

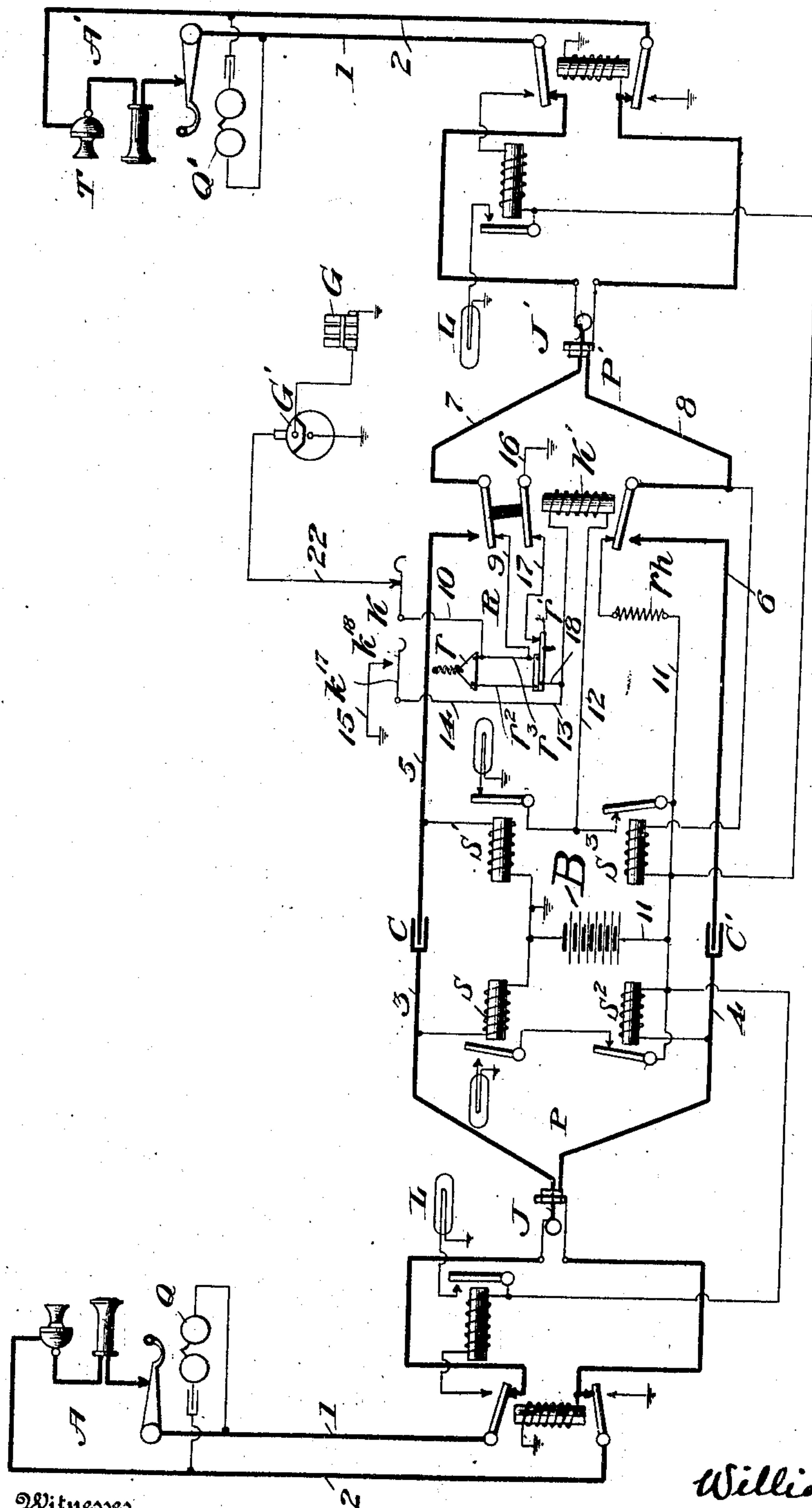
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W. W. DEAN.

RINGING DEVICE FOR TELEPHONE EXCHANGES.

APPLICATION FILED AUG. 8, 1906.



Witnesses

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RINGING DEVICE FOR TELEPHONE-EXCHANGES.

No. 872,293.

Specification of Letters Patent.

Patented Nov. 26, 1907.

Original application filed January 16, 1906, Serial No. 296,288. Divided and this application filed August 8, 1906, Serial No. 329,751.

