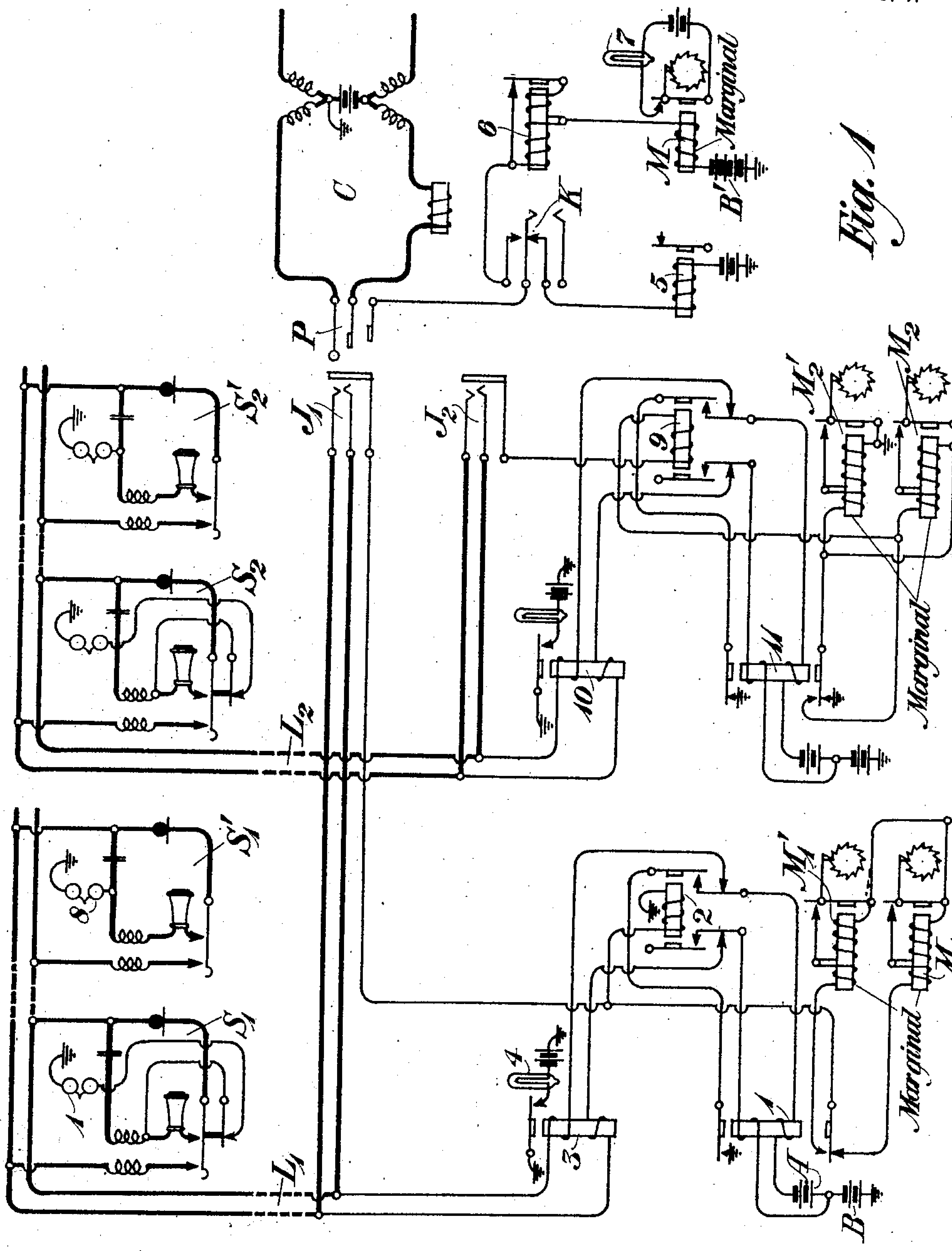
L. H. DARROW.
MESSAGE REGISTERING SYSTEM.
APPLICATION FILED DEC. 23, 1918.

1,412,458.

Patented Apr. 11, 1922.
3 SHEETS—SHEET 1.



INVENTOR.
L. H. Darrow
BY G. E. Folk
ATTORNEY.

