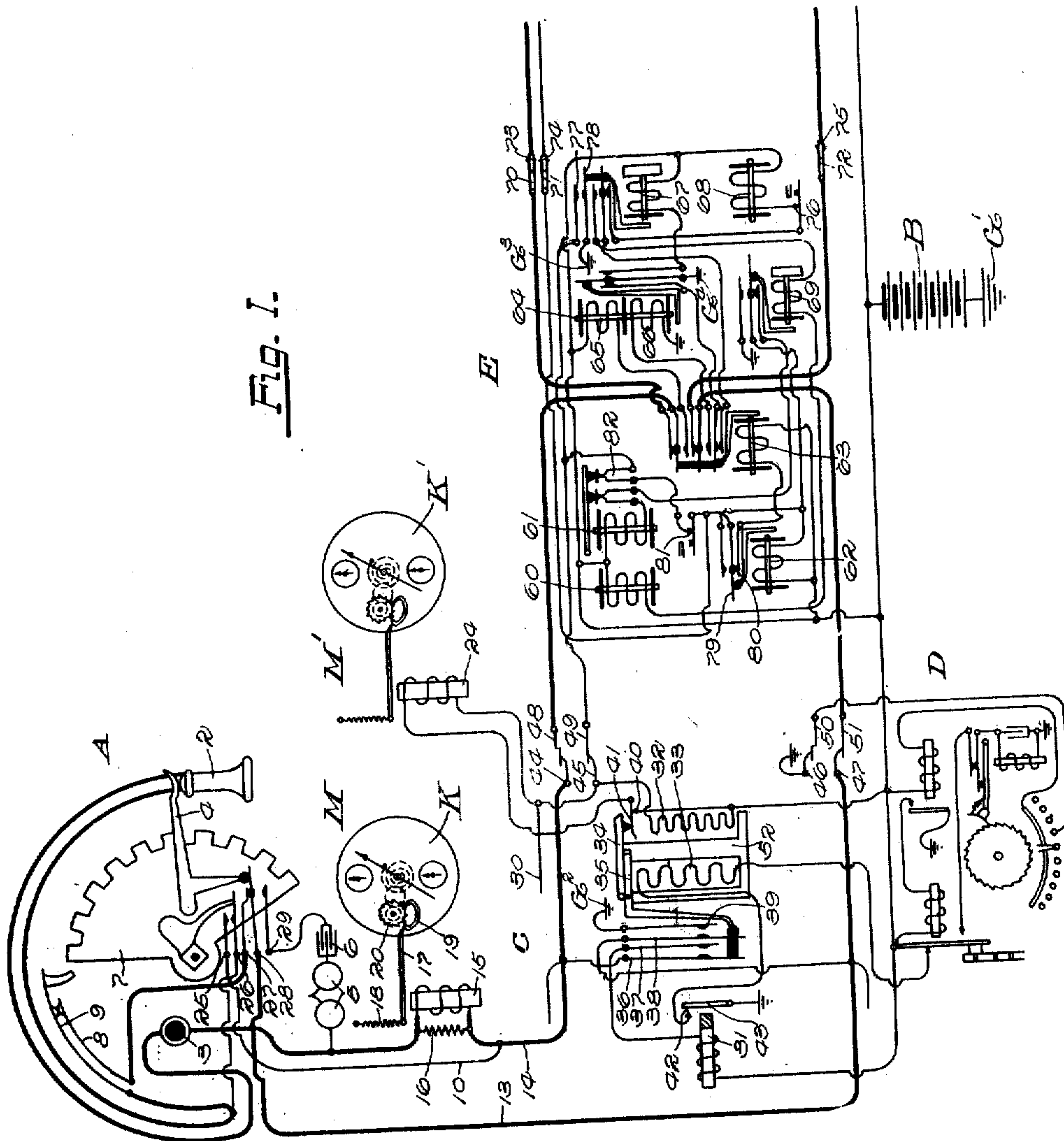


G. A. YANOCHOWSKI.
TELEPHONE METER SERVICE SYSTEM.
APPLICATION FILED SEPT. 2, 1915.

Patented Apr. 16, 1918.
2 SHEETS—SHEET 1.

1,263,013.



