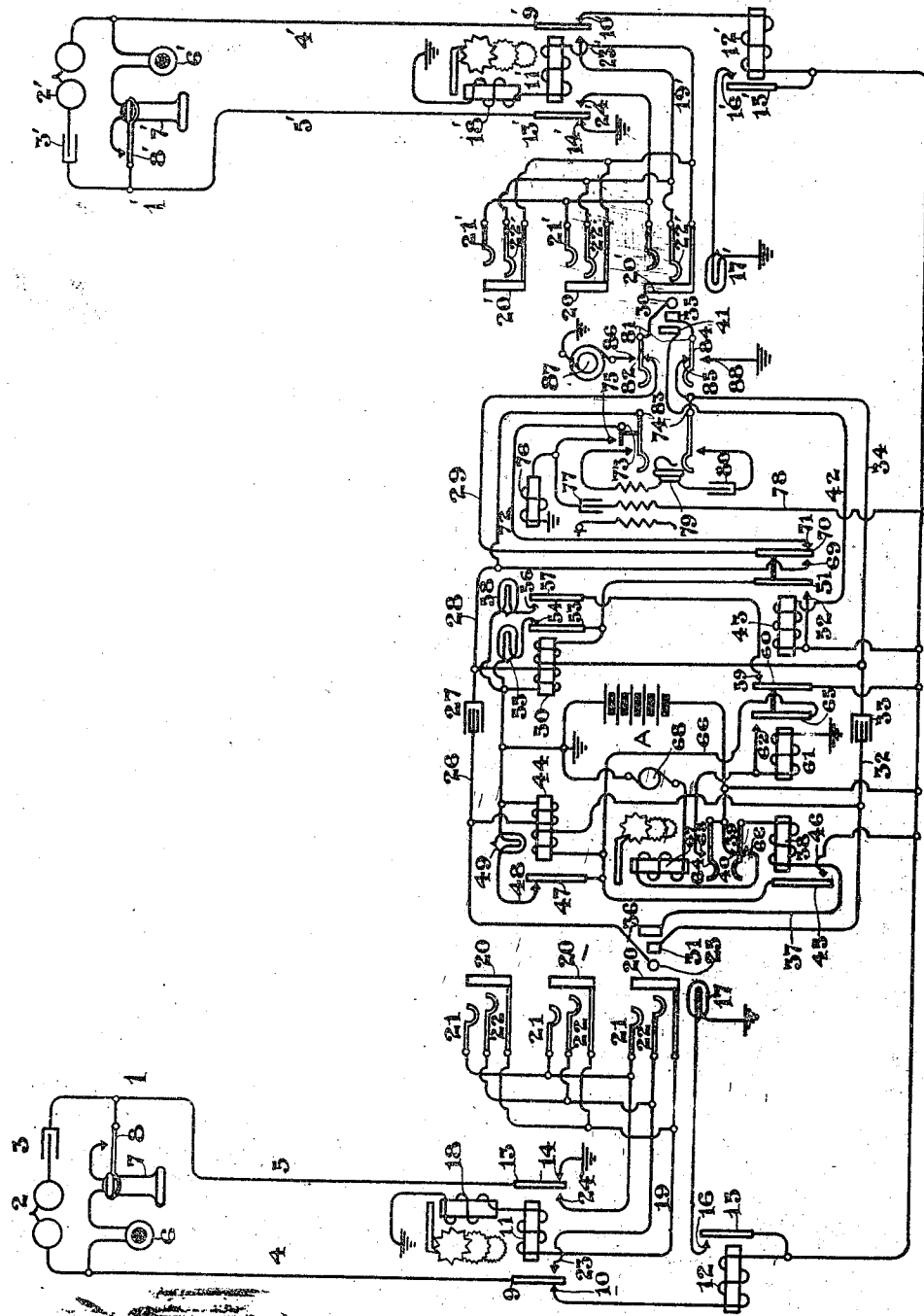


C. S. WINSTON.
 SERVICE METER SYSTEM.
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1,012,780.

Patented Dec. 26, 1911.



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UNITED STATES PATENT OFFICE.

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SERVICE-METER 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 in Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Service-Meter Systems, of which the following is a specification.

