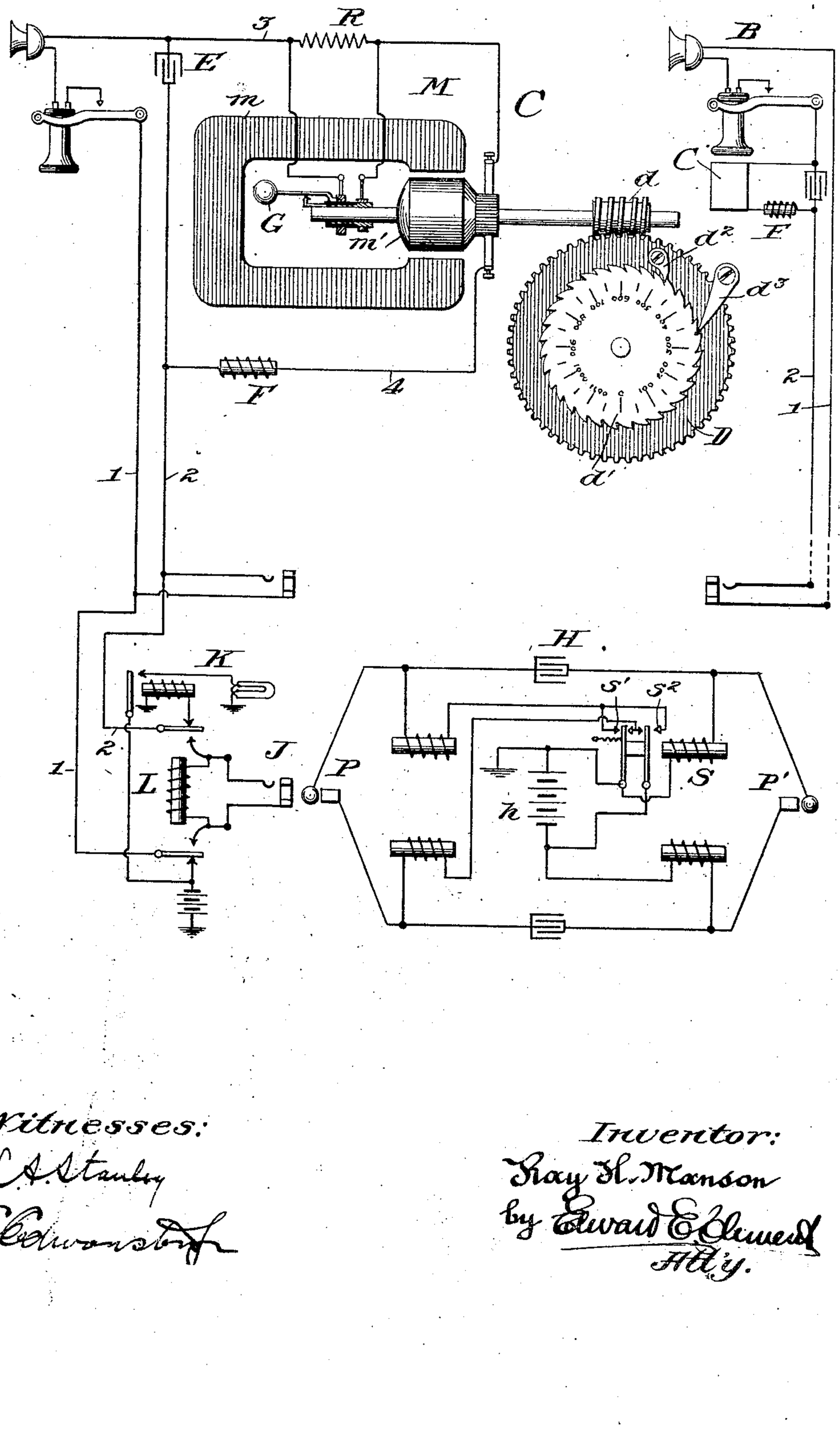
R. H. MANSON.

TELEPHONE METER SYSTEM AND APPARATUS.