Witnesses
Chas. M. Candy.
in Hamilton

Inventor
George A. Yanochowski
By Charles E. Balk
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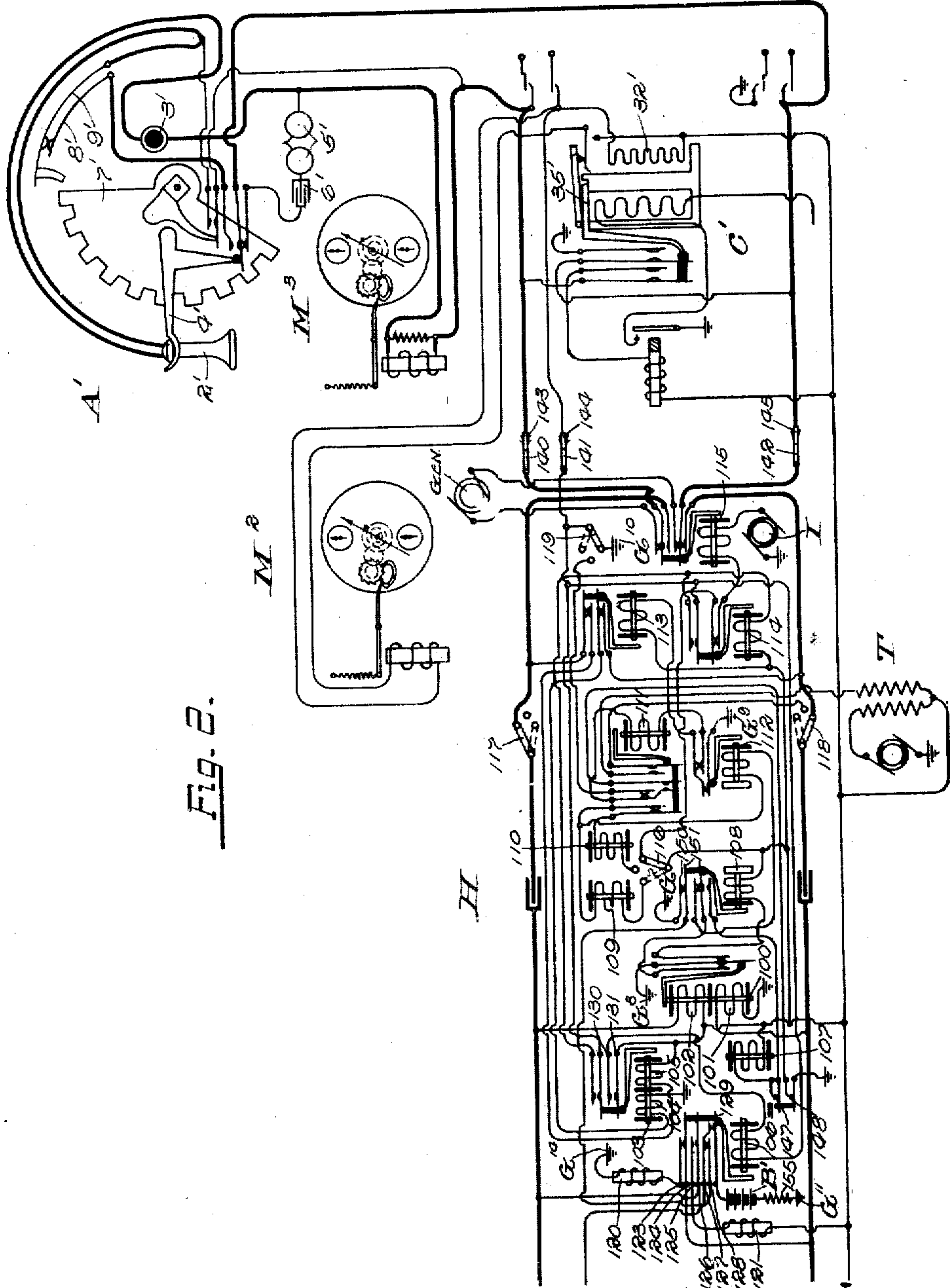


Fig. 2.

Witnesses
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UNITED STATES PATENT OFFICE.

GEORGE A. YANOWSKI, OF CHICAGO, ILLINOIS, ASSIGNOR TO AUTOMATIC ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

TELEPHONE METER-SERVICE SYSTEM.

1,263,013.

Specification of Letters Patent.

Patented Apr. 16, 1918.

Application filed September 2, 1915. Serial No. 48,613.

To all whom it may concern:

Be it known that I, GEORGE A. YANOWSKI, a citizen of the United States of America, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Telephone Meter-Service Systems, of which the following is a specification.

My invention relates to registers for telephone systems, and more particularly to a type of register which may be used in connection with an automatic telephone system for recording the actual length of time during which a line is in use for conversation.