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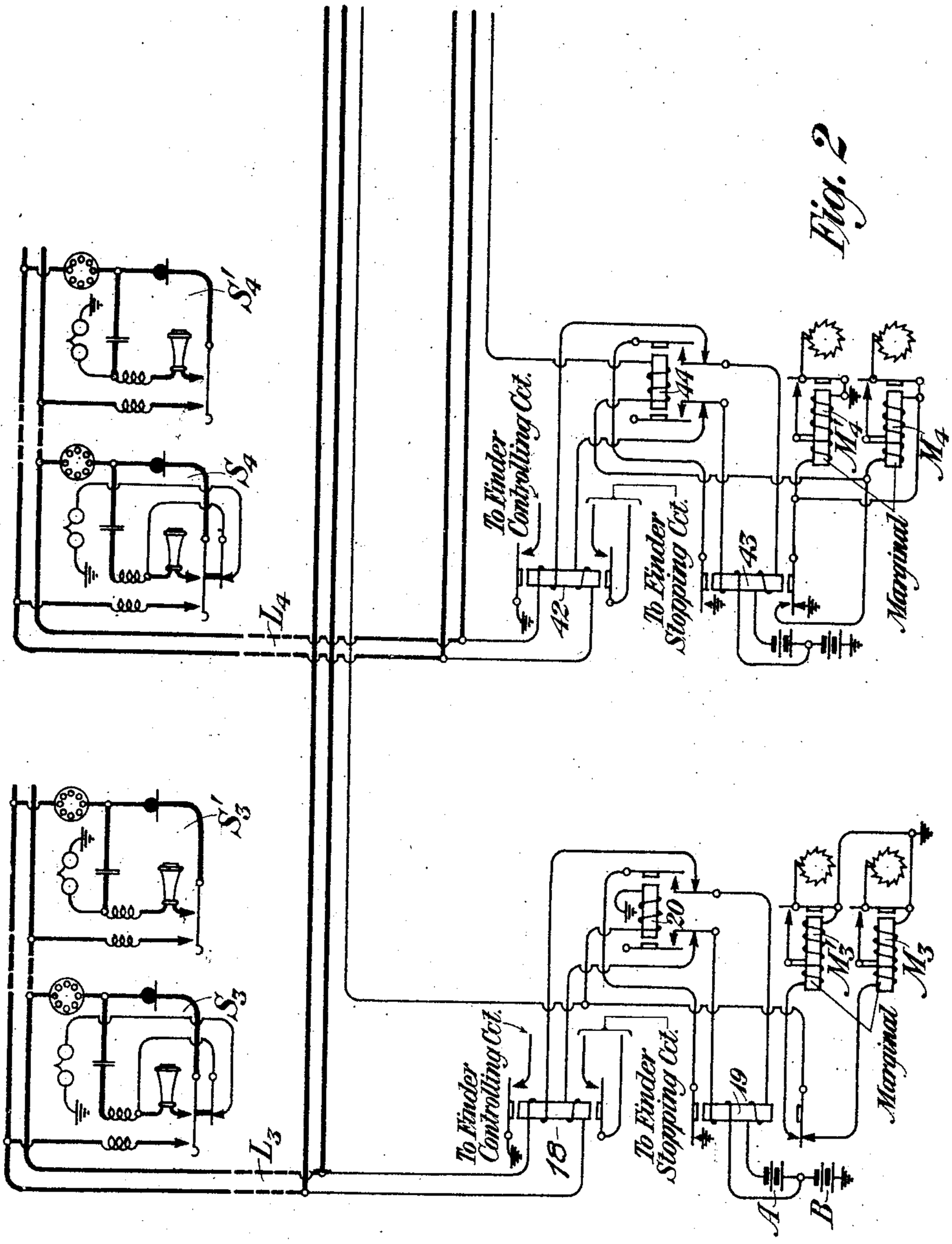

Fig. 2.

INVENTOR:

L. H. Darrow

BY G. E. Yoke.

ATTORNEY.

