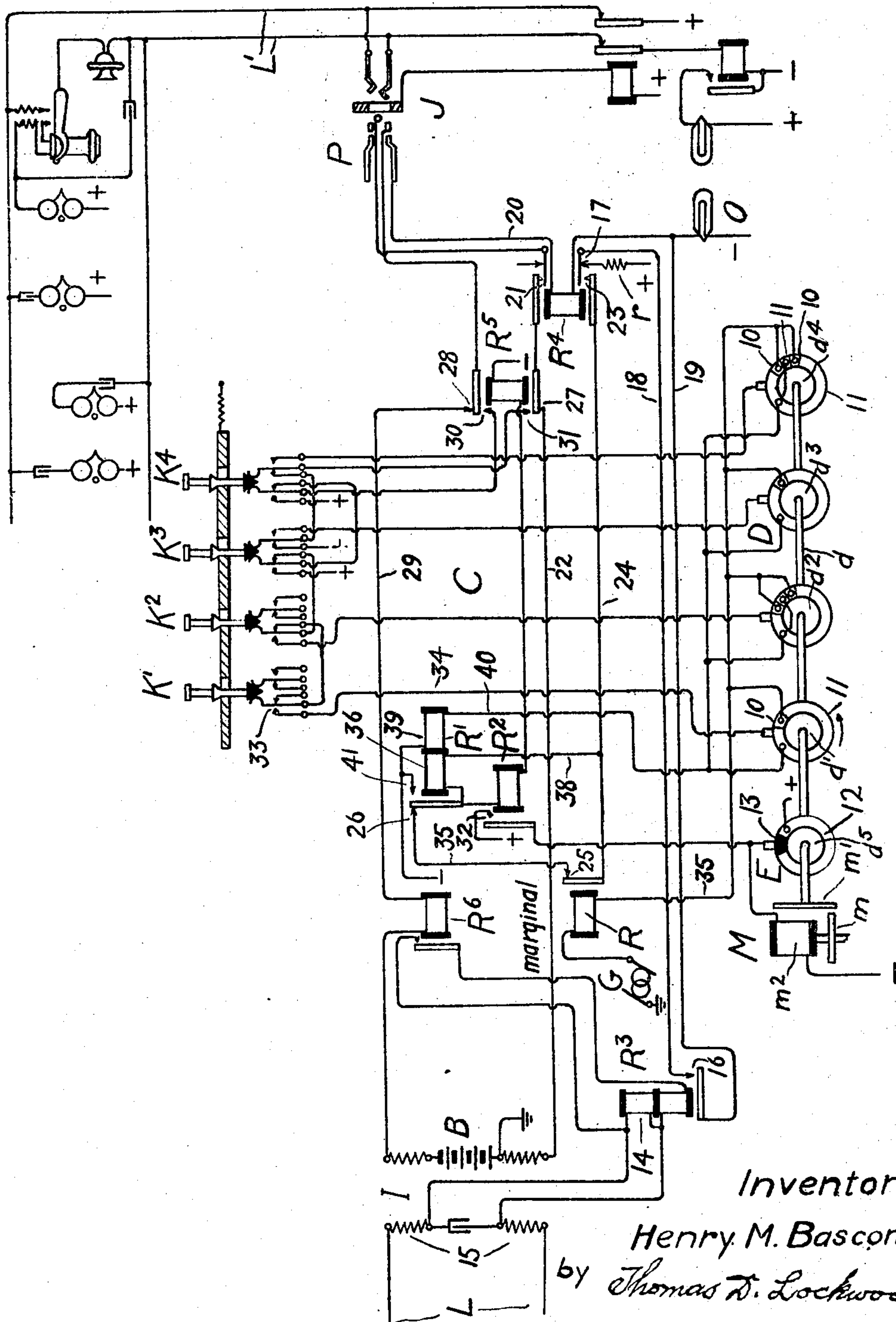


H. M. BASCOM.
PARTY LINE SIGNALING SYSTEM.
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UNITED STATES PATENT OFFICE.

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PARTY-LINE SIGNALING SYSTEM.

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To all whom it may concern:

Be it known that I, HENRY M. BASCOM, residing at Brooklyn, in the county of Kings and State of New York, have invented certain Improvements in Party-Line Signaling Systems, of which the following is a specification.