My invention relates to measured service systems for telephone lines and particularly to systems for use in connection with central energy telephone lines having three conductor multiple jacks at the central office.

The object of my invention is to improve the supervisory apparatus of the system to inform the operator when a connection has been satisfactorily completed and when it is time for the operator to register a call against the calling subscriber.

Other objects of my invention are the means for causing the signal to be permanently displayed until the operator has registered the call, and such other objects as will be further brought out in the following description and claims.

My invention is illustrated in the accompanying drawing in which the apparatus is shown in its normal and unactuated condition, and is intended to be typical of any desired apparatus capable of a similar use.

The calling subscriber's station 1 is provided with the annunciator 2 and condenser 3 in a permanent bridge between the line conductors 4 and 5, and with the transmitter 6 and receiver 7 in a bridge maintained normally open by the contacts of the switch hook 8. Line conductor 4 is connected at the central office through contacts 9 and 10 of cut-off relay 11 and the coil of line relay 12 with the live pole of battery A. The line conductor 5 is connected through contacts 13 and 14 of the cut-off relay 11 with ground. Line relay 12 controls normally open contacts 15 and 16 in the circuit of the line lamp 17. One terminal of the coil of cut-off relay 11 is connected through the coil of the line service meter 18 with earth, the other terminal being connected through conductor 19 with the sleeve contact 20 of the answering and multiple jacks. The tip and ring contacts 21 and 22 of these jacks are connected to the normally open inside contacts 23 and 24 of the cut-off relay 11. The called line 1' is equipped with similar apparatus, the corresponding apparatus of this

line being designated by like figures with the suffix " ' ".

The cord circuit for connecting the calling and called lines for conversation has the tip, ring and sleeve strands, each strand having a contact to register with the like contacts of the jacks. The tip and ring strands extend respectively from the tip 25 of the answering plug through conductor 26, condenser 27, and conductors 28 and 29 to the tip contact 30 of the calling plug, and from the ring contact 31 of the answering plug through conductor 32, condenser 33 and conductor 34 to the ring contact 35 of the calling plug. The sleeve contact 36 of the answering plug is connected through conductor 37, the coil of relay 38, and through series contacts 39 and 40 of the operator's service meter key, with the live pole of battery A, and the sleeve contact 41 of the calling plug is connected through conductor 42 and the coil of relay 43 with the live pole of battery A.

The supervisory relay 44 has two coils, one permanently connected between the tip strand 26 of the talking circuit and the ground pole of battery A, and the other connected between the ring strand 32 of the talking circuit and the contact 45 of relay 38, this contact being adapted to be connected with contact 46 and thence with the live pole of battery A by the actuation of the relay 38. Contact 45 is also connected through the normally closed contacts 47 and 48 of relay 44 and the signal 49 to ground. The supervisory relay 50 similarly has a coil connected between the tip conductor 28 and the ground pole of battery A on the calling side of condenser 27, and has a coil connected between the ring conductor 34 and the contact 51 of relay 43, this contact being adapted to be connected through contact 52 with the live pole of battery A when the relay 43 is actuated. Contact 51 of relay 43 is also connected through contacts 53 and 54 of relay 50 and the supervisory signal with the ground pole of battery A. The relay 50 also has the normally open contacts 56 and 57, contact 56 connecting with earth through the register signal 58, and contact 57 connecting through the contacts 59 and 60 of locking relay 61 with the live pole of battery A. The locking relay 61 has one terminal of its coil connected with earth and

the other terminal connected with its own open contact 62 and with the open contact 63 of the service meter key, the contact 63 being adapted to be connected with battery 5 through the spring 64 when the key is actuated. Relay 61 also has the spring 65 adapted to connect with the contact 62 and connected through conductor 66 with the contact 45 of relay 38. The operator's service 10 meter key has the normally open contact 66 adapted upon the actuation of the key to connect with contact 39, the contact 66 being connected through the coil of the position meter 67 with the direct current generator 15 68, and thence to earth. Supervisory relay 43 has the normally open contacts 69 and 70 maintaining normal separation between the portions 28 and 29 of the tip cord strand. The contact 70 is normally connected 20 through contact 71 and conductor 72 with the auxiliary contact 73 of the operator's listening key 74, the contact 73 being adapted when the key is actuated to connect with contact 75 and thence to the impedance coil 25 76 and condenser 77, the other terminal of the impedance coil being connected with earth and the other terminal of the condenser 77 being connected through the tertiary of the operator's induction coil and conductor 30 78 with the live pole of battery A. The actuation of the operator's listening key is adapted to place the secondary of the operator's induction coil, the operator's receiver 79 and condenser 80 in a bridge between the 35 tip and ring talking strands of the cord circuit.

