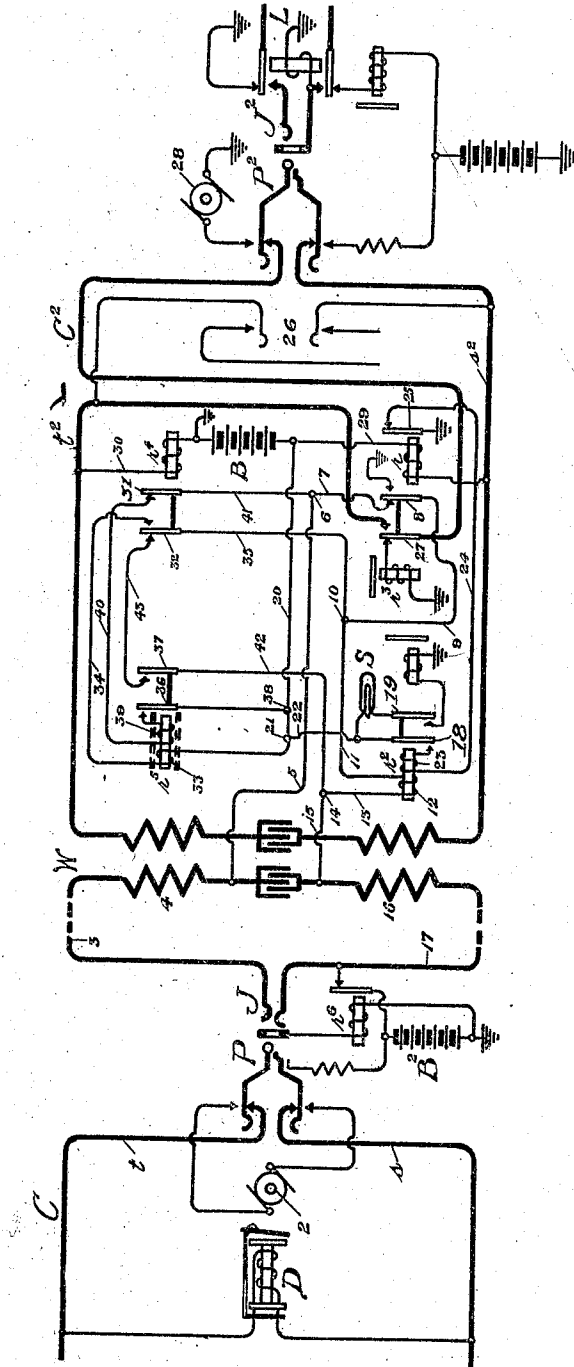


C. S. WINSTON.
TELEPHONE TRUNKING SYSTEM.
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911,188.

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TELEPHONE TRUNKING SYSTEM.

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To all whom it may concern:

Be it known that I, CHARLES S. WINSTON, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Telephone Trunking Systems, of which the following is a specification.

My invention relates to improvements in telephone trunk circuits, and particularly in such circuits intended for use between magneto and common battery offices.

One object of the invention is to provide simple means for positively throwing the drop or other signal in the magneto cord circuit when the common battery subscriber returns his receiver to the hook.

Other objects are to provide simple and inexpensive apparatus for suitably carrying out the various operations involved in establishing and supervising connections between central offices.

To the accomplishment of these and such other objects as may hereinafter appear, I provide the apparatus hereinafter more fully described and illustrated in the accompanying drawing in which the figure is a diagram of a trunk circuit extending between a magneto and a common battery telephone office.

At the office C the usual magneto cord circuit is shown and is provided with a calling plug P, a drop D bridged thereacross, and a suitable ringing generator 2. The operator's telephone set and the answering plug of this circuit are not shown but will be understood as connected in the ordinary way. The trunk circuit at this office is provided with a springjack J by means of which the cord circuit may be connected with the trunk. At the office C² the trunk is provided with the plug P² adapted to connect with the springjack J² of the telephone line L which is of the so-called two-wire type. A repeating coil W conductively divides but inductively unites the outgoing end of the trunk with the incoming end.

When a call is received at the magneto office for connection with a line terminating at the common battery office, the calling plug P of the cord circuit at the former office is inserted in the jack J of the trunk and the ringing generator is connected therewith, thereby sending current over a path

which may be traced from the generator 2 to the tip strand *t* of the cord circuit, thence over the side 3 of the trunk line, the winding 4 of the repeating coil W, conductor 5, to point 6, thence by way of conductor 7 to spring 8 of the relay *r* which is connected between the strand *s*² of the trunk cord and the live pole of the battery B, thence by way of conductor 9 to point 10, thence over conductor 11 and through the winding 12 of relay *r*², conductor 13 to point 14, conductor 15, winding 16 of the repeating coil W, sleeve conductor 17 of the trunk circuit, and thence over strand *s* of the cord circuit back to the other side of the generator. The ringing current flowing in this path operates said relay *r*² causing it to attract its armatures 18 and 19, thereby closing first the circuit of the trunk signal S from the live pole of the battery B over conductor 20 to point 21 and thence by way of conductor 22 through the lamp S, the forward contact of spring 19 and through a suitable pilot relay to ground.