Registers of the above character may be located either at the subscriber's substation or at the exchange. The preferable mode of construction provides a spring operated register which is normally locked. When the called subscriber answers, the register associated with the calling line is unlocked and continues to run during the conversation, after which it is again locked and remains inoperative until another call is made.

The object of my invention is the provision of improved means for controlling registers of the above general character. In carrying out my invention, I employ in connection with each register a marginal unlocking relay normally inoperative but which may be rendered active by an increased flow of current brought about when the called subscriber answers.

A further object of my invention is the modification of automatic apparatus in such a manner that an increased current can be sent at the proper time through the above-mentioned controlling relay.

To accomplish the foregoing and other useful ends my invention comprises means which will be hereinafter fully explained, reference being had to the accompanying drawings.

In the drawings, Figures 1 and 2, taken in order with the lines at the ends thereof in alignment, represent a complete circuit connection between a calling substation A and a called substation A' in a system embodying the principles of my invention. The said connection has been established through the medium of the individual line switch C, the selector switch E, and the connector switch H.

The substation A (Fig. 1) may be of the

general type of substation shown in British patent to T. G. Martin, #1419 of 1910. As herein represented it consists of the receiver 2, transmitter 3, receiver hook 4, ringer 5, and condenser 6. Being an automatic substation it is also provided with a pair of impulse springs 8 and 9 controlled by the impulse wheel 7 through the medium of a finger hole dial (not shown).

The line conductors 13 and 14 of the substation A are connected at the exchange to the individual line switch C which is of the general type disclosed in British patent to R. W. James, #26,301 of 1906; being, however, of the particular type shown in United States Letters Patent #13901, reissued Apr. 13, 1915, to Frank Newforth, Jr. The line switch comprises among other details a plunger (not shown) attached to the end of a so called plunger arm 34. The plunger arm 34 and the cut off armature 35 are controlled by the magnet 52 which has two windings; one of which, the pull in winding 33, operates both the plunger arm and the armature 35; while the other, the holding winding 32, is only strong enough to operate the cut off armature and to hold the plunger arm in an operated position after it has been operated by the pull in winding. When the plunger arm is operated, the plunger is forced into a bank of contact springs, forcing the springs 44, 45, 46, and 47 into engagement with contacts 48, 49, 50, and 51, respectively. Although only one set of springs and contacts (44 to 51, inclusive) is shown, it is understood that each line switch is provided with a plurality of such sets, each set forming the terminal of a trunk line leading to a selector switch. Each trunk line is connected in multiple with the corresponding springs of all the line switches of the group which is controlled by the master switch D. The line switch C is controlled by the subscriber through the medium of the line relay 31.

The master switch D is of the general type disclosed in British patent to R. W. James, #26,301 of 1906; being, however, more nearly of the particular type disclosed in British patent to T. G. Martin #1,419 of 1910. The function of the master switch, as is well known, is to maintain the plungers of all the idle line switches in position before the terminal of an idle trunk line.

Accessible to the line switch C is shown a

selector switch E, which is the general type of selector switch disclosed in United States Letters Patent #815,321, granted March 13, 1906, to Keith, Erickson, and Erickson; except that the so called side switch is omitted, and the circuits are modified to enable the switch to operate in a system in which the central office apparatus is controlled by impulses delivered over the two sides of the line in series, as shown in British patent to T. G. Martin #10,376 of 1912. Among other details the selector E comprises a bank of contacts arranged in horizontal rows or levels, which contacts are adapted to be engaged by a set of wipers 70, 71, and 72 carried upon a shaft (not shown) which has a vertical movement controlled by the vertical magnet 60, and a rotary movement controlled by the rotary magnet 61. The operation of the various parts of the switch is controlled through the medium of the double wound line relay 64. Means for permitting the switch to be restored to normal position is provided in the release magnet 68, which, upon energizing, withdraws the retaining pawls from the shaft. The contact 76 is closed only when the shaft has been raised one or more steps from its lowest position. The relays 67 and 69 are slow-acting, that is, they retain their armatures for an instant after their energizing circuits are broken.