The calling end of the cord circuit is provided with a ringing key 81 having series contacts 82 and 83 in the tip strand of the 40 cord circuit and series contacts 84 and 85 in the ring strand of the cord circuit. The spring 82 is adapted to connect with contact 86, and thence through the alternating current ringing generator 87 to earth when the 45 ringing key is actuated, and the ring contact 84 is adapted to connect with earth through contact 88.

In the operation of my system the calling subscriber removes his receiver 7, from the 50 switch hook 8 and thus completes a circuit from the live pole of battery A through the line relay 12, contacts 10 and 9 of cut-off relay 11, line conductor 4, transmitter 6, receiver 7, the now closed contacts of switch 55 hook 8, line conductor 5 and the contacts 13 and 14 of relay 11 to ground. Current in this path actuates relay 12 and displays the line signal 17. The operator seeing the line signal displayed inserts her answering plug 60 into the jack thereby indicated and causes the tip, ring and sleeve contacts 25, 31 and 36 of the answering plug to register with the tip, ring and sleeve contacts 21, 22 and 20 of the jack. A circuit is thus completed 65 from the live pole of battery A through

contacts 40 and 39 of the service meter key, coil of relay 38, conductor 37, sleeve contacts 36 and 20 of the plug and jack, conductor 19, coil of cut-off relay 11 and the coil of the line service meter 18 to ground. 70 Current in this path is sufficient to actuate relays 11 and 38 but is not sufficient for the actuation of the line service meter 18, this meter having considerable mechanical resistance and therefore requiring considerable 75 current for its actuation. The actuation of relay 11 severs the circuit of the line relay 12 and effaces the line signal 17. The actuation of relay 38 connects the live pole of battery A with the ring conductor 32 80 through the coil of the supervisory relay 44. Current therefore flows through contacts 46 and 45 of relay 38, a coil of relay 44, over ring conductor 32 through the ring contacts 31 and 22 of the plug and jack, the 85 now closed contacts 23 and 9 of relay 11, line conductor 4, transmitter 6, receiver 7, switch hook 8, line conductor 5, contacts 13 and 24 of relay 11, tip contacts 21 and 25 of the jack and plug and the other coil of supervisory relay 44 to ground. 90 This current actuates the relay 44 separating its contacts 47 and 48 and preventing the display of the signal 49 which would otherwise have been displayed by the closing of contacts 45 and 46 of relay 38. The operator now depresses 95 her listening key 74 and receives the number of the desired telephone line. She then raises her calling plug and touches the tip contact 30 of that plug to the sleeve contact 100 20' of the jack of the desired line. If the line is busy the sleeve contact of another cord circuit is connected with the sleeve contact of one of the multiple jacks and therefore maintains the sleeve contacts of all of 105 the multiple jacks at a potential higher than that of earth. Current will therefore flow over the tip 30 through contacts 82 and 83 of the ringing key 81, conductor 29, contacts 70 and 71 of relay 43, conductor 72, the now 110 closed auxiliary contacts 73 and 75 of the operator's listening key 74 to earth through the impedance coil 76. This will cause a slight change in the potential of the terminal of the condenser 77 which will be 115 slightly discharged. The discharge will cause a disturbance in the tertiary winding of the operator's induction coil and this disturbance will be inductively reproduced in the secondary of that coil and in the operator's receiver 79. 120 If the line is idle and no disturbance is heard in the operator's receiver she inserts her calling plug completely into the jack of the desired line causing its tip, ring and sleeve contacts 30, 35 125 and 41 to register with the tip, ring and sleeve contacts 21', 22' and 20' of the jack. A circuit is thereby completed from the live pole of battery A through the coil of relay 43, conductor 42, sleeve contacts 41 and 20' 130