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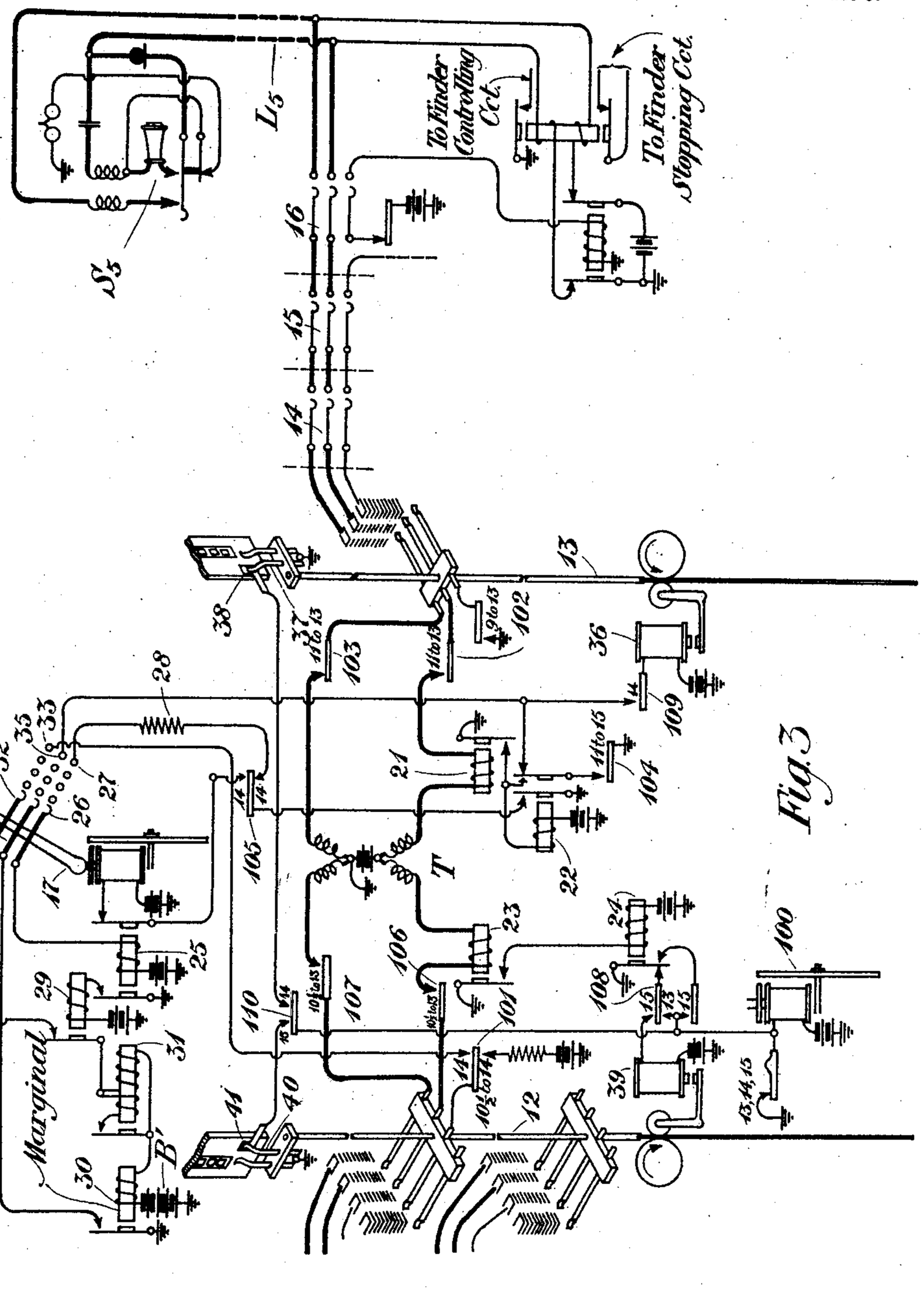

Fig. 3

INVENTOR.

BY L. H. Darrow

G. E. Folk.

ATTORNEY.

UNITED STATES PATENT OFFICE.

LEO H. DARROW, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

MESSAGE-REGISTERING SYSTEM.

1,412,458. Specification of Letters Patent. Patented Apr. 11, 1922.

Application filed December 23, 1918. Serial No. 268,001.

To all whom it may concern:

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

This invention relates to toll devices and the operating means therefor employed in telephone systems, and more particularly telephone systems in which more than one substation is provided for the lines. While the invention has been disclosed as applied to a manual system and a full automatic system, it will be understood that it is equally applicable to a semi-automatic system.

One of the principal features of the invention resides in the provision of a plurality of message registers for a party line, each register corresponding to one of the substations on the line.

Another feature of the invention resides in the provision in a system of the character just described of means whereby when a call is initiated at a given substation on the line a corresponding message register will be selected for operation.