The selector switch E has access to a number of connector switches, one of which is shown at H (Fig. 2). This connector switch is of the general type of connector switch disclosed in United States Letters Patent #815,176, granted March 13, 1906, to Keith, Erickson, and Erickson; the circuits being modified, however, to enable the switch to operate in a system in which the central office apparatus is controlled by impulses delivered over the two sides of the line in series. Among other details the connector H comprises a bank of contacts arranged in horizontal rows or levels, which contacts are adapted to be engaged by a set of wipers 140, 141, and 142 carried upon a shaft (not shown) which has a vertical movement controlled by the vertical magnet 109, and a rotary movement controlled by the rotary magnet 110. The usual side switch comprising the wipers 116, 117, 118, and 119 is controlled by the private magnet 113 in the well-known manner. The operation of the various parts of the switch is controlled through the medium of the double wound line relay 100, which also serves to supply talking current to the calling line. The called line is provided with talking current by means of the double wound answering bridge relay 103. The ringing relay 115 affords means for projecting ringing current over the called line to signal the called subscriber. Means for permitting the switch

to be restored to normal position is provided in the release magnet 107 which, upon energizing, withdraws the retaining pawls from the shaft. The contacts 147 and 148 close only when the shaft has been raised one or more steps from its normal position. The relay 106, controlled by the answering bridge relay 103, is peculiar to my invention and its function is to provide the increased current flow for the operation of the calling subscriber's register. The relays 108 and 112 are slow-acting, that is, they retain their armatures for an instant after their energizing circuits are broken.

The individual line switch C' is similar to line switch C and is controlled along with a number of other line switches by a master switch similar to the master switch D.

The substation shown at A' is in all respects similar to the substation A.

For supplying operating and talking current I have shown at B a battery having the positive terminal grounded. For supplying an increased current to certain circuits I have shown at B' a booster battery having its negative terminal grounded. I have shown a generator GEN for supplying ringing current and an interrupter I for intermittently operating the ringing relay. At T I have shown a busy-signaling machine.

At M I have shown a time registering mechanism which is associated with, and is located near the substation A. At M' I have shown a similar time register associated with the substation A, but which is located at the central exchange. M¹ and M² represent similar time registers which are associated with the substation A' and which are located at the substation and at the central exchange, respectively. In actual practice it is improbable that more than one time register would be supplied for each substation; but since the location of the time register may depend upon circumstances, and since the method of control is somewhat different in the different locations, I have preferred to show two time registers herein associated with each substation in order to more clearly show the adaptability of my invention to various conditions.

Referring now to the time registering mechanism shown at M (Fig. 1), the time piece K is shown only diagrammatically, as it may be of any suitable construction, such for instance, as an ordinary spring driven clock movement. It should, however, be capable of registering the maximum total time for which the telephone is apt to be used during a somewhat extended period, say, for instance, a month. The time piece K is controlled by the magnet 15, in series with line conductor 14, through the medium of its armature 17, which is normally held by the spring 18, in engagement with the escapement 19 to prevent it operating. The

magnet 15 is shunted by the non-inductive winding 16 in order to provide a better path for talking currents.

Referring now to the time registering mechanism M', the time piece K' and all other parts except the magnet 24 are similar to the corresponding parts of the register M. The magnet 24 has one terminal joined to a terminal of the holding winding 32 of the line switch C at spring 45, and the other terminal is connected to the spring 41, whereby, upon the operation of line switch C, it is connected to the ungrounded terminal of battery B.

The time registers M³ and M² are connected similarly to the time registers M and M', respectively.

Having given a general description of the apparatus, I will now describe the operation of a system embodying the principles of my invention. There will first be explained the method by which a calling substation A may establish a connection with the substation A'; after which there will be made clear the method by which the time registers M and M', associated with the calling substation A, are controlled. Inasmuch, as the automatic apparatus shown herein is well known in the art, having been fully described in the publications above referred to, its operation will be described in a general way, the details being given only where they have to do with the operation of my invention.

Referring now to Fig. 1, the subscriber at substation A, upon removing his receiver to initiate a call, completes an energizing circuit for the line relay 31 of the line switch C over the following path: ground at G², contact springs 39 and 38, line conductor 13, contact springs 28 and 27 of substation A, impulse springs 8 and 9, receiver 2, transmitter 3, winding of magnet 15 and non-inductive resistance 16 in parallel, line conductor 14, contact springs 36 and 37, and winding of line relay 31 to battery B. The line relay is energized over the above circuit and, upon attracting its armature, completes a circuit for the pull in winding 33. The pull in winding, upon energizing, attracts the plunger arm 34 and the cut off armature 35; the former, by means of its plunger, forcing the springs 44—47 inclusive into engagement, respectively, with contacts 48—51, inclusive; and the latter disconnecting the line conductors 13 and 14 from ground and battery, respectively, by separating contact springs 38 and 39, and 36 and 37.

