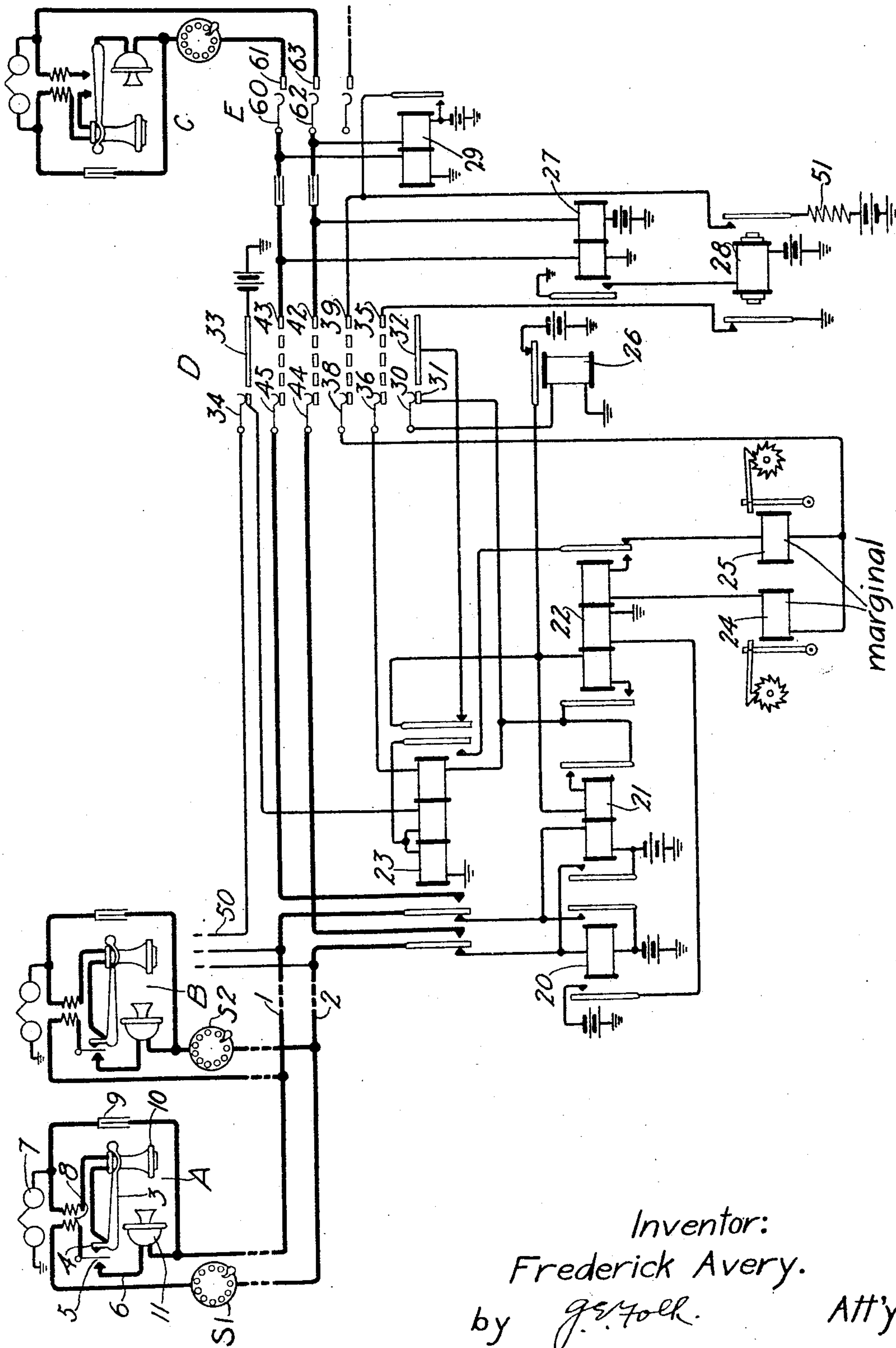


F. AVERY.
MESSAGE REGISTER SYSTEM.
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1,409,913.

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Inventor:
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UNITED STATES PATENT OFFICE.

FREDERICK AVERY, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

MESSAGE-REGISTER SYSTEM.

1,409,913.

Specification of Letters Patent. Patented Mar. 21, 1922.

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To all whom it may concern:

Be it known that I, FREDERICK AVERY, residing at New York, in the county of New York and State of New York, have invented certain Improvements in Message-Register Systems, of which the following is a specification.

This invention relates to message register systems for telephone exchanges, and more particularly to message register systems for use in telephone exchanges employing party line working wherein each of the stations of the party line is provided at the central office with a message register for registering calls.