To all whom it may concern:

Be it known that I, WILLIAM W. DEAN, a citizen of the United States, residing at Elyria, in the county of Lorain and State of Ohio, have invented certain new and useful Improvements in Ringing Devices for Telephone-Exchanges, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to telephone exchange systems and has for its object the improvement of the ringing devices and circuits employed therein.

In the commercial practice of telephony there are a number of conditions to be met in regard to ringing wanted subscribers, which have not heretofore been satisfied. Among these I may mention the necessity for making the operator's work as simple as possible, substituting mechanism in her place wherever practicable, so that said mechanism will perform required operations upon her manual initiation; also the economic condition resulting from raising the standards of exchange construction, and particularly that of the net work of wires and cables in a system, so that the increase in the investment demands a maximum use of the plant at a fixed return, or the maximum return at a fixed use, in order to be profitable, this condition having brought about the general adoption and use of party-lines in cities. Party-line ringing is in many respects a problem by itself, but in my present development of the subject I apply the same principles in its treatment which I employ in ordinary single-party or other ringing, combining therewith the special feature of selection on the part of the operator.

The principal object of my invention is to meet the requirements I have stated, as well as others included in the same category, and in so doing to produce apparatus and circuits for automatic ringing which will be applicable to existing systems as well as new installations, and which for that purpose can be made complete and self-contained in themselves.

As a corollary object is the elimination of inductive resistance or other impending factor in the ringing circuit, and the general improvement of the same in detail.

In attaining my objects I employ as the basis for my scheme of circuits and appa-

tus, a ringing relay. The operation of this ringing relay is the same whether it be used for single-party lines or for poly-station signaling. It is first energized by the act of the operator, and when energized it performs the important functions of the common ringing key, opening the cord-circuit, and connecting the generator circuit across the terminals of the calling plug. In connection with this relay I provide a device responsive to current changes in the subscriber's line, this device maintaining the relay circuit in operative condition, and the relay active, until the subscriber has answered, whereupon the relay is instantly disconnected and the talking circuit thereby restored, clear of all generator connections. This device is non-inductive, consisting preferably of a hot wire or thermic relay. It takes current either from the generator circuit or from the main battery, and the connections are such that it will respond as soon as the subscriber answers, whether the generator is that moment connected, or whether it is during an interval between rings, the battery being then connected. This will be understood when I point out that I preferably employ a commutator in the generator circuit, which puts ringing current on the keys at brief recurring intervals of say two seconds duration, with intervening intervals of four seconds during which the circuit is grounded, current then coming back over the subscriber's line from the main battery.

In party-line ringing, as in single-station line work, the operator simply depresses the proper key, which closes the circuit of the ringing relay, which in turn closes its own locking circuit through the normally closed contact of the thermic relay, whose operating wire is at the same time included between the generator circuit and line. Generator current then goes to line at successive intervals, as already stated, until the subscriber answers, when the thermic relay breaks the locking circuit, the ringing relay lets go, all generator connections are cut-off, and the talking circuit is restored.

This application is a division of my co-pending application, Serial No. 296,288, filed January 16th, 1906.

My invention is illustrated in the accompanying drawings, in which the figure shows a diagrammatic view of the circuits used.

Referring now to the drawing, I have shown therein two subscribers' stations A, A' each connected to the central office by line-wires 1 and 2, terminating in the contacts of a cut-off relay, and connected when its relay is energized to the respective jacks, J, J'. Each line has a lamp signal, L, governed by the relay in the usual way, and both lines are supplied with current for all purposes from the common main battery B. To interconnect these lines I show a cord-circuit 3, 4, 5, 6, 7, 8, separated by condensers, C, C', and provided with the usual supervisory signals controlled by relays, S, S', S², S³. These relays are bridged across the respective ends of the cord-circuit in pairs, with the battery B between them. The conductors 3—4 terminate in the answering plug P, while the conductors 5—7 and 6—8 terminate in the calling plug P'. The key K and the ringing relay, K', are associated with this plug, P'. Also associated with the plug is a thermic relay or circuit controller, R. This comprises a strain plate, *r*, a pivoted lever, *r'*, and a pair of wires, *r*², *r*³, connecting the corners of the strain plate with points on the lever lying upon opposite sides of the pivot thereof. The wire, *r*², is electrically disconnected from everything else, but the wire, *r*³, forms a part of the common generator circuit, 9—10, passing to the key, K. The relay K' is included in a circuit, 11, 12, 13, 14, 15 passing through the springs, *k*¹⁷, *k*¹⁸. This circuit is closed from the main battery to ground, when the plunger is pressed all the way down so as to close together the springs, *k*¹⁷, *k*¹⁸. As soon as the relay attracts its armatures, owing to this closure, it locks itself through the supplemental circuit, 16, 17, 18, which passes through normally closed contacts of the thermic relay R.