By the engagement of springs 44 and 47 with contacts 48 and 51, respectively, the line conductors 13 and 14 are extended to the double wound line relay 64 of the selector E. The line relay is thereupon energized over the previously traced circuit through sub-

station A and completes a circuit from ground at G⁴ to the slow-acting relay 67. Relay 67, upon energizing, completes a holding circuit extending back to the line switch C over the following path: ground at G³, contact springs 78 and 77, contact 49, spring 45, holding winding 32 to battery B. Although the circuit of the line relay 31 has already been broken, it retains its armature long enough to allow the above holding circuit to be established. A branch of the holding circuit may now be traced from spring 45, through magnet 24 of time register M', and by way of spring 41 and contact 40 (closed with the plunger arm 34 in an operated position) to battery B. However, the current flow in magnet 24 is insufficient to operatively energize it at this time. A second branch of the holding circuit extends over wire 30 to multiple test contacts in the banks of connectors having access to the line of substation A where, by a ground potential on these test contacts, the said line is made busy.

The foregoing operations have all occurred in response to the removal of the receiver from the hook. The subscriber at substation A may now operate his dial in accordance with the first digit of the desired number, thereby breaking the continuity of his loop a number of times, and at the same time short circuiting the receiver, transmitter, and magnet 15 by means of contact springs 25 and 26 and conductor 10. As a result of these interruptions the line relay 64 is deenergized a corresponding number of times, sending an impulse at each deenergization from ground at G⁴ to the slow-acting relay 69 and the vertical magnet 60 in series. The vertical magnet, in response to these impulses, steps up the shaft until the wipers stand opposite the horizontal level in which are located contacts which are terminals of the desired group of connectors. The relay 69, being slow-acting, retains its armature during the series of impulses and closes a circuit for the test relay 62, which relay locks itself to ground at G³. At the end of the series of impulses the relay 69 deenergizes, thereby closing a circuit for the rotary magnet 61, whereupon the wipers 70, 71, and 72 start rotating in search of a trunk extending to an idle connector. As is well known, the rotary magnet interrupts its own circuit and also the locking circuit of the test relay at every energization, the contacts in the latter circuit, however, being short circuited by the test wiper 71 while passing over busy or grounded test contacts. As soon, therefore, as the test wiper reaches an ungrounded test contact the test relay 62 falls back and opens the rotary magnet circuit, thereby bringing the wipers to rest upon the contacts of an idle connector H. The relay 62, upon deenergizing, completes

a circuit for the line switching relay 63, which latter, upon energizing, disconnects the line conductors 13 and 14 from the line relay 64 and extends them, by way of wipers 5 70 and 72 and bank contacts 73 and 75, to the line relay 100 of the connector H.

The line relay 100 thereupon energizes over the previously traced circuit through substation A and completes a circuit from 10 ground at G^8 to the slow-acting relay 108. Relay 108, upon energizing, completes a new holding circuit as follows: ground at G^7 , contact springs 150 and 151, contact springs 128 and 127, bank contact 74, wiper 71, to 15 contact spring 79, where the circuit divides, one branch extending, by way of contact spring 80 and winding of line switching relay 63, to battery B, and the other branch extending, by way of off normal contacts 81 20 and rotary armature contacts 82, to contact spring 77, where it joins the previously described holding circuit and provides a holding ground for the line switch C after the relays 64 and 67 have deenergized.

25 The subscriber at substation A may now operate his dial in accordance with the second digit of the desired number, resulting in this case in deenergizations of the line relay 100 of the connector H. At each deenergization 30 the line relay sends an impulse from ground at G^8 to the vertical magnet 109 in series with relay 112, side switch wiper 116 being in its first position. The vertical magnet, in response to these impulses, steps up the shaft 35 until the wipers 140, 141, and 142 stand opposite the horizontal level of contacts in which are located the contacts individual to substation A'. The relay 112, being slow-acting, retains its armature during the series 40 of impulses and maintains a circuit from ground at G^9 to the private magnet 113. At the end of the series of impulses the relay 112 and the private magnet 113 deenergize, the latter controlling the side switch 45 wipers in the usual manner to advance them to their second position.

The subscriber at substation A may now operate his dial in accordance with the third and final digit of the desired number, resulting as before in deenergizations of the 50 line relay 100. In this case, however, side switch wiper 116 being in its second position, the line relay sends impulses to the rotary magnet 110 in series with relay 112, 55 whereby the wipers 140, 141, and 142 are rotated until they rest upon contacts 143, 144, and 145, respectively, these contacts being individual to substation A'. The relay 112 and the private magnet 113 are operated as before, whereby the side switch 60 wipers are advanced to their third position.