APPLICATION FILED APR. 18, 1907.

946,381. Patented Jan. 11, 1910.



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UNITED STATES PATENT OFFICE.

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TELEPHONE METER SYSTEM AND APPARATUS.

946,381. Specification of Letters Patent. **Patented Jan. 11, 1910.**

Application filed April 18, 1907. Serial No. 369,017.

To all whom it may concern:

Be it known that I, RAY H. MANSON, 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 Telephone Meter Systems and Apparatus, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to telephone meter systems and apparatus in general, and particularly to such as are designed and constructed for measuring and registering the duration or length of time the telephone is in use, as distinguished from the number of times that it is used.

The principal object of the present invention is to provide a registering meter driven by an electric motor connected to the line circuit of the telephone instruments and designed to be operated by current flowing in the line.

In my companion application, Serial No. 369,016, I have disclosed a telephone meter system in which the electric motor of the meter is designed to rotate in one direction by current flowing in a certain direction in the line to operate the meter, and to rotate idly in the opposite direction when current is reversed in the line without operating the meter, the cord circuit at the central office being so arranged that current will flow in opposite directions in two connected lines so that the meter of one of these lines will register while the other remains unaffected. In that system the meter of the connected lines which is to register (which is preferably that of the calling subscriber) begins to register when the subscriber removes his receiver from the hook and continues to register until he again hangs up his receiver, so that the meter will register the total time that his receiver has been off the hook.

It is the principal object of my present invention to provide a system and apparatus in some respects similar to that above outlined, but in which the meter of the subscriber to be charged will register only during the time that both his receiver and the receiver of the called subscriber are off the hook, that is, during the actual time that the complete connection for conversation is made.

With this and other objects in view, the invention consists in the novel apparatus and circuits, together with their combinations, hereinafter described and illustrated in the accompanying drawing, in which the figure shows in diagram two subscribers' stations, together with the central office circuit terminals and the connecting cord circuit therefor, the meter apparatus at one station being shown in enlarged detail.

Referring to the drawing, A represents the calling subscriber's station, and B the called subscriber's station, each being provided with the usual transmitting and receiving instruments. Station A is connected by line wires 1 and 2 with the answering jack J at the central office. Any preferred line indicator, and cut-off, represented by K and L, respectively, may be employed at the central office in connection with jack J, those shown being of a well known type which need not be described as they form no part of the present invention. It will be understood that my invention is suitable for and may be adapted to any telephone system.

The meter C comprises an electric motor M having a permanent or separately excited field magnet m and an armature m^1. The armature m^1 is geared by worm d to a large gear wheel D of the registering mechanism. Concentric with gear wheel D or otherwise mounted in relation thereto is a dial disk d^1 adapted to be engaged by a pawl d^2 mounted upon gear wheel D and driven thereby when said gear wheel rotates in a given direction, but to pass idly thereover when said gear wheel is rotated in the opposite direction. A stop pawl d^3 also engages the teeth of the dial disk d^1 to positively prevent the rotation of the latter in a backward direction.

The armature of motor M is connected in series with the line by leads 3 and 4, and a condensor E is bridged across the terminals of these motor leads. An inductive resistance or choking coil F is preferably inserted in the armature circuit of the motor to choke back and eliminate any noises that might be produced and impressed upon the line from the commutator of the motor.

In order to provide a constant speed for the motor, I employ a regulating resistance, shown diagrammatically at R, and controlled in any suitable manner, such as by a centrifugal governor G mounted upon or controlled by the armature shaft of the motor. This regulating resistance R is normally

short circuited through the contacts of the governor G, but when the speed of the motor exceeds a predetermined limit this short circuit is open and the resistance R thereby becomes effective to reduce the speed.

At the central office the cord circuit is represented at H as of a well known common battery 4-relay type which need not be described in detail. A battery *h* is connected to this circuit, to supply current for the telephone instruments and also for operating the electric motors of the meters.