of the plug and jack, conductor 19', the coil of cut-off relay 11' and the coil of line service meter 18' to ground. The current in this path is sufficient for the actuation of relays 43 and 11' but is not sufficient for the actuation of the line service meter 18'. The actuation of relay 43 disconnects the testing apparatus from the cord circuit and completes the continuity of the tip strand between portions 28 and 29. It also completes the circuit of the calling supervisory signal 55, displaying that signal. The operator now actuates her ringing key 81 and completes a circuit from the alternating current ringing generator 87 through contacts 86 and 82 of the ringing key 81, contacts 30 and 21' of the plug and jack, contacts 24' and 13' of cut-off relay 11', line conductor 5', condenser 3', annunciator 2', line conductor 4', contacts 9' and 23' of cut-off relay 11', ring contacts 22' and 35 of the jack and plug and contacts 84 and 88 of the ringing key 81 to ground. Current in this path being alternating passes through the condenser 3' and sounds the annunciator 2'. The operator immediately releases her ringing key and awaits the response of the called subscriber. When the called subscriber responds a circuit is completed from the live pole of battery A through contacts 52 and 51 of relay 43, one of the coils of relay 50, ring conductor 34, ring contacts 35 and 22' of the plug and jack, contacts 23' and 9' of cut-off relay 11', line conductor 4', transmitter 6', receiver 7', the now closed contacts of the switch hook 8', line conductor 5', contacts 13' and 24' of cut-off relay 11', tip contacts 21' and 30 of the jack and plug, tip conductor 29, contacts 70 and 69 of relay 43, conductor 28 and the other coil of supervisory relay 50 to ground. The current in this path actuates the relay 50 opening the circuit of the supervisory lamp 55 at contacts 53 and 54, and simultaneously closing its contacts 56 and 57 in the circuit of the service meter lamp 58. This completes the circuit of the service meter lamp from the live pole of battery A through the contacts 60 and 59 of relay 61, contacts 57 and 56 of relay 50 and through the lamp to the ground pole of battery A. The display of signal 58 which is preferably a colored lamp reminds the operator that the conversation is in progress and that it is now her duty to press her service meter key and register a call upon the calling subscriber's meter. The depression of the service meter key completes a circuit from the direct current generator 68, which is of higher voltage than the battery A, through the coil of the position meter 67, contacts 66 and 39 of the service meter key, coil of relay 38, conductor 37, sleeve contacts 36 and 20 of the plug and jack, conductor 19, the coil of cut-off relay 11, and the coil of the line service meter 18

to ground. Owing to the higher voltage of the generator 68 the current is now sufficient to actuate the service meter 18 and a call is therefore registered against the calling subscriber. The actuation of the service meter key also completes a circuit from the live pole of battery A through contacts 64 and 63 of the key and the coil of locking relay 61 to ground. This actuates the relay 61 opening its contacts 59 and 60 in the circuit of the register signal 58 and closing its contacts 62 and 65 which complete a locking circuit for the relay 61 depending for its maintenance upon the condition of the contacts 45 and 46 of relay 38. The current normally flowing through the service meter though not being enough to actuate that meter is sufficient to maintain the meter in its actuated condition after it has once been completely actuated by the passage of the larger current through it from the generator 68. The operator is therefore prevented from registering two calls against the calling subscriber for a single connection. All signals at the central office are now effaced and the lines are in condition for conversation. When the subscribers have terminated their conversation and hang up their receivers they sever the circuits of supervisory relays 44 and 50 which therefore fall back and complete the circuits of supervisory signals 49 and 55. The operator seeing these signals displayed withdraws the plugs from their respective jacks and severs the circuits of relays 11 and 38, and of relays 11' and 43. The falling back of relay 38 severs the circuit of signal 49 and also opens the locking circuit of relay 61 allowing that relay to return to its normal position, and the falling back of relay 43 severs the circuit of supervisory signal 55. The apparatus has now returned to its normal condition and one call has been recorded against the calling subscriber.