The second circuit is from the conductor 22 through spring 18 to relay *r*² and its forward contact, the locking winding 23 of relay *r*² and thence by way of conductor 24 and the normal contact and spring 25 of said relay *r* to ground. Thus the relay *r*² is maintained energized and the local circuit of the lamp S closed after the ringing generator in the cord circuit is disconnected. Upon observing this signal S the trunk operator connects her telephone therewith through the medium of the listening key and obtains the number of the party wanted. Upon learning the number the wanted line is tested in the usual manner, the test circuit being completed over the tip strand *t*² of the trunk, spring 27 of relay *r* and its normal contact, through the test relay *r*³ to ground; this test relay controlling a suitable local circuit of the operator's set. Upon finding the line idle the plug P² of the trunk is inserted in the jack of the telephone line and the ringing generator 28 operated. The insertion of the plug P² provides a path for current from the battery B over conductor 29 through the relay *r* and thence over strand *s*², and through the cut-off relay of the line to ground. The cut-off relay is thus operated to place the line in condition for conversation and the relay *r* is operated and

serves, by attracting its spring 25, to open the circuit to the locking winding of the relay r^2 thus permitting the deenergization of said relay and the opening of the circuit of the signal S, which is accordingly retired. In addition, the attraction of the spring 27 of this relay r disconnects the test relay and completes the two portions of the strand t^2 of the trunk cord for conversation. At the same time the spring 8 of said relay r engages its forward ground contact for a purpose hereinafter described.

Upon the response of the called subscriber current flows from the battery B over the sleeve side of the telephone line to the substation to charge the transmitter for talking and thence back to the central office over the tip side of the telephone line and through the strand t^2 and conductor 30 to and through relay r^4 to other terminal of the battery B. The relay r^4 is therefore operated, thus separating its spring 31 from its back contact and its spring 32 also from its back contact and connecting the same with its forward contact, thereby establishing a circuit from the live pole of the battery B over conductor 20, through winding 33 of a slow acting relay r^5 , conductor 34, forward contact and spring 32 of relay r^4 , conductor 35 to point 10, thence by way of conductor 9, spring 8 and its forward contact of relay r to ground. The current flowing in this path energizes said relay r^5 during conversation and the relay is made slow acting so that it will not quickly let go its springs, all for a purpose to be hereinafter described. One method of accomplishing this retarding effect is to provide the said relay with a copper shell, indicated by dotted lines in the drawing, in which the eddy currents caused by the change in the magnetic field surrounding said relay tend to retard such change and hence its deenergization.

At the end of the conversation, the subscriber upon the line L hangs up his telephone, thereby deenergizing relay r^4 , which opens through its spring 32 the circuit of the winding 33 of relay r^5 . Owing to the fact that the relay r^5 is made slow acting as above described, the springs 31 and 32 of said relay r^4 reach their normal contacts before the springs 36 and 37 of said relay r^5 are separated from their forward contacts. This establishes a circuit from the live pole of the battery B over conductor 20 to point 38, spring 36 of relay r^5 and its forward contact, the locking winding 39 of said relay, conductor 40, back contact and spring 31 of relay r^4 , conductor 41 to point 6, conductor 5, winding 4 of repeating coil W, tip side 3 of the trunk line, strand t of the magneto cord circuit, thence through the bridged clearing drop D of the cord circuit, strand 5, sleeve conductor 17 of the trunk, winding 16 of the repeating coil W, conductor 15 to

point 14, conductor 42, spring 37 and forward contact of relay r^5 , wire 43, back contact and spring 32 of relay r^4 , branch 35 to point 10, conductor 9, spring 8 of relay r to ground. The current in this path maintains the relay r^5 energized and also energizes and operates the drop D in the magneto cord circuit to thereby indicate to the magneto operator that the conversation has terminated. In the path just traced the conductors 42, 43 and 35 form a short circuit about winding 12 of relay r^2 to prevent the same operating. Upon observing this signal the operator at the magneto office takes down the cord circuit thereby opening the said path for current from battery B and deenergizing relay r^5 . At the same time the relay r^5 at the outgoing end is deenergized and permits current from the battery B², which may be the same as the battery B, to send current over the sleeve side 17 of the trunk, winding 16 of repeating coil W, conductor 15 to point 14, wire 13, winding 12 of relay r^2 , conductor 11 to point 10, conductor 9, spring 8 of relay r to ground. The relay r^2 being at this time deenergized the winding 12 of the relay r^2 is not now short-circuited by conductors 42, 43 and 35. The operation of the relay r^2 closes the local circuit of the signal S which is lighted to give the disconnect indication to the incoming operator. As soon as this is observed by the operator she withdraws the plug P² which deenergizes the relay r and opens the circuit of relay r^2 at its spring 8 and forward contact, thus restoring the signal and all other parts to normal condition.