P is the answering plug of the cord circuit and P^1 is the calling plug. For the purpose of my invention I provide relay contacts adapted to reverse the connection of the battery with the answering plug upon the completion of the talking circuit of the called subscriber. While these contacts may be operated by any relays suitably connected, I prefer to arrange them to be operated by the tip calling (supervisory) relay S, as shown. In its normal position, when the movable member of this relay is upon its back contacts s^1, current from battery *h* will flow to plug P in the same direction as it flows to plug P^1, but when relay S is energized the movable member will connect with contacts s^2 and current will flow from battery *h* to plug P in the reverse direction from that in which it flows to plug P^1.

The operation of the system and meter will be apparent from the foregoing, and is as follows: Calling subscriber A having removed his receiver from the hook, when answering plug P is inserted into the jack J current will flow from battery *h*, one of the back contacts s^1 of relay S, tip of plug P, line wire 2, motor M, instruments of subscriber A, line wire 1, and return to battery by sleeve of plug P and the other contact s^1. This direction of current is such as to drive the armature of motor M at station A in its idle direction, that is, so as not to operate the registering mechanism of the meter. The disk B of the motor will therefore be rotated in anti-clockwise direction so that pawl d^2 will travel idly over the teeth of the register disk d^1 which will be held positively against movement in that direction by pawl d^3. Having ascertained the number of the subscriber wanted, the operator inserts calling plug P^1 into the calling jack of subscriber B. When subscriber B removes his receiver from the hook, the circuit is completed through the instruments, meter motor, and line wires of that station from battery *h* in the same direction as that just traced in connection with station A. The meter motor of station B will therefore be rotated in its idle direction and the meter of the called station will not register. This circuit also includes the magnet of the relay S which thereupon attracts its armature, thereby opening the circuit of subscriber A at contacts s^1 and closing it at contacts s^2. Current now flows from battery *h* through one of contacts s^2, the sleeve of plug P, to station A, returning by the tip of plug P and the other contact s^2 to battery, thereby reversing the flow of current upon the line of the calling subscriber. This reversal of current reverses the direction of rotation of armature m^1 of motor M at station A and will drive disk D in the clockwise direction to operate the registering dial. The meter of station A therefore begins to register as soon as the called subscriber removes his receiver from the hook, while the motor of the called subscriber continues to rotate in the idle direction. It will thus be seen that the calling subscriber alone is charged, and that only for the time during which the connection is actually completed with the called subscriber. Another advantage of this system is that when a conversation is completed and the calling subscriber desires another connection, the motor of his meter will be reversed when the called subscriber hangs up his receiver, so that the calling subscriber will not be charged for the time that he must wait for another connection.

Many changes may be made in details of construction and arrangement of parts and circuits without departing from the spirit of my invention, and these I wish it understood fall strictly within the scope and purview thereof; for instance, the meters of the subscribers might be located at central office if preferred, also the type of gear and the ratio of connection between the motor and the registering device may be varied at pleasure.

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

1. In a telephone system, a plurality of subscribers' stations and a central office, line circuits connecting said stations with said central office, means at said central office for establishing a speaking connection between two of said subscribers' stations, and an electrically operated time registering device energized from one of said subscribers' circuits and arranged to register only the time during which both of such line circuits are in talking condition.

2. In a telephone system, a plurality of subscribers' stations connected by suitable line circuits with a central office, speech transmitting and receiving instruments at said subscribers' stations, a time registering device at one of said stations at least, an electric motor driven by electric energy supplied from the central office over the line circuit and arranged to operate said registering device, a source of electrical energy, and circuit connections completed only during the interconnection of the talking apparatus

of two stations to drive said motor and operate said registering device.

3. In a telephone system, a plurality of subscribers' stations connected by suitable line circuits with a central office, a connecting circuit at said central office for said line circuits, a time registering device at a subscriber's station, an electric motor at such substation driven from the line circuit of that station and operatively connected to said time registering device to operate the same only upon the flow of current in a predetermined direction, and means for establishing current flow in that line of the proper direction upon the completion of a talking circuit between said subscriber's station and another subscriber's station.