In the signaling organizations for multi-party telephone lines, commonly known as semi-selective machine ringing systems, it is customary when there are four substations connected with the line to transmit ringing currents selectively to the subscribers in groups of two over the two sides of the line, respectively, distinguishing between the stations joined to the same line conductor by distinctive code signals made up of alternate ringing and non-ringing intervals of different duration. An example of this in standard practice is where two substations receive ringing current over the tip and ring sides of the line, respectively, for two seconds followed by a silent interval of four seconds; while to the other two substations ringing current is similarly transmitted for one second with a succeeding silent interval of one second followed by a ringing interval of one second and a silent interval of three seconds. These signals continue until the receiver is taken from the hook at one of the substations. They are produced by a source of signaling current connected to the line through one of two sets of segments of a continuously driven interrupter or controlling device, the particular set of segments utilized and the side of the line upon which ringing current is sent out being determined by one of a series of mechanically locking keys depressed by the operator. Inherent in such arrangements is the possibility of an initial silent interval, after the operator has depressed the proper key and before the wiper which takes off current for the wanted substation is reached by the ringing segment so that ringing current becomes effective. In the particular example just given, this preliminary silent interval may vary from zero to eight seconds. It is found that when the called subscriber does not answer promptly, the continued frequent operation of the ringer annoys and becomes a cause of complaints from the subscriber who is signaled over the same side of the line. Less trouble from this source would result were the silent intervals longer, but

if the interrupters are changed for this purpose there is the consequent lengthened initial period of delay with the attendant slowing down of the service. By my invention I am enabled to increase the silent interval to any desired extent and yet obtain an almost immediate application of ringing current to the line when the operator depresses a ringing key. I furthermore so organize the system that current from the usual 24-volt common battery may be employed to operate the relay which controls the disconnection of the source of ringing current, instead of the special 48-volt battery which has heretofore been used.

The accompanying drawing shows diagrammatically a single embodiment of the invention applied to a trunk of which only one extremity is shown, this generally excluding parts not directly bearing upon this invention.

There is illustrated a cord circuit C of a B operator situated at the incoming end of a trunk L, this including the 24-volt common battery B between the windings of the usual repeating coil I and terminating in the calling plug P for insertion in the jack J of a called line, as L'. Individual to the cord is an interrupting or controlling mechanism D, here shown as consisting of a shaft d having fixed to it disks d^1 , d^2 , d^3 , and d^4 , which may be connected to the talking strands of the cord circuit, d^1 and d^2 to the ring strand and d^3 , d^4 to the tip strand through mechanically locking keys K^1 , K^2 , K^3 , and K^4 , respectively. These keys remain in their depressed position until released by the actuation of one of the other keys. The disks are arranged as usual, with insulated segments 10 connected to the ringing generator G through the winding of a marginal relay R, and adjacent segments 11 joined to the battery B or other source of continuous current by way of one winding of a relay R^1 . The shaft is rotated at the desired speed, which may be three and one-third revolutions per minute, by motor mechanism M including a friction disk m rotated continuously from any suitable source of power and a cooperating disk m^1 fast upon the shaft d and which may be drawn into driving engagement with the disk m by a magnet m^2 . Associated with the interrupter mechanism is controlling mechanism E, which may be in the form of

an additional interrupter disk d^5 secured to the shaft d and having a long segment 12 provided with a battery connection and a short insulation segment 13. A wiper co-
 5 operating with the periphery of this disk d^5 serves to unite its segments with the motor magnet m^2 and also to the front armature of a relay R^2 .

In addition to relays R , R^1 and R^2 already mentioned, the cord circuit is provided with relays R^3 , R^4 , R^5 and R^6 . Relay R^3 , when energized by current over the trunk, causes the illumination of the guard and disconnect lamp O and makes the first
 10 closure of a circuit for energizing relays R^2 and R^5 . Relay R^4 has its winding in the sleeve strand of the cord C . It closes at its front contacts a break in one of the talking strands of the cord, completes the
 15 circuit of relays R^2 and R^5 and prepares for the extinguishment of the lamp O . When relay R^5 attracts its armature it opens the talking strands of the cord, joining the outgoing ends to the ringing keys. Relay
 20 R^2 controls the energization of the motor magnet m^2 to start the rotation of the interrupter mechanism D . The removal of the receiver from its hook at the substation of line L' operates either relay R or R^1 , depending on whether it is during the ringing
 25 or silent interval. Relay R^1 controls the release of relays R^2 and R^5 . By relay R^6 the customary supervisory functions are exercised.

