

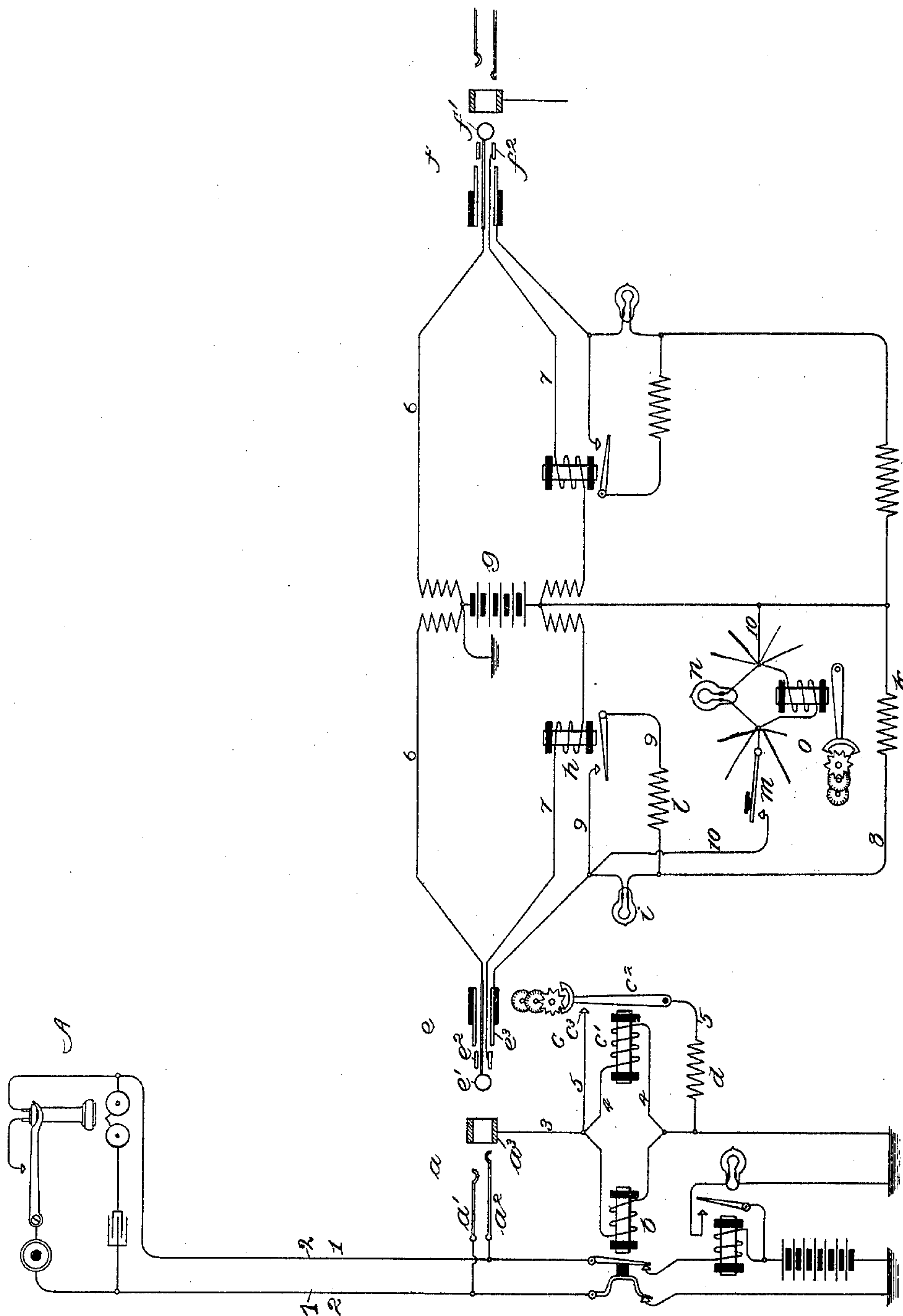
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C. E. SCRIBNER.
SERVICE METER FOR TELEPHONE EXCHANGES.

(Application filed Jan. 12, 1901.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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SERVICE-METER FOR TELEPHONE-EXCHANGES.

SPECIFICATION forming part of Letters Patent No. 681,860, dated September 3, 1901.

Application filed January 12, 1901. Serial No. 42,964. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. SCRIBNER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Service - Meters for Telephone-Exchanges, (Case No. 492,) of which the following is a full, clear, concise, and exact description.

My invention relates to a measured-service telephone-exchange system, and has for its object to provide an improved organization of circuits and apparatus for a telephone-exchange system whereby each connection completed at the central office between a calling-line and another line may be recorded and a signal simultaneously displayed indicating that such record has been made.

A further object is to provide means for automatically recording the number of connections completed by each operator.

My invention is particularly applicable to measured-service systems wherein an electrically-operated meter or connection-register is associated at the central office with each telephone-line whose service is to be measured. This register may be connected with a local switchboard-circuit which is associated with the subscriber's line and which is adapted to be completed by conductors in the operator's plug-circuit when connection is made with the line by plugging into the spring-jack terminal thereof. In association with the connection-register I provide a signal device in a local circuit controlled by the register, so that when a connection is recorded the condition of the local circuit is changed and the signal operated, thus indicating to the attendant that proper record has been made. The signal may be a lamp associated with each pair of plugs with which the attendant is provided for completing connections.