A further feature of the invention resides in the provision of a message register system of the character above described which is adapted for use in connection with a manual system, a semi-automatic system or a full automatic system.

Other and further features of the invention will be fully apparent from the following description when read in connection with the accompanying drawings, Figure 1 of which constitutes a circuit diagram embodying the invention as applied to a manual system, while Figs. 2 and 3, when taken together, constitute a circuit diagram embodying the invention as applied to a full automatic system:

Referring to Fig. 1, telephone lines L_1 and L_2 are shown terminating in jacks J_1 and J_2, each line being provided with two substation sets S_1—S'_1 and S_2—S'_2, respectively. The substation circuit arrangements at the two substations on each line differ from each other slightly, that of the substation S_1 being so arranged that when the receiver is removed from the switch hook the ringer which is normally connected to ground is disconnected, while in the substation S'_1 the ringer remains connected in circuit after the receiver is removed from the switch hook so that both sides of the line are grounded through the ringer. Message registers M_1 and M'_1 are provided for the line L_1, similar registers M_2 and M'_2 being provided for the line L_2. A cord circuit C having an answering plug P adapted to co-operate with the jacks J_1 and J_2 is used in completing connections from the lines. Associated with the cord circuit is register M for registering calls completed by the cord circuit, a key K being also provided, which when operated, will cause the actuation of the register M and the message register of the line corresponding to the substation from which the call originated.

Suitable relay combinations are associated with each line for selecting the proper register, but as it is thought that the invention is of such a character that these features may be understood from a description of the operation, no further detailed description will be given. The operation is as follows: Assuming that the subscriber at substation S_1 removes the receiver from the switch hook the ringer 1 is disconnected and a circuit is completed from battery A, through the lower winding of differential relay 1, right hand normal contact of cut off relay 2, upper winding of line relay 3, ring conductor of line L_1, through the transmitter of the substation S_1 and over the switch hook contacts to the tip conductor of the line L_1, through the lower winding of line relay 3, left hand normal contacts of cut off relay 2, upper winding of differential relay 1 to battery A. The line relay 3 being accumulatively wound is energized over the circuit above traced and completes a circuit for the line lamp 4 but the differential relay 1 is not energized. Consequently the register M_1 is connected over the lower back contact of the relay 1 in parallel with the cut off relay 2 to the sleeve conductor of the jack J_1. The operator, in response to the line signal, inserts a plug P in the jack J_1, thereby completing a circuit from battery, through the winding of relay 5, over the normal contact of key K, sleeve contacts of plug P and jack J_1 and thence in

parallel through the winding of cut off relay 2 to ground and over the lower back contact of relay 1 and through the winding of the message register M_1 to ground. The magnet of the message register is marginal and is not operated over the circuit above traced but the cut off relay 2 operates to open the circuit above traced to the line relay 3 and the differential relay 1 so that the line lamp is extinguished.

At the conclusion of the conversation the operator before withdrawing the plug P from the jack operates the key K, thereby closing a circuit from high voltage battery B', through the winding of the register M, left hand high resistance winding of relay 6, make contact of the key K, sleeve contacts of the plug and jack and through the windings of cut off relay 2 and message register M_1 in parallel to ground. Relay 6 is energized and at its front contact completes a low resistance path through its right hand winding, thereby increasing the current flow over the path above traced so that the message register M_1 is actuated to record the call. The message register upon being actuated short circuits its high resistance winding, thereby further increasing the current flow over the circuit so that register M is energized to register the call established by the cord circuit and cause the lamp 7 to glow, thereby indicating to the operator that registration has taken place.

In the case of a call initiated by the substation S'_1 the ringer 8 remains connected to ground so that a circuit is completed from ground through batteries B and A in series, through the lower winding of differential relay 1, normal right hand contact of cut-off relay 2, upper winding of line relay 3, ring conductor of the line L_1, contacts of the switch hook at substation S'_1, through the receiver and ringer 8 to ground. A circuit is also completed from ground through the battery B, through the upper winding of differential relay 1, left hand normal contact of cut-off relay 2, lower winding of line relay 3, tip conductor of line L_1, through the transmitter at substation S'_1, over the switch hook contacts and through the receiver and ringer 8 to ground. The current flow through the first circuit above traced exceeds the flowing in the latter circuit and consequently both relays 1 and 3 are energized, the latter completing the circuit for the line lamp 4 and the former at its lower contact connecting the message register M'_1 in parallel with the cut-off relay 2. When the operator inserts the plug P in the jack J_1 in response to the glowing of the line lamp a circuit is completed for the cut-off relay 2, which upon being energized opens the circuit of the line relay 3 and at its right hand front contact completes a locking circuit for the differential relay 1 from ground, over the upper front contact of relay 1, right hand contact of relay 2, lower winding of relay 1, through batteries A and B in series to ground. The differential relay 1 therefore remains energized and maintains the connection of the message register M'_1 to the sleeve circuit. Consequently when the key K is actuated the message register M'_1 is energized and records a call for the substation S'_1.