An object of the invention is to provide an improved circuit arrangement in systems of this nature for selectively associating with the calling station of a party line, the message register individual thereto and for subsequently operating said register.

In accordance with this invention a party line having two substations thereon and terminating in a non-numerical switch in an automatic exchange is provided with a line relay for each of the stations connected to the line. The contacts of the switch hook at the substation, actuated in response to the removal of the receiver, are arranged so as to cause the energization of the relay individual to the calling station. The line relay corresponding to the calling station in operating shunts the other line relay connected to the calling line. The line relays control the actuation of a switching relay which in turn controls the inclusion of the register corresponding to the calling station, in the message register operating circuit. Upon the response of the called subscriber the message register is operated.

Other features of the invention will become apparent from a consideration of the following description and the appended claims.

Referring to the drawing, which shows only as much of a telephone exchange system as is necessary for a comprehension of the invention, two substations A and B are shown connected to a line 1, 2 extending to a central office. A non-numerical switch D may be employed for extending the line to a connector switch, diagrammatically represented as E and thence to a called substation C. Line relays 20 and 21 individual to stations A and B respectively control the actuation of a switching relay 22. When

relay 20 operates, in response to the initiation of a call by the station A, relay 22 is operated thereby including message register or meter 24 in the message register operating circuit whereas when relay 21 operates, in response to the initiation of a call from a subscriber at station B, relay 22 does not operate thereby including message register or meter 25 in the message register operating circuit.

The non-numerical switch D may be of the type similar to that disclosed in application of Forsberg and de Vignier, Serial No. 317,126, filed August 13, 1919, and the connector switch diagrammatically represented as E, a portion only of which is shown in the drawing, may be of any well-known type of step-by-step switch adapted to be operated under the control of an impulse sender.

In the following detailed description of the operation of the system it will first be assumed that the subscriber at substation A on the party line 1, 2 wishes to hold conversation with the subscriber at substation C. For simplicity, the called line is shown as an ordinary single substation line not equipped with a message register. When the subscriber at substation A removes his receiver from the switch hook 3, the switch hook in moving upwardly closes contacts 4 and 5 appreciably before it closes contacts 5 and 6 whereupon relay 20 is energized over a path which may be traced from ground, through ringer 7, secondary winding of induction coil 8, receiver 10, contacts 4 and 5, primary winding of induction coil 8, sender S¹, conductor 2, outer left-hand normal contacts of relay 23, and winding of relay 20 to grounded battery. Relay 20 in attracting its right-hand armature completes a shunt circuit around the winding of line relay 21 individual to substation B so that when contacts 4, 5 and 6 are closed and ground is connected to conductor 1, relay 21 will not be operated. At the left-hand contacts of relay 20, a circuit is closed for relay 22 which thereupon energizes. Relay 22 in attracting its right-hand armature includes message register 24, individual to the substation A, in the message register operating circuit, and in attracting its left-hand armature completes a circuit for motor magnet 26, said circuit extending from ground, through the winding of magnet 26, brush

30, contact 31, left-hand armature and front contact of relay 22, left-hand winding of relay 22, and armature and back contact of magnet 26 to grounded battery. Magnet 26 operates and steps the brushes of switch D from normal position into engagement with the first set of contacts, thereby connecting battery through segment 33 and brush 34 to multiple conductor 50 to place a busy test on the multiple terminals of the calling line.

Should the switch, connected to the first set of contacts of non-numerical switch D, be busy, no potential will be present on the test contact of switch D and magnet 26, being self-interrupting, will continue to operate to move the set of brushes of switch D over its associated contacts over a circuit traceable from ground, winding of magnet 26, brush 30, segment 32, back contact and outer right-hand armature of relay 23, and armature and back contact of magnet 26 to grounded battery.

When the terminals of an idle switch shown as E, are reached, ground will be present on the test terminal which will cause relay 23 to be operated. The circuit for the energization of relay 23 may be traced from ground, left-hand normal contact of slow-to-release relay 28, terminal 35, brush 36, right-hand winding of relay 23, left-hand contacts and winding of relay 22 and armature and back contact of magnet 26 to grounded battery. Relay 23 in operating extends conductors 1, 2 of the calling line through to the switch E, opens the operating circuit of magnet 26 and disconnects the line relays 20 and 21 from the conductors 1, 2. When relay 23 operates and the conductors 1, 2 are extended through to the switch E, impulse relay 27 of switch E operates over a circuit traceable from grounded battery, through the right-hand winding of relay 27, terminal 42, brush 44, outer left-hand alternate contacts of relay 23, conductor 2, sender S¹, primary winding of induction coil 8, contacts 5 and 6, transmitter 11, conductor 1, inner left-hand alternate contacts of relay 23, brush 45, terminal 43 and left-hand winding of relay 27 to ground. Ringer 7 has a winding of high resistance and only a portion of the current flowing through contacts 5 and 6 branches off at contact 4 and flows through the receiver 10, secondary winding of coil 8 and ringer 7 to ground. Relay 27, in operating, completes a circuit at its armature and front contact for slow-to-release relay 28. Relay 28, in operating, removes ground from terminal 35 thereby rendering said terminal busy. Relay 23, in operating, completes a locking circuit for itself which extends from ground, through the left-hand winding of relay 23, inner right hand armature and front contact of relay 23, right-hand alternate contacts of relay 22, winding of relay 22, wind-