In detail the operation of the ringing system is as follows: An A operator having connected one of her cord circuits with the trunk L , the relay R^3 receives current through its winding 14 over the trunk con-
 35 ductors and through windings 15 of the repeating coil I from battery in the A operator's cord. Contact 16 of relay R^3 is thereby closed giving a circuit to the lamp O by way of resistance r , resting contact 17
 40 of relay R^4 , conductor 18, contact 16 and conductor 19. As this lamp acts in a well-known manner, its operation will not be particularly described. The B operator, upon receiving the number of the called
 45 line, depresses the key, as K^1 , corresponding to the particular substation desired and places the plug P in the proper jack, as J . Upon coöperation of the plug and jack relay R^4 is energized over sleeve conductor
 50 20 and the corresponding contacts of the jack and plug. Contacts 21 of relay R^4 closes a break in the tip strand 22 of the cord C . It also breaks contact 17 and closes contact 23. There is now a circuit includ-
 55 ing the sleeve contacts of the jack J and plug P , strand 20, winding of relay R^4 , conductor 19, contact 16 of relay R^3 , conductor 18, contact 23 of relay R^4 , conductor 24, back contacts 25 and 26 of relays R and R^1 ,
 60 respectively, and the windings of relays R^2

and R^5 . This circuit shunts the lamp O and extinguishes it. Relay R^4 is maintained operated and relays R^2 and R^5 are energized. At the back contacts 27 and 28 relay R^5 severs the talking strands 22 and
 70 29 and at front contacts 31 and 30 joins the tip and ring of the plug P to the springs, and consequently to the make contacts, of key K^4 . The front contact 32 of relay R^2 gives a path for current to magnet m^2 . The disk m^1 is attracted against the driven disk m and thus imparts rotary
 75 movement to the shaft d in the direction of the arrow. The make contact 33 of key K^1 , now closed, is united by a conductor 34 to the wiper which normally rests upon the segment 11 of disk d^1 just clear of the segment 10, which is brought under the wiper
 80 by rotation of shaft d . Consequently ringing current at once flows from the generator G through the winding of relay R (which does not operate for this strength of current) conductor 35, segment 10 of disk d^1 and the coöperating wiper, conduc-
 85 tor 34, contact 33 of key K^1 , on through the make contacts of keys K^2 , K^3 and K^4 in series, contact 30 of relay R^5 , ring strand of the cord and contacts of the plug and jack, over the ring side of the line and
 90 through the ringers of the two substations connected thereto to ground. For the disk d^1 the segment 10 is shown as having one eighth the peripheral extent of the segment 11. At the rate of rotation previously
 95 stated this will operate the ringers of the two substations for two seconds, followed by a sixteen second interval of silence when the wipers are in contact with segment 11. When the subscriber at the substation to
 100 which this particular signal has been assigned removes the receiver from its hook the resulting increased flow of current causes relay R to attract its armature, if ringing current is at this time passing.
 105 The opening of contact 25 breaks a short circuit of the winding 36 of relay R^1 and said relay is energized by the passage of current through this winding, the path being the same as that described in connection
 110 with the energization of relays R^2 and R^5 , except that the conductor 38 and the winding 36 are now substituted for the portion including contacts 25 and 26. During the silent interval winding 39 receives battery
 115 current over the line, this flowing from conductor 34 by way of the segment 11 and conductor 40, energizing relay R^1 . The short circuit of winding 36 is thus opened at contact 26. As the cessation of signaling
 120 is initiated by different relays during the ringing and silent intervals, that responsive to battery current may be designed without reference to the requirements of a relay operated by alternating current. Therefore
 125 the usual common battery of 24 volts may

be employed to operate relay R^1 . During either interval, upon the removal of the short circuit, relay R^1 locks itself through contact 41, and in so doing short circuits relays R^2 and R^5 , which are thus released. The last-named relay severs the ringing circuit at contacts 30 and 31 and completes the continuity of the talking strands at contacts 27 and 28. Relay R^6 is now under the influence of the substation switch hook and with the relay R^3 controls the calling supervisory lamp at the A operator's position in a manner well-known. The initiating circuit of the motor magnet m^2 is opened at contact 32 of relay R^2 . If the insulating segment 13 of disk d^5 is beneath the co-operating wiper the motor magnet is deprived of current, releasing the disk m^1 from the driving disk m and the rotation of the interrupter ceases. If the deenergization of relay R^2 occurs while the battery segment 12 of the disk d^5 is beneath the wiper, the rotation continues by virtue of this circuit connection for the motor magnet until the segment 13 reaches the wiper, when the interrupter is stopped in its normal position. It will therefore be seen that regardless of the length of the silent interval, ringing will begin promptly upon the insertion of the plug in the jack of the called line and the depression of the key K^1 , the desired initial silent interval being determined by the device d^5 .

Were the key K^2 the one actuated the effect would be the same, except that in the corresponding disk d^2 there are two of both the ringing and silent segments so arranged as to provide for operation of the substation ringers connected to the ring side of the line for one second immediately after the depression of the key, with succeeding intervals of one second of silence, one second of signaling and fifteen seconds of silence, after which the cycle is repeated as in the first instance until the subscriber answers.