A slightly modified circuit arrangement for the message registers is shown in connection with the line L_2, in this case the registers being connected in series with the cut-off relay 9 of the line L_2 instead of in parallel therewith as in the case of line L_1. A call initiated by the substation S_2 results in the energization of line relay 10 but does not actuate the differential relay 11 so that the message register M_2 is connected to the sleeve circuit from the sleeve contact of the jack J_2, through the winding of cut-off relay 9, through the winding of the message register M_2 and over the lower back contact of relay 11 to ground. Further operations, incident to the registration of the message, are similar to those already discussed and need not be described. In the case of a call originating at the substation S'_2, both line relay 10 and differential relay 11 will be actuated over circuits similar to those described in connection with the substation S'_1. Relay 11 at its lower front contact connects the message register M'_2 to the sleeve circuit from the sleeve contact of the jack J_2, through the winding of cut-off relay 9, lower front contact of relay 11 and through the winding of the message register M'_2 to ground. The cut-off relay 9 locks up the marginal relay 11 over a circuit similar to that described for the relay 1 so that the message register M'_2 remains connected as described until the registration takes place in a manner similar to that previously discussed.

In the arrangement shown in Figs. 2 and 3 the substation circuits and the message register circuits in the case of the line L_3 are connected in a manner similar to that described in connection with the line L_1, while in the case of the line L_4 they are connected in a manner similar to that described in connection with the line L_2.

The line finding switch 12, shown at the left of Fig. 3, may be of any suitable character and as it forms no part of the present invention it is only diagrammatically indicated in the drawing. If desired, the line finding apparatus may be of the general character disclosed in patent to Lundell Number 1,166,466, issued January 4, 1916. The selector switches 13, 14 and 15 as well as the connector switch 16 diagrammatically shown at the right of Fig. 3 may be operated in any well-known manner and

the switches may be of a character similar to that shown in patent to Craft et al Number 1,123,696, issued January 5, 1915. The sequence switch 100 of which the contacts and operating means are diagrammatically illustrated in Fig. 3 may be of the type shown in patent to Reynolds et al Number 1,127,808, issued February 9, 1915, while the power means or driving device of the rotary switching apparatus 17 may be of the same character as the driving means for the sequence switch of the said patent, and if desired sequence switch structures may be substituted for the switching devices shown in connection with the switch 17.

The circuit arrangements so far as they pertain to the message register operation may be of the character shown in patent to Lundell Number 1,243,314, issued October 16, 1917, although it will be understood that other arrangements for operating the registers in connection with full automatic systems may be provided if desired.

It is believed that the apparatus is of such a character as to be readily understood from a description of the operation of the toll devices under various circumstances, without further detailed description of the apparatus employed. Assuming now that a call originates at the substation S_3 of the line L_3 a circuit is completed for the line relay 18 and differential relay 19, similar to that already described in connection with the substation S_1 of Fig. 1. The line relay 18 is energized but the differential relay 19 is unaffected so that the message register M_3 is connected over the lower back contact of the relay 19 in parallel with the cut-off relay 20. In case the call had originated at the substation S'_3 the relay 19 would have been actuated in addition to the line relay 18 and the message register M'_3 would have been connected in parallel with the cut-off relay 20 instead of the message register M_3. The line relay 18 in either case upon being energized completes the finder controlling circuit over its upper front contact and causes the finder switch 12 to establish a connection from the trunk T to the line L_3 in a well-known manner. A circuit is thereby completed from battery over sequence switch contact 101, third wiper of the finder switch 12, sleeve contact of the line L_3 and thence in parallel through the winding of the cut-off relay 20 and the message register M_3 or M'_3 as the case may be to ground. The energization of the relay 20 opens the circuit of the line relay 18 and in case the differential relay 19 is energized completes a locking circuit for said relay similar to that already described in connection with the line L_1.