ing of register 24, brush 38, terminal 39, front contact and right-hand armature of relay 28 and resistance 51 to grounded battery. Relay 22 is also maintained energized over the circuit just traced. Due to the resistance 51, the flow of current over this circuit is insufficient to operate register 24.

The subscriber may now proceed to send out impulses to set the connector on the terminals of the called substation whereupon the called subscriber will be signaled in the well-known manner.

When the called subscriber responds, relay 29 will be energized over a circuit extending from ground, left-hand winding of relay 29, brush 60, terminal 61, through the loop of substation C, terminal 63, brush 62, and right-hand winding of relay 29 to grounded battery. Relay 29, in operating, shunts resistance 51 thereby operating the message register 24 over a circuit traceable from grounded battery, front contact and armature of relay 29, terminal 39, brush 38, winding of register 24, right-hand winding and right-hand alternate contacts of relay 22, front contact and inner right-hand armature of relay 23, and left-hand winding of relay 23 to ground. Relays 22 and 23 are then held locked under control of relays 28 and 29.

Upon completion of the conversation and restoration of the receiver to the switch hook by the subscribers at stations A and C, relays 27 and 29 will deenergize. Relay 28 in retracting its armature when relay 27 releases, and relay 29 in releasing open the holding circuit for relays 22 and relay 23 and the latter in deenergizing completes a circuit for stepping magnet 26 extending from ground, through the winding of magnet 26, brush 30, segment 32, outer right-hand normal contacts of relay 23, and armature and back contact of magnet 26 to grounded battery. Under the control of magnet 26 the brushes of switch D are stepped to normal whereupon the operating circuit for magnet 26 is interrupted. The deenergization of the impulse relay 27 may cause the restoration to normal of switch E in the usual manner and the system is then ready for the next call.

Assuming now that station B initiates a call, line relay 21 will operate and shunt relay 20 upon the removal of the receiver from the switch hook due to contacts 4 and 5 closing appreciably before contacts 5 and 6. It will be assumed that the apparatus of station B with the exception of the sender has the same reference characters as like apparatus at station A. The circuit for relay 21 includes grounded battery, left-hand winding of relay 21, left-hand inner normal contacts of relay 23, conductor 1, primary winding of induction coil 8, contacts 5 and 4, receiver 10, secondary wind-

ing of induction coil 8, and ringer 7 to ground. Relay 21 also completes a circuit at its right-hand contacts for magnet 26, said circuit extending from ground, winding of magnet 26, brush 30, normal contact 31, right-hand armature and front contact and right-hand winding of relay 21, and armature and back contact of magnet 26 to grounded battery. Magnet 26 in operating moves the brushes of switch D one step. As long as brush 36 engages the terminals of busy trunks, no potential will be present on the test terminals engaged by brush 36 and magnet 26 will continue to operate over a circuit traceable from ground, through the winding of magnet 26, brush 30, segment 32, outer right-hand normal contacts of relay 23 and armature and back contact of magnet 26 to grounded battery.

When the terminals of an idle switch, such as E, are reached, ground will be present on the terminal 35 and relay 23 will operate over a circuit extending from ground, left-hand armature and back contact of relay 28, terminal 35, brush 36, right-hand winding of relay 23, right-hand contacts and winding of relay 21, and armature and back contact of magnet 26 to grounded battery. Relay 23 in operating extends the called line through to the connector switch E and relay 27 operates over a circuit similar to that previously traced whereupon relay 28 operates. In energizing, relay 23 completes a locking circuit for itself, said circuit extending from ground, left-hand winding of relay 23, inner right-hand alternate contacts of relay 23, right-hand normal contacts of relay 22, winding of register 25, brush 38, terminal 39, front contact and right-hand armature of relay 28, and resistance 51 to grounded battery. Register 25 will not operate in series with resistance 51.

The subscriber may now actuate the impulse sender to set the switch upon the terminals of the desired line in the manner well-known after which the subscriber C may be signaled.