I have shown but one source of current, marked G, and connected from ground to the wire 10 through the constantly driven commutator G', which has a segment insulated for the generator and the rest of its periphery grounded. The proportions of the grounded and generator segments may be varied at will, but they are preferably such and the speed of revolution is so adjusted, that the source of current, G, will be connected to the wire 22 for two seconds, and the wire will be grounded for four seconds, in each revolution.

The operation of the system thus described is as follows:—Assuming subscriber A to have called, and the call to have been answered in the usual way, also that the calling plug, P', has been inserted in the jack, J', of the wanted line, if the wanted line is a single-party line, the operator closes the springs, *k*¹⁷, *k*¹⁸, by depressing a plunger, whereupon the relay K' becomes energized by current from the main battery B, and draws in its armatures, thereby opening the cord-conductors 5—7 and 6—8, and connecting the

portions 7 and 8 to the wires 9, 11, respectively. The wire 9 thus leads from the tip of the plug through the wire *r*³ to wire 10, to generator, and ground; on the other side the wire 8 goes to main battery through the resistance *rh*. The locking circuit for the relay K' is as follows: B, 11, 12, K', 13, 18, *r'*, 17, 16, ground. As long as the thermic relay remains in normal condition the relay K' would therefore remain energized, maintaining the generator connected to the wanted line. When the called subscriber answers, his telephone, T, becomes bridged across the line 1—2 in place of his ringer, Q', thus substituting a low resistance for a relatively high one and thereby permitting a very large increase in the generator current flowing in the line. The thermic relay R is so proportioned and adjusted that the amount of current required to actuate a subscriber's ringer as limited by the resistance thereof, will not heat the wire *r*³ sufficiently to open the contact made by the lever *r'*. When the subscriber has bridged his telephone, however, the consequent increase in current heats the wire *r*³ to a greater degree, so that by its expansion the lever *r'* is moved and opens the normally closed contacts and breaks the locking circuit 16, 17, 18. As soon as this is broken the relay, K', releases its armatures, and cuts off the generator, at the same time restoring the continuity of the cord-conductors.

I am aware that many changes may be made in the apparatus and some changes in the circuits, which I have herein set forth, without altering the characteristic essential features of my invention, and all such changes are contemplated by me and are to be taken as within the scope of my claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

1. An automatic ringing device for telephone systems, comprising a ringing relay having line and generator connections, an operator's key adapted to momentarily close the relay circuit, short-circuit contacts controlled by the relay so that when energized it will lock itself, and non-inductive means controlled by the wanted subscriber to break the relay locking circuit, substantially as described.

2. In a telephone system, a cord-circuit automatic ringing device comprising a ringing relay, an operator's key adapted to temporarily close the circuit of said relay, a locking circuit closed through itself by the relay when energized, and non-inductive means then becoming associated with the wanted subscriber's line-circuit, adapted to break said locking circuit when the subscriber answers, substantially as described.

3. In a telephone system a cord-circuit automatic ringing device comprising a ringing relay, a generator circuit adapted to be

connected thereby to line, a locking circuit closed by the relay through itself when energized, and non-inductive means included in the generator circuit adapted to break said locking circuit when the called subscriber answers, substantially as described.

4. In a telephone system, a cord circuit automatic ringing device, comprising a ringing relay, a generator circuit adapted to be connected to line thereby, a locking circuit for said relay closed by itself when energized, non-inductive means responsive to an act of the called subscriber for breaking said locking circuit, and a manual key under the control of an operator for initially closing the circuit of the ringing relay.

5. In a telephone exchange system, a cord-circuit, a subscriber's line adapted to be connected thereby, a ringer of relatively high resistance normally bridged across said line, a telephone set of relatively low resistance adapted to become bridged on the line in answering a call, a ringing relay in the cord-circuit adapted to connect a generator to line to actuate the ringer, and a non-inductive device in the path of the generator current to line and controlling the ringing relay, said non-inductive device being unresponsive to current of an amount determined by the resistance of the ringer, but responding and becoming active for an amount of current permitted to pass by the low resistance telephone set, substantially as described.