4. In a telephone system, a plurality of subscribers' stations connected by suitable line circuits with a central office, a connecting circuit at said central office for said line circuits, a time registering device at a subscriber's station, an electric motor at such substation driven from the line circuit of that station and operatively connected to said time registering device to operate the same only upon the flow of current in a predetermined direction, means for impressing upon said line circuit a current from said connecting circuit in the opposite direction, and means for reversing said flow of current to operate the registering device upon the completion of a talking connection with another subscriber's station.

5. In a telephone system, a plurality of subscribers' stations connected by suitable line circuits with a central office, a connecting circuit at said central office for said line circuit, a time registering device at a subscriber's station, an electric motor energized from the line circuit of that station and having a rotatable armature operatively connected to said time registering device to operate the same upon the flow of current in a predetermined direction, but not affecting said time registering device upon the flow of current in the opposite direction, means for impressing upon that line a flow of current from said connecting circuit in the inoperative direction, and means for reversing said flow of current when a talking circuit is completed with another subscriber's station.

6. In a telephone system, a plurality of subscribers' stations connected by suitable line circuits with a central office, a time registering device at each of two of said subscribers' stations, an electric motor energized from said line circuits and inoperative to drive said registering devices when rotating in one direction, but operative to drive the same when rotating in the opposite direction, a connecting circuit at said central office adapted to supply initially current in the same direction to two connected lines, and means for reversing the direction of current in one of said lines upon the completion of the talking circuits at said connected subscribers' stations.

7. In a telephone system, a calling and a called subscriber's station connected by suitable line circuits to a central office, a time registering device at each of said subscribers' stations provided with electrical actuating means energized from said circuits operative to continuously drive said registering devices upon the flow of current in said lines in a predetermined direction, a connecting circuit at said central office arranged to supply current initially to said line circuits in the same inoperative direction, and a relay associated with said connecting circuit energized upon the answering of the called subscriber and arranged to reverse the flow of current in the circuit of the calling subscriber to drive the actuating means located at the calling substation.

8. In a telephone system, a calling and a called subscriber's station connected by suitable line circuits to a central office, a time registering device at each of said subscribers' stations provided with electrical actuating means energized from said circuits operative to continuously drive said registering devices upon the flow of current in said lines in a predetermined direction, a connecting circuit at said central office arranged to supply current initially to said line circuits in the same inoperative direction and provided with a supervisory relay for the called subscriber's line, and contacts controlled by said supervisory relay to reverse the flow of current in the circuit of the calling subscriber upon the answering of the called subscriber to drive the actuating means located at the calling substation.

9. A connecting circuit for telephone lines comprising suitable terminals, time period measuring meters associated with the lines, a source of electric energy operatively connected to said circuit, and a relay arranged to reverse the connection of the source of energy to the line of the calling subscriber when a through talking circuit between two subscribers is completed whereby the meter of the calling subscriber may be operated.

10. A connecting circuit for telephone lines comprising suitable terminal plugs, meters associated with the lines, a source of electric energy operatively connected to said circuit, a relay arranged to reverse the connection of the source of energy to the line of the calling subscriber when a through talking circuit between two subscribers is completed whereby the meter of the calling subscriber may be operated, said relay constituting also a supervisory relay connected to the tip of the calling plug, the contacts operated by said supervisory relay serving to reverse such connection.

11. A connecting circuit for telephone lines comprising suitable terminals, time period measuring meters associated with the lines, a source of electric energy operatively connected to said circuit, and means for reversing the connection of the source of energy to the line of the calling subscriber whereby the meter of the calling subscriber may be operated.

12. A connecting circuit for telephone lines comprising suitable terminal plugs, time period measuring meters associated with the lines, a source of electric energy operatively connected to said circuit, means for reversing the connection of the source to the line of the calling subscriber whereby the meter of the calling subscriber may be operated, such reversing means being under the control of one of the connected subscribers.

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

RAY H. MANSON.

Witnesses:
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W. C. STRONG.