Upon the response of the called subscriber, relay 29 operates over a circuit previously described and at its armature completes a shunt circuit around resistance 51, whereupon the register 25 operates over a circuit extending from grounded battery, front contact and armature of relay 29, terminal 39, brush 38, winding of register 25, right-hand normal contacts of relay 22, front contact and inner right-hand armature of relay 23, and left-hand winding of relay 23 to ground. Relay 23 is then held locked under control of relays 28 and 29.

Upon completion of conversation and restoration of the receivers to the switch hooks at stations B and C, relays 27 and 29 de-energize whereupon the connector switch E

is restored to normal in the manner well-known. Relay 27 in releasing, releases relay 28. Relays 28 and 29 in releasing cause the release of relay 23. When relay 23 retracts its armature, switch D is restored to normal in the manner previously described and the system is ready for the next call.

What is claimed is:

1. In a telephone system, a telephone line, a plurality of stations thereon, a meter for each station of the line, a circuit for operating the meters, a line relay for each station of the line, means responsive to the initiation of a call from one of said stations for actuating the line relay corresponding thereto, a switching device controlled by said line relay for including the meter corresponding to the calling line in the metering circuit, and means for thereafter closing said meter circuit to actuate said meter.

2. In a telephone system, a telephone line, a plurality of stations thereon, a meter for each station of the line, a circuit for operating the meters, a line relay for each station of the line, means responsive to the initiation of a call from one of said stations for actuating the line relay corresponding thereto, a relay controlled by said line relays for including a meter corresponding to the calling line in the metering circuit, and means for subsequently automatically closing said metering circuit to actuate the selected meter.

3. In a telephone system, a subscriber's line having a plurality of stations thereon, a plurality of line relays for said line, each relay being individual to a station of said line, a plurality of registers for said line, each register being individual to a station of said line, means actuated in response to the initiation of a call from any of said plurality of stations for selectively operating said line relays to associate with the calling line the register individual thereto, and means for subsequently operating said register.

4. In a telephone system, a line, two substations connected thereto, a meter for each substation of the line, automatic switching means including a non-numerical switch connected to said line for extending a connection from said line to a calling station, a line relay for each substation connected to said line, means operative in response to the removal of the receiver from the switch hook of the calling station for operating the line relay corresponding thereto, circuit connections completed upon the operation of said line relay for shunting the other line relay connected to said line and for initiating the operation of the non-numerical switch, a relay controlled by the operation of said line relay for preparing an operating circuit for the meter corresponding to the calling line, and means for operating said meter

upon the response of the called subscriber.

5. In a telephone system, a party line, stations thereon, a switch hook for each station, a meter for each station at the central office, a metering circuit, a meter switching relay at the central office for including the meter in said metering circuit corresponding to the calling station, a plurality of line relays at the central office, one for each station, for controlling the actuation of said switching relay, and means responsive to the removal of the receiver from the switch hook of the calling station to operate the line relay corresponding thereto.

6. In a telephone system, a line terminating in a non-numerical switch, two subscribers' stations connected to said line, a switch hook for each station, a line relay for each station, a message register for each station, an operating circuit therefor, a circuit completed upon the removal of the receiver from the switch hook of a calling station for energizing the line relay corresponding to the calling station, a relay controlled by the line relay for including the meter corresponding to the calling station in the operating circuit, and means for subsequently automatically closing said metering circuit to operate said selected meter.

7. In a telephone system, a line terminating in a non-numerical switch, two subscribers' stations connected to said line, a line relay for each station, said line relays being connected to opposite sides of the line, a meter for each station, an operating circuit therefor, a circuit completed for one side of the line in response to the initiation of a call to operate the line relay corresponding to the calling station, a circuit completed by

said relay in operating, for preventing the line relay connected to the opposite side of the line from operating, a relay controlled by the line relay for including a meter corresponding to the calling line in the meter operating circuit, and means for subsequently automatically closing said operating circuit to actuate the selected meter.

8. In a telephone metering system, a line, a pair of stations thereon, a relay at the central office for each station, each connected to one limb of the line, a meter for each station, a circuit including one side of the line and the corresponding relay closed upon the initiation of a call from one station, a shunt circuit closed by said relay about the other line relay, a metering circuit, a relay controlling the connection of said meters thereto and in turn controlled by the line relays, and means for thereafter closing said metering circuit.

9. In a telephone metering system, a line, a pair of stations thereon, a relay at the central office for each station connected to opposite limbs of the line, a circuit including one side of the line and the corresponding relay, said circuit being controlled by the switch hook contacts of the corresponding station and being closed thereby before the substation loop including the other limb of the line is closed, a shunt circuit, said circuit being closed by said relay about the other line relay before said substation loop is closed, and a metering circuit controlled by said relays.

In testimony whereof, I have signed my name to this specification this 3rd day of June 1920.

FREDERICK AVERY.