6. In a telephone system, a subscriber's line, an operator's cord circuit and calling plug adapted to connect with said line, a ringing relay associated with said calling plug and adapted to connect a generator thereto and to line, an operator's ringing key adapted to initially complete the circuit of the ringing relay, means then becoming operative to complete a locking circuit through the ringing relay, and a non-inductive current-responsive device in circuit with the generator and controlled by an act on the part of the subscriber for breaking the locking circuit of the ringing relay.

7. In a telephone exchange system, a line circuit and an operator's cord plug circuit adapted to connect therewith, a ringer bridged across the line, means associated with said ringer to place a low resistance shunt across the line in answer to a call, a ringing relay associated with the cord circuit calling plug to connect a generator to the line, means then becoming operative to close a locking circuit through the ringing relay, an operator's ringing key for initially closing the circuit of the ringing relay, and a non-inductive current-responsive device then brought into the generator circuit to line, and thereafter responding to a rise of current in the line to break the locking circuit of the ringing relay.

8. In a telephone exchange system, a line circuit and an operator's cord circuit having

a calling plug adapted to connect with the line, a ringer bridged across the line, means associated with the ringer to place a low resistance shunt across the line in response to an act of the subscriber, a ringing relay associated with the cord circuit calling plug and adapted to connect a generator to the line and to close a locking circuit through itself, an operator's key for initially closing the circuit of the ringing relay, and a thermally operable device then brought into the generator circuit and thereafter responding to an act on the part of the subscriber to break the locking circuit of the ringing relay.

9. In a telephone exchange system, an operator's cord circuit and calling plug, a ringing relay associated with the calling plug and adapted to connect a ringing generator to line, an operator's ringing key adapted to be momentarily closed to energize the ringing relay and thereby to connect the generator to line, and a non-inductive circuit responsive device thereafter included in the ringing generator circuit and controlling said relay.

10. An automatic ringing device for telephone systems, comprising a ringing relay having line and generator connections, an operator's key adapted to momentarily close the relay circuit, short-circuit contacts controlled by the relay so that when energized it will lock itself, and thermic means controlled by the wanted subscriber to break the relay locking circuit, substantially as described.

11. In a telephone system, a cord-circuit automatic ringing device comprising a ringing relay, an operator's key adapted to temporarily close the circuit of said relay, a locking circuit closed through itself by the relay when energized, and thermic means then becoming associated with the wanted subscriber's line circuit, adapted to break said locking circuit when the subscriber answers, substantially as described.

12. In a telephone system a cord-circuit automatic ringing device comprising a ringing relay, a generator circuit adapted to be connected thereby to line, a locking circuit closed by the relay through itself when energized, and thermic means included in the generator circuit adapted to break said locking circuit when the called subscriber answers, substantially as described.

13. In a telephone system, a cord circuit automatic ringing device, comprising a ringing relay, a generator circuit adapted to be connected to line thereby, a locking circuit for said relay closed by itself when energized, thermic means responsive to an act of the called subscriber for breaking said locking circuit, and a manual key under the control of an operator for initially closing the circuit of the ringing relay.

14. In a telephone exchange system a

cord-circuit, a subscriber's line adapted to be connected thereby, a ringer of relatively high resistance normally bridged across said line, a telephone set of relatively low resistance adapted to become bridged on the line in answering a call, a ringing relay in the cord-circuit adapted to connect a generator to line to actuate the ringer, and a thermic device in the path of the generator current to line and controlling the ringing relay, said thermic device being unresponsive to current of an amount determined by the resistance of the ringer, but responding and becoming active for an amount of current permitted to pass by the low resistance telephone set, substantially as described.

15. In a telephone exchange system, an operator's cord circuit and calling-plug, a generator, a ringing relay adapted to connect the generator to line, and a thermic relay controlled by the subscriber and controlling the ringing relay, substantially as described.

16. In a telephone system, a subscriber's line, an operator's cord circuit and calling plug adapted to connect with said line, a ringing relay associated with said calling

plug and adapted to connect a generator wire thereto and to the line, an operator's ringing key adapted to initially complete the circuit of the ringing relay, and means to lock the circuit of the ringing relay, together with thermic means controlled by the subscriber to release the ringing relay, substantially as described.

17. In a telephone system, a subscriber's line, an operator's cord circuit and calling plug adapted to connect with said line, a ringing relay associated with said calling plug and adapted to connect a generator wire thereto and to the line, a ringing key adapted to initially complete the circuit of the ringing relay, and a locking circuit closed through said relay by itself, together with thermic means thereafter controlled by the subscriber to open the locking circuit of said ringing relay, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM W. DEAN.

Witnesses:

RAY H. MANSON,
N. SMALLWOOD.