As side switch wiper 119 comes into its third position a circuit is completed from 65 ground at G^{10} , by way of wiper 141 and bank contact 144, to the holding winding

32' of line switch C', thereby attracting the cut off armature 35' and disconnecting the lines of substation A' from ground and battery B. Ground at G^{10} is also extended to multiple contacts similar to contact 144 in 70 other connectors of the group thereby making the line of substation A' busy to other calls. By the engagement of side switch wipers 117 and 118 with their third position contacts, the line conductors 14 and 13 are 75 extended to the wipers 140 and 142, respectively, thereby completing the connection between the two substations. By the engagement of side switch wiper 116 with its third position contact, a circuit is completed 80 for the ringing relay 115 in series with the interrupter I, whereby ringing current is projected intermittently out over the line of substation A' to signal the called subscriber.

The subscriber at substation A has now 85 established the required connection with substation A' and the bell there is being rung to attract the attention of the subscriber. It remains to be seen how the time registering mechanisms M and M' are set 90 in operation by the response of the subscriber at substation A'; and how, at the termination of the conversation, the operation of these mechanisms is stopped.

It has been explained how the magnet 24 95 of register M' has one terminal connected to battery B and the other connected to the holding circuit, which has been grounded first at G^8 and later at G^7 , the current flow being insufficient, however, to operatively energize magnet 24. It is clear also 100 that the magnet 15 of register M, being in series with line conductor 14, has taken current successively in series with line relays 31, 64, and 100. These line relays are all 105 wound to a high enough resistance, however, to reduce the current flow to a point where the magnet 15 will not be operatively energized.

Now when the subscriber at substation 110 A' removes his receiver from the hook a circuit is completed for the double wound answering bridge relay 103, which relay serves to supply talking battery to substation A'. Relay 103, upon energizing, com- 115 pletes a circuit for the ring cut-off relay 114 which locks up and breaks the circuit of the ringing relay 115, thereby stopping the intermittent ringing. As a further result of the energization of relay 103, a circuit 120 is closed for the relay 106 which circuit may be traced as follows: ground at G^{10} , side switch wiper 119 in third position, winding of relay 106, and contact springs 130 and 131 to battery B. 125

Relay 106, upon energizing, brings about circuit changes which result in the operation of magnets 15 and 24 of the registers M and M'.

We will consider first the circuit change 130

caused by the shifting of the contact spring 127 from contact spring 128 to contact spring 129. This results in inserting the booster battery B' in the holding circuit in such a manner that its voltage is added to that of battery B, the complete circuit for magnet 24 now being as follows: ground at G¹¹, resistance 155, negative pole of battery B', positive pole of battery B', contact springs 129 and 127, bank contact 74, wiper 71, off normal contact 81, contacts 82, contact 49, spring 45, winding of magnet 24, contact spring 41, contact 40, negative pole of battery B, positive pole of battery B, ground at G', to ground at G¹¹ the starting point. The increased current flow due to the increased voltage enables magnet 24 to attract its armature, whereupon the escapement is freed and the time piece K' begins running.

The circuit effecting the operation of magnet 15 of register M is brought about by the engagement of contact springs 124 and 126 with contact springs 123 and 125, respectively. By this operation the retardation coil 120 is connected in parallel with winding 101 of line relay 100, and retardation coil 121 is connected in parallel with winding 102 of line relay 100. Since the combined resistance of the parallel circuits above-mentioned is considerably less than the resistance of the windings of line relay 100 alone, an increased current will flow in the winding of magnet 15. Magnet 15 thereupon attracts its armature and frees the escapement of the timepiece K, which also starts running.

The registers will continue to operate as long as both receivers remain off. Should the called subscriber hang up, the circuit of the answering bridge relay is broken and it deenergizes, thereby breaking the circuit of relay 106. Relay 106, upon deenergizing, breaks the circuits for causing an increased current flow in magnets 15 and 24, whereupon these magnets retract their armatures which again engage the escapements of their respective time pieces and make them inoperative. Should the calling subscriber hang up first, the circuit of the line relay 100 and the magnet 15 are broken at the same time. As a result the time register M is stopped at once by the deenergization of magnet 15. The deenergization of line relay 100 results in the restoration of the automatic apparatus to normal in the well-known manner. As side switch wiper 119 leaves its third position the circuit of relay 106 is broken and said relay deenergizes, whereupon magnet 24 retracts its armature and the time register