The call is now extended over the switches 13, 14, 15 and 16 to the desired line L_5 in a well understood manner and when the talking connection has been established the sequence switch 100 will be in position 13 and will remain in this position until the calling subscriber replaces his receiver on the switch hook. With the sequence switch in position 13, a circuit will be completed from battery, through the supervisory or cord relay 21, over sequence switch contact 102, through the switches and trunks to the called subscriber's line, over the lower side of said line, through the substation apparatus thereat, back over the upper side of said line, through the upper brushes of the switches and back to ground over sequence switch contact 103. Relay 21 will be energized and complete a circuit, for relay 22, which in attracting its right hand armature completes a holding circuit for itself through the sequence switch contact 104. The attraction of the inner right hand armature of relay 22 connects sequence switch contact 105 to ground.

A circuit is also provided for the supervisory relay 23 of the calling subscriber from battery, through the winding of said relay, over sequence switch contact 106, over the ring contact of the line L_3 at the switch 12, over the ring conductor of the line L_3, through the substation apparatus and back over the tip conductor of the line L_3 and tip contacts of the switch 12, over sequence switch contact 107 to ground. A circuit is completed by the relay 23 over its front contact for the relay 24, which remains energized during the conversation.

Upon the termination of the conversation when the calling subscriber places his receiver on the hook the supervisory relay 23 will be deenergized opening the circuit for the relay 24, which in retracting its armature completes a circuit from battery, through the motor magnet of sequence switch 100, sequence contact 108 and back contact and armature of relay 24 to ground. The sequence switch motor magnet is energized and moves the sequence switch into position 14.

The supervisory relay 21 is now deenergized, either from the called subscriber having hung up, or from the opening of the sequence switch contacts 102 and 103 in position 14. Deenergization of the relay 21 is without effect, however, as relay 22 remains locked up. In position 14 of the sequence switch 100 a circuit is completed from ground, over the inner front contact of relay 22, over the upper sequence switch contact 105, right hand back contact of relay 25 and through the motor magnet of the rotary switch 17 to battery. The switch 17 now proceeds to rotate over the contacts corresponding to the various trunks such as T until its wipers rest upon the contacts corresponding to the trunk T, whereupon a circuit is completed from battery, through the

relay 25, wiper 26, contact 27, resistance 28, lower sequence switch contact 105, over the inner front contact of relay 22 to ground.

Relay 25 is energized over the circuit just described and at its right hand contact opens the circuit of the motor magnet of the switch 17 which comes to rest. Relay 25 at its left hand front contact completes a circuit for the relay 29, which at its left hand front contact completes a message recording circuit from high potential battery B', through the winding of marginal relay 30, through the high resistance winding of relay 31, left hand front contact of relay 29, wiper 32 of switch 17, contact 33, upper sequence switch contact 101, over the sleeve contacts of the line L_3 at switch 12, and thence in parallel through the winding of the cut-off relay 20 and the message register M_3 or M'_3 as the case may be. Relay 31 is energized over the circuit above traced and by completing the circuit of its left hand low resistance winding reduces resistance in the circuit to such an extent that the marginal winding of the message register M_3 or M'_3 is energized to record the message. The message register by short circuiting its high resistance winding further increases the current flow over this circuit so that the marginal relay 30 is energized, thereby completing a circuit over its left hand front contact from ground, over the wiper 34 and contact 35 of switch 17, over sequence switch contact 109 and through the winding of the down drive magnet 36 of the switch 13 to battery. This circuit will cause the release of the selector switch 13 and its return to normal in a manner such as discussed in patent to Reynolds Number 1,103,623, issued July 14, 1914.

As the selector switch approaches its normal position the commutator brush 37 thereof engages the conducting segment 38, completing a circuit from ground over the sequence switch contact 110 and through the motor magnet of sequence switch 100 to battery and ground; thus moving the sequence switch to position 15. In position 15 a circuit is completed from battery, through the motor magnet 39 of finder switch 12, over sequence switch 108 and back contact of relay 24 to ground, thus causing the line finder to return to its normal position. As the line finder approaches its normal position the commutator brush 40 thereof engages the conducting segment 41, completing a circuit from ground, over sequence switch 110, through the motor magnet of the sequence switch 100 to battery and ground, thus moving the sequence switch out of position 15 and to its normal or subnormal position as desired. As soon as the sequence switch 100 passes out of position 15 the locking circuit of relay 22 is opened restoring said relay to normal. The sequence switch in passing out of position 14 also opens the circuit previously traced for the stopping relay 25 of the switch 17 which is now restored to normal so that the switch 17 may be associated with another trunk, the connection over which is being released.

