', relay 8 and transformer 9.

The battery 7'' maintains vibration of the armature 6 and thereby maintains a constantly reversing or nominally alternating potential upon the outer contacts of key 5 by connecting the batteries 7, 7' alternately. When key 5 is operated current will flow from the batteries alternately through both windings in series of transformer 9, through relay 8 shunted by lamp 8', and thence to and through the ringer and condenser of the substation 2, returning over the remaining limb of the line. The windings of the transformer are differential when thus traversed by a current and the apparent induct-

ance of the transformer will be due only to the difference in the number of turns between the two windings.

The potential of the batteries 7, 7' shall be sufficient to operate the ringer of substation equipment 2 in case it is a high-wound ringer taking a small current, and in case there are not a large number of ringers bridged upon the line, in other words, in case an overload for the battery current is not encountered. Relay 8 shall be such in construction and adjustment that it will respond to the ringing current and attract and hold its armature upon the ringing current resulting when an overloaded line is encountered. By such operation of relay 8 the conductors 10 and 11 are united and circuit for the batteries 7, 7' is found through keys K, K' to armature 6, thence conductor 12, primary of transformer 9, conductors 11, 10, 13. By this current, which constantly reverses direction, a potential is set up in the secondary of transformer 9, which results in a current of sufficient power to ring satisfactorily upon the overload line. A ratio of two to one in the turns of the transformer 9 is shown. This ratio may be varied in accordance with the requirements of the system in which my improved ringing device is used.

Thus I provide a device adapted normally to ring upon a lightly loaded line with a minimum of expenditure of energy from the ringing batteries, yet one which automatically is converted into a device suitable for ringing upon a heavily loaded line when such a line is encountered in the normal operation of the switchboard, the ringing device automatically returning to its first or normal condition when such ringing load is discontinued.

The ringing load may not necessarily involve a heavily loaded line, since the same results in the matter of the converted ringing device will follow the effort to ring upon several lines at the same time, as might occur when the single ringing device supplies ringing current for a number of telephone operators. Thus a small telephone exchange may operate economically from the battery directly and conductively at all times except at occasional overloads, the conversion feature of the ringing device being held as a reserve power with a maintenance cost which is substantially nil except when the reserve or conversion feature is used.

By opening key K or K', the delivered current may be changed from alternating form to substantially pulsating form.

In Fig. 2 an alternative arrangement of ringing batteries and vibrator contacts is shown. A single ringing battery is used with double vibrator contacts instead of a double battery with single vibrator contacts.

The relay action for converting the device from direct ringing to inductive ringing is substantially as before. The keys K and K' will operate to give a pulsating current of selected polarity when one of them is opened.

In telephone exchanges using storage batteries or central energy systems, the vibrator batteries 7'' may be the same as the ringing batteries. By thus combining 7'' and 7''' in Fig. 2, the entire system operates from the one battery.

Having thus described my invention, what I claim as new and desire to secure by United States Letters Patent is:

1. In a telephone ringing system, a source of ringing supply comprising a battery and a vibrator for connecting the terminals of said battery to the telephone line to be rung upon; and means governed by the ringing condition of said telephone line for interposing an inductive transformer between said telephone line and said battery and vibrator.

2. In a telephone ringing system, a line to be rung upon; a source of energy delivering current suitable for ringing upon said line; and a relay associated with said source of energy and adapted to interpose a transformer between said source and said line, said relay being actuated only in response to an overload current from said source to said line.

3. In a telephone ringing system, a line to be rung upon; a source of energy delivering current suitable for ringing upon said line; and a relay associated with said source of energy and adapted to interpose a transformer between said source and said line, said relay being actuated by ringing current only when said line to be rung upon offers a low resistance.

4. In a telephone ringing system, a direct ringing device; a relay in circuit and in series therewith, said relay operating to change said direct ringing device into an inductive ringing device in response to an overload current delivered from said direct ringing device.

5. In a telephone ringing system, a source of ringing energy normally adapted to ring upon lines requiring a small current and automatic means automatically converting said source to adapt it to ring upon heavily loaded lines, said automatic means operating to convert said source when a heavily loaded line is connected thereto.

6. In a telephone ringing system, a telephone line; a source of ringing supply comprising a battery and a vibrator for connecting the terminals of said battery to said line; and means for interposing an inductive transformer between said telephone line and said battery and vibrator, said means operated by the initial current flow when

said source and said line are connected, and said means being governed by the ringing condition of said line.

7. In a telephone ringing system, a line
5 to be rung upon; a source of energy delivering current suitable for ringing upon said line; and a relay in the ringing conductors and adapted to interpose a transformer between said source and said line, said relay
10 being actuated by current from said source and governed by the resistance of said telephone line.

8. In a telephone ringing system, a line to be rung upon; a source of energy delivering

current suitable for ringing upon said line; 15
and a relay in series with said source of energy and adapted to interpose a transformer between said source and said line, said relay being actuated by ringing current only when said line to be rung upon offers a low 20
resistance.

Signed by me at Kansas City, county of Jackson, and State of Missouri, in the presence of two witnesses.

HARRY N. FARIS.

Witnesses:

JOHN P. JORDAN,
G. N. QUADE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."