It is thus seen that by extremely simple apparatus and few parts, the desired results are accomplished, and while I have described but one method of doing the work it will be understood that various changes and alterations may be made therein without departing from the scope or principle of the same. The various batteries at each office may obviously be and in practice are one and the same; so too, the various grounds are the common office return or ground connection.

I claim:

1. The combination with a trunk circuit extending between a magneto telephone office and a common battery office, of a cord circuit at the former office having a bridged clearing-out drop, a subscriber's line with which the incoming end of the trunk is adapted to connect, a source of current associated with said end to send current over the line during conversation, and electro magnetic mechanism at the incoming office under the control of the subscriber and including a slow acting relay adapted to be locked in position to send current back over the outgoing end of the trunk to operate said drop when the subscriber hangs up his

telephone and to be deenergized when connections are severed with the outgoing end of the trunk, substantially as described.

2. The combination with a trunk circuit
5 extending between a magneto telephone office and a common battery office, of a cord circuit at the former office having a bridged clearing-out drop, a subscriber's line with which the incoming end of the trunk is
10 adapted to connect, a source of current associated with said end to send current over the line during conversation, and electro magnetic mechanism at the incoming office under the control of the subscriber and in-
15 cluding a slow acting relay adapted to be locked in position to send current from said source back over the outgoing end of the trunk to operate said drop when the sub-
20 scriber hangs up his telephone and to be again unlocked when the connection is severed with the outgoing end of the trunk, substantially as described.

3. The combination with a trunk circuit, of a cord circuit to connect with one end
25 and having a bridged clearing-out signaling device, a trunk cord at the other end of the trunk to connect the same with a subscriber's line, a source of current associated with the cord and line to permit current to the
30 latter for talking, a relay at the incoming end of the trunk controlled by the latter line, a slow acting relay controlled by the first mentioned relay, a locking winding upon said slow acting relay, and circuits
35 suitably controlled by said relays to send current from said source through said locking winding over the outgoing end of the trunk to operate said bridged signaling de-
40 vice in the cord when the subscriber hangs up his telephone, substantially as described.

4. In a telephone trunking system, the combination with a trunk circuit, of a cord
45 circuit having a bridged clearing-out drop and adapted to be connected with the outgoing end of the trunk, a common battery subscriber's line to be connected with the other end of the trunk, relay mechanism associated with the incoming end of the trunk and adapted to maintain current over
50 the outgoing end thereof to operate said cord circuit drop after the common battery subscriber hangs up his telephone and until the connection is severed with the outgoing end of the trunk, substantially as described.

55 5. In a telephone system, the combination with a trunk circuit, of a cord circuit having a bridged supervisory signaling device

and adapted to be connected with the out-
going end of the trunk, a common battery
subscriber's line to which the other end of
60 the trunk is adapted to connect, a relay associated with the incoming end of the trunk adapted to be actuated by current
65 flowing over the outgoing end of the trunk and through the coil of said bridged super-
visory signaling device when the common
battery subscriber hangs up his receiver and thereafter until the connection is severed
70 with the outgoing end of the trunk, substantially as described.

6. In a telephone system, the combination with a trunk circuit, of a cord circuit having
a bridged clearing-out drop and adapted to
be connected with the outgoing end of the
trunk, a common battery subscriber's line to
75 which the incoming end of said trunk is adapted to connect, means associated with the incoming end of said trunk for directing current through the said clearing-out drop
80 when the common battery subscriber hangs up his telephone and thereafter until the connection is severed with the outgoing end
of the trunk and for thereafter removing
the current source from its connection with
said trunk line, substantially as described. 85

7. In a telephone system, the combination with a trunk circuit, of a cord circuit
adapted to connect with the outgoing end
thereof, and a telephone line with which the
incoming end may be connected, an auxil-
90 iary circuit associated with the trunking circuit, a relay for controlling said auxiliary circuit, a second relay for controlling the circuit of the first relay, the second relay
95 being adapted to close the initial actuating circuit of the first relay when the second relay is in its actuated position, and to close
the locking circuit of the first relay when
the second relay is in its unactuated position,
100 the circuit of said first relay being interrupted when the armature of the second relay is in an intermediate position, and means for preventing the first relay from becoming sufficiently deenergized during the
105 movement of the armature of the second relay to open the circuit by its locking coil, substantially as described.

Signed by me at Chicago, county of Cook
and State of Illinois in the presence of two
witnesses.

CHARLES S. WINSTON.

Witnesses:

ROBERT LEWIS AMES,
EDITH F. GRIER.