In the case of the line L_4 the circuits of the line relay 42, differential relay 43, cut-off relay 44, and message registers M_4 and M'_4 are modified in the same manner as described in connection with the similar apparatus of the line L_2 of Fig. 1, so that the message registers are connected in series with the cut-off relay 44 instead of in parallel therewith. The operation in connection with these circuits is similar to that already described and need not be further discussed.

It will be seen that by means of this invention a simple and efficient circuit arrangement is provided whereby a message register corresponding to any substation on a party line may be selected for operation so that calls originating on the line will be recorded against the party originating them. It will also be obvious the general principles herein discussed may be embodied in many other organizations widely different from those illustrated, without departing from the spirit of the invention, as defined in the following claims.

What is claimed is:

1. In a telephone system, a line, a plurality of substations on said line, a relay nonresponsive to currents flowing serially over the line conductors but responsive to currents flowing over the line conductors in parallel, a plurality of meters for the line one corresponding to each substation, and means controllable solely by said relay for selectively rendering any one of said meters exclusively operable, and switching means to disconnect said relay from the line.

2. In a telephone system, a line, a plurality of substations on said line, a differential relay associated with said line, a cut-off relay associated with said line, means controlled by the cut-off relay for disconnecting said differential relay from the line, a plurality of meters for the line one corresponding to each substation, and means controllable by said differential relay for selectably connecting one of said meters in circuit with said cut-off relay.

3. In a telephone system, a line, a plurality of substations on said line, a differential relay associated with said line, a cut-off relay associated with said line, a plurality of meters for the line one corresponding to each substation, and means controllable by said differential relay for selectably connecting one of said meters in circuit with said cut-off relay.

4. In a telephone system, a line, a plurality of substations on said line, a differential relay associated with said line, a cut-off relay associated with said line, means con-

trolled by said cut-off relay for disconnecting said differential relay from the line, means controllable from certain of said substations for maintaining an energizing circuit for said differential relay until it is disconnected from said line, means controllable by said cut-off relay for maintaining a locking circuit for said differential relay when it is disconnected from the line, a plurality of meters for the line one corresponding to each substation, and means controllable by said differential relay for selecting any one of said meters for operation.

5. In a telephone system, a line, a plurality of substations on said line, a differential relay associated with said line, a cut-off relay associated with said line, means controlled by said cut-off relay for disconnecting said differential relay from the line, means controllable from certain of said substations for maintaining an energizing circuit for said differential relay until it is disconnected from said line, a plurality of meters for the line one corrsponding to each substation, and means controllable by said differential relay for selectively rendering any one of said meters exclusively operable.

6. In a telephone system, a line, a plurality of substations on said line, a differential relay associated with said line, means to disconnect said differential relay from the line, means controllable from certain of said substations for maintaining an energizing circuit for said differential relay until it is disconnected from said line, a plurality of meters for the line one corresponding to each substation, and means controllable by said differential relay for selectively rendering any one of said meters exclusively operable.

7. In a telephone system, a line, a plurality of substations on said line, a cut-off relay, a plurality of meters for the line one corresponding to each substation, and means controllable from any one of said substations for selectively connecting the corresponding meter in series with said cut-off relay.

8. In a telephone system, a line, a plurality of substations on said line, a differential relay associated with said line, a plurality of meters one corresponding to each substation, means controlled by said differential relay for selectively rendering any meter exclusively operable and connecting it to a meter circuit over which a current flows insufficient to operate said meter, switching means to disconnect said relay from the line, and means to cause an increase in the current flow over said circuit sufficient to operate said meter.

9. In a telephone system, a line, a plurality of substations on said line, a plurality of meters for the line one corresponding to each substation, automatic switching means for extending a connection from said line, means controllable from said substations for selecting the corresponding meter and connecting it to a circuit completed over the sleeve circuit by said switching means, and automatic means to operate the selected meter by increasing the current flow over said circuit.

In testimony whereof, I have signed my name to this specification this eighteenth day of December, 1918.

LEO H. DARROW.