While I have shown and described my invention with respect to certain details and combinations, it is to be understood that I do not wish to be unduly limited thereto, many variations being possible without departing from the spirit or scope of my invention.

I claim:

1. In a telephone system, the combination with a telephone line, of a service meter for the line, a cord circuit to connect with the line for conversation, a pair of supervisory signals associated with the cord circuit and adapted to be effaced when a conversational connection is completed, a third signal associated with the cord circuit and adapted to be displayed when a conversational connection is completed, an operator's key adapted when actuated to complete a path for actuating current through said service meter and to efface said third sig-

nal, and means depending upon the removal of the answering end of the cord circuit from its connection with the calling line for again placing said signal in condition to be operated, substantially as described.

2. In a telephone system, the combination with a telephone line, of a service meter for the line connected in a circuit independent of the talking circuit, a cord circuit, a pair of sources associated therewith, one of said sources being of a voltage insufficient for the actuation of said service meter, and the other of said sources being of a higher voltage and sufficient for the actuation of said service meter, a signal for the cord circuit adapted to be displayed when a conversational connection has been completed, a locking relay controlling contacts in the circuit of said signal, a key for changing the connection of said service meter from one of said sources to the other, whereby the service meter is actuated, said key having normally open contacts in the circuit of said locking relay, whereby said signal is effaced after said key has been actuated, substantially as described.

3. In a telephone system, the combination with a telephone line, of a cord circuit to connect therewith for conversation, a supervisory relay having a pair of coils connected in a bridge of the talking circuit during conversation, said relay being actuated during a conversational connection, a signal displayed by the actuation of said relay to indicate that the conversation has begun, a service meter for the line, and means under the control of the operator for actuating said service meter and effacing said signal, substantially as described.

4. In a telephone system, the combination with a telephone line, of a service meter for the line, a cord circuit, a supervisory relay having a pair of coils in a bridge between the talking strands of the calling end of the cord circuit, said relay being actuated when the called subscriber answers his call, a signal displayed by the actuation of said relay, a switch under the control of the operator for the actuation of said service meter, and means to efface said signal by the actuation of said switch, substantially as described.

5. In a telephone system, the combination with a telephone line, of a cut-off relay and a service meter adapted to be actuated over a path independent of the talking circuit of said line, a cord circuit to connect with said line having a contact adapted to complete the circuit of said cut-off relay and service meter during the connection, a pair of sources associated with the cord circuit, one of said sources being connected with said cut-off relay and service meter when

the cord is first connected with the line and being of insufficient potential for the actuation of the service meter, the other of said sources being adapted to be momentarily connected with the cut-off relay and service meter and being of a potential great enough to actuate said service meter, a signal for the cord circuit displayed when a conversational connection has been completed and means to efface said signal after the service meter has been actuated, substantially as described.

6. In a telephone system, the combination with a telephone line including talking strands, of a cord circuit to connect therewith for conversation, a supervisory relay connected in a bridge between the talking strands of the cord circuit, said relay being actuated during a conversational connection, a signal displayed by the actuation of said relay to indicate that the conversation has begun, a service meter for the line independent of connection with talking strands of said line, and a key under the control of the operator for actuating said service meter and effacing said signal, substantially as described.

7. In a telephone system, the combination with a telephone line including talking strands, of a cord circuit to connect therewith for conversation, a supervisory relay in a bridge of the talking strands of the cord circuit, a signal displayed by the actuation of said relay to indicate that a conversational connection has been established, a service meter for the line independent of connection of the talking strands of said line, and a key associated with the cord circuit for actuating said service meter and effacing said signal, substantially as described.

8. In a telephone system, the combination with a metallic circuit telephone line, of a cord circuit to connect therewith for conversation, a supervisory relay in a bridge of the talking strands of the cord circuit, a signal displayed by the actuation of said relay to indicate that a conversational connection has been established, a third conductor independent of connection with the talking circuit, a service meter for the line, a service meter for the cord, and a key associated with the cord circuit for actuating said service meters over said third conductor, and effacing said signal, 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:

CLIFFORD C. BRADBURY,
MARJORIE E. GRIER.