A further feature of my invention consists in the provision of an operator's register, which may be common to the whole number of pairs of plugs handled by one operator and which is associated with the plug-circuit in such a way that when a connection is made with any line and the register of that line

actuated the operator's register will also be actuated. A complete record of the amount of work done by each operator is thus automatically made, which also serves as a check upon the accuracy of the line-registers.

I will describe my invention particularly by referring to the accompanying drawing, which is a diagram illustrating the preferred embodiment thereof, and that which I regard as new will be pointed out in the appended claims.

The telephone-exchange system illustrated is of a general type which is well known in the art. Each line has at its substation the usual telephonic and signaling apparatus, with a switch-hook controlling the circuits through the same. A source of current is connected with the line at the central office by way of the contacts of a cut-off relay, and a line-relay controlling a subsidiary line-signal (an incandescent lamp) is included in the circuit of the line between the battery and the contacts of the cut-off relay. This circuit is controlled by the subscriber's telephone switch-hook in a well-known manner, the removal of the telephone-receiver from the hook serving to close the circuit, thus bringing about the display of the line-signal to attract the attention of the operator. A spring-jack a is provided for the line, having two line-springs a' a^2 , connected, respectively, with the limbs 1 2 thereof, and a third contact or test ring a^3 . This test-ring a^3 is connected to ground by a conductor 3, which includes the winding of the cut-off relay b . This relay may have a resistance of, say, thirty ohms. In a shunt about the cut-off relay I provide an electromagnetic toll-counter or connection-register c , comprising a magnet c' of comparatively high resistance—say five hundred ohms—and an armature c^2 for said magnet, connected with and adapted to actuate a recording-train. Each separate impulse of current received by the magnet causes a registration by the recording-train. Connection-registers of this type are known in the art and do not require detailed description. I have used a conventional illustration which is well understood. The armature c^2 of the connection-register is adapted when drawn up to close a contact c^3 .

This contact controls a path 5 to ground, shunting the high-resistance magnet c' with a low resistance d , which may be thirty ohms.

The central-office attendant or "operator" 5 is provided with the usual pairs of plugs with link conductors uniting the members of each pair for connecting any two lines together by plugging into the spring-jacks of such lines. A pair of such plugs, with their cord-circuit, 10 is illustrated in the diagram. The plug e is the answering-plug, and plug f is the calling-plug. Each plug has three contact portions insulated from one another and adapted, when the plug is inserted in a spring-jack, to make 15 engagement with the three contact portions of the jack. The tip and ring contacts e' e^2 of the answering-plug e are connected by link conductors 6 7, respectively, with the tip and ring contacts f' f^2 of its mate or calling-plug 20 f , the windings of a repeating-coil being interposed in the plug-circuit in the usual manner. A central battery g is bridged across the conductors 6 7 between the windings of the repeating-coil, and one side of the bat- 25 tery—the side which is connected to the conductor 6—is connected to earth. This battery is preferably a storage battery, adapted to supply an indefinite amount of current at a pressure of about twenty volts. The mag- 30 net of a supervisory relay is included in the conductor 7 between the battery g and the ring-contact e^2 of the answering-plug. The shank or third contact e^3 of the answering-plug is connected with the free pole of the 35 battery g by a conductor 8, which includes, serially, a subsidiary signal-lamp i and a resistance-coil k of, say, one hundred ohms. The supervisory relay h is adapted when excited to close a low-resistance shunt 9 about 40 the signal-lamp i , (which preferably has a resistance of about one hundred and twenty ohms,) said shunt containing a resistance l of about forty ohms.

I provide a conductor 10, connecting the 45 third contact or shank e^3 of the answering-plug with the free pole of battery g , shunting the lamp and the resistance k . This shunt-path 10 is of very low resistance and is adapted to be closed by a manually-operated 50 key or other switch m . A signal-lamp n and a connection-register o are connected in multiple branches of the circuit 10, and each of these devices has a resistance of only a few ohms.

55 It is understood, of course, that the operator is provided with the usual telephone apparatus for "listening in" and the suitable calling-keys associated with each pair of plugs; but these devices form no part of this 60 invention and are not illustrated.