Disks d^3 and d^4 corresponding to keys K^3 and K^4 resemble, respectively, d^1 , d^2 in their effects, but the relation of their wipers to the segments is such that ringing does not begin until the interrupter has been in rotation for two seconds. This gives a non-ringing period for the tip of the plug to pass the ring contact of the jack during the insertion of the former, thus avoiding the passage of signaling current over the wrong side of the line.

At the close of the conversation, relay R^6 having been deenergized by the opening of the line L' as a consequence of the return of the substation receiver to its hook, the removal of the plug of the A operator's cord from the jack at the outgoing end of the trunk L releases relay R^3 and opens at contact 16 the locking circuit of relay R^1 ,

which releases. The releasing of relay R^3 also opens the shunt around the lamp O , causing it to light. Thereupon the B operator removes the plug P from the jack J , thus releasing relay R^4 . The apparatus of the cord circuit C is now in normal position except the ringing keys. As to these, the last one depressed may be left locked down, to be released if another in the series is actuated upon the next connection or a particular one of the keys may be depressed by the operator when she takes down the connection. If the A operator takes out and replaces a plug under her control, the opening and closing of contact 16 by the deenergization and energization of relay R^3 will cause the ringing operation to be repeated. Similarly, if the B operator takes out and replaces the plug under her control, the opening and closing of the sleeve circuit at the contact of the jack and at contact 23 of relay R^4 will cause the ringing operation to be repeated.

I claim:

1. In a signaling system for producing signals at predetermined intervals, a source of signaling current and conductors to which said current is to be applied, mechanism between the current sources and conductors for applying said current in successive cycles of predetermined intervals, a device operable to render the controlling mechanism effective, and means for determining the interval after which the source and conductors shall be connected following the operation of the device.

2. In a signaling system for producing signals at predetermined intervals, a source of signaling current and conductors to which said current is to be applied, normally stationary mechanism between the current source and conductors adapted when set in operation to apply said current in successive cycles of predetermined intervals, a device operable to start the controlling mechanism and means to determine the position from which the controlling mechanism starts.

3. The combination with substation lines, of a connecting circuit therefor, a source of signaling current, an interrupting mechanism between the connecting circuit and current source, motor mechanism for the interrupting mechanism, means for starting the motor mechanism when the connecting circuit is joined to the substation lines, and means controlled by a substation for rendering the motor mechanism ineffective.

4. The combination with telephone lines, of a connecting circuit therefor, a source of signaling current, an interrupting mechanism between the connecting circuit and current source, motor mechanism for the interrupting mechanism, means for starting the motor mechanism when the connecting circuit is joined to the lines, and means for

stopping the motor mechanism upon the response of the called subscriber.

5. In a machine ringing system, lines to be signaled and switching means therefor, a source of ringing current, an interrupter, motor mechanism therefor, and a relay controlling the motor mechanism and controlled by the switching means.

6. In a machine ringing system, lines to be signaled and switching means therefor, a source of ringing current, an interrupter, motor mechanism therefor, and a relay controlling the motor mechanism and controlled by the called line.

7. In a machine ringing system, lines to be signaled and switching means therefor, a source of ringing current, an interrupter, motor mechanism therefor, and relays controlling the motor mechanism and controlled by the called line and by the switching means.

8. In a machine ringing system, lines to be signaled and switching means therefor, a source of ringing current, an interrupter, motor mechanism therefor, relays controlling the motor mechanism and controlled by the called line and by the switching means, and means movable with the interrupter for also controlling said motor mechanism.

9. In a machine ringing system, lines to be signaled and switching means therefor, sources of ringing current and continuous current, an interrupter, motor mechanism therefor, relays for controlling the motor mechanism, and circuits for the relays controlled by the called line and including respectively the ringing current source and the continuous current source.

10. The combination with telephone lines and a connecting circuit therefor, of sources of ringing current and of continuous current, relays in the connecting circuit for controlling the application of ringing current to the called line, and circuits for said relays one of which is operated by ringing current in one of said circuits.

11. In a machine ringing system, lines to be signaled and switching means therefor, sources of ringing current and continuous current, an interrupter for said currents, motor mechanism for the interrupter, relays for controlling the motor mechanism, one of said relays being controlled by another, and circuits for the relays controlled by the called line and including respectively the ringing current source and the continuous current source.

12. In a machine ringing system, lines to be signaled and switching means therefor, sources of ringing current and continuous current, an interrupter for said currents, motor mechanism for the interrupter, relays for controlling the motor mechanism, one of said relays being controlled by another, energizing circuits for the relays controlled by the called line and including respectively the ringing current source and the continuous current source, and a locking circuit for that relay which is under the control of the associated relay.

In testimony whereof I have signed my name to this specification, this 13th day of April, 1916.

HENRY M. BASCOM.