The operation of the system is as follows: The operator having noticed subscriber A's call signal-lamp, which has been lighted in the usual way as a result of the removal of 65 his telephone-receiver from its switch-hook, answers the call by inserting her answering-plug e in the answering-jack a of the line,

connects her telephone in circuit, and in- 70 quires the number of the subscriber with whom connection is desired. When she has obtained this information, she inserts the other plug, f , of the pair in the spring-jack of the called line and signals the called sta- 75 tion. Then having completed the connection, (or she may wait until the called party answers,) she depresses the key m to operate the connection-register of the calling-line, thus making a record of the connection. 80 When the answering-plug is inserted in the jack a , a circuit is completed from the grounded battery g of the plug-circuit through conductor 8 to the contact e^3 of the plug, ring- 85 contact a^3 of the jack, and thence in multiple through the cut-off relay b and the connection-register c to ground. The subscriber's 85 telephone being off the hook, the supervisory relay h will be excited by current from battery g flowing in the line-circuit thus completed at the substation, and the lamp i will be shunted by the forty-ohm resistance l ; 90 but the current flowing in the circuit 8 3, nevertheless, will not be sufficient at this time to excite the connection-register c' , the current being cut down by the resistance k ; but when the operator depresses the key m 95 she closes the low-resistance shunt 10, which so increases the flow of current that the connection-register is operated. In drawing up its armature c^2 the magnet c' of the connection-register closes the contact c^3 , whereby 100 the low-resistance shunt 5 is closed about the five-hundred-ohm magnet. Owing to the very low resistance of the shunt-path 10 in the plug-circuit, however, sufficient current still flows through the magnet c' to keep the ar- 105 mature from falling back, very little force being required to do this. When the shunt-path 5 is closed to ground by the closing of contact c^3 , the current flowing in the conductor 10 is so increased that the signal- 110 lamp n , hitherto unaffected, will be lighted, thus indicating to the operator that a record of the connection has been properly made. At the same time the register o is operated. This register may be common to all the pairs 115 of plugs which the operator has, and will thus indicate the total number of connections which she has made, while the individual register of each line will indicate the number of connections made with that par- 120 ticular line. The general register may thus be employed to check the accuracy of registration of the different individual line-registers, as well as to record the amount of work done by the operator. 125

Having thus described my invention, I claim as new, and desire to secure by Letters Patent, the following:

1. The combination with telephone-lines 130 extending from substations to a central-office exchange, of means at the central office for uniting two of the lines in response to a call from one of them, a connection-register or service-meter associated with one of the lines,

means for actuating said connection-register to record the connection, a local switchboard-circuit including a signal, and switch contacts, operated by the register in recording the connection, adapted to change the electrical condition of the local circuit, to cause the display of said signal, as set forth.

2. The combination with a telephone-line having a spring-jack terminal at an exchange-switchboard, of a plug and plug-circuit for making connection with the line, an electrically-operated connection-register for the line, a circuit for said call-register established in plugging into the spring-jack, means in the circuit for operating the register, and a signal before the operator controlled by the register in recording the connection, whereby the attendant is informed of the operation of the call-register, as set forth.

3. The combination with a telephone-line having a spring-jack terminal at a central-office switchboard, of an operator's plug and plug-circuit for making connection with the line, an electrically-operated connection-register associated with the line and means for actuating the same, a local switchboard signal-circuit, established in making connection with the line, a signal before the operator, included in said local circuit, and switch contacts operated by the register in recording the connection, controlling the electrical condition of the said local signal-circuit, whereby the operation of the subscriber's connection-register is indicated by said signal, as described.

4. The combination with a telephone-line having a spring-jack terminal at a central-office switchboard, of an operator's plug and plug-circuit for making connection with the line, an electrically-operated connection-register for the line, a circuit for said register established in contacts of the plug and spring-jack, a switch controlling the electrical condition of the circuit to operate the connection-register, a signal in the circuit adapted to respond to an increase of current, and a shunt closed by the connection-register in recording the connection, whereby the signal is displayed when the register operates, as described.

5. The combination with a telephone-line having a spring-jack terminal at a central office, and an operator's plug and plug-circuit for making connection with the line, of a con-

nection-register for the line and a circuit including said register with a source of current, established in making connection with the line, a resistance in the circuit, a shunt about the resistance and a switch for closing said shunt, whereby the register is operated by the increased current, switch-contacts operated by the register, a shunt closed by said switch-contacts in the operation of the register, and a signal device in the circuit, responsive to the increased current when the register operates, substantially as set forth.

6. The combination with telephone-lines extending from substations to spring-jacks at a central-office switchboard, of an operator's plug-circuit at the switchboard for making temporary connection with any of said lines, a local circuit including a source of current, established in registering contacts of one of the plugs and the spring-jack of any line, a subscriber's service-meter for each line in the portion of said local circuit which terminates in the spring-jack of that line, a switch adapted to change the electrical condition of the circuit to operate the subscriber's service-meter, and an operator's general service-meter connected with the plug-circuit portion of said local circuit, responsive to the changes produced by said switch, whereby each connection registered upon the subscribers' meters of lines to which the plug-circuit is connected, is registered also upon the operator's general meter.

7. The combination with subscriber's telephone-lines terminating in spring-jacks at an exchange-switchboard, of a service-meter associated with each line, an operator's plug-circuit for uniting said lines, a circuit for the service-meter established in registering contacts of a plug and the spring-jack of a line in making connection therewith, means for changing the electrical condition of said local circuit to actuate the service-meter, and an operator's service-meter in the portion of the local circuit associated with the plug, responsive to current changes in the circuit, whereby the first-mentioned service-meter and the operator's meter are simultaneously operated.

In witness whereof I hereunto subscribe my name this 24th day of November, A. D. 1900.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,
F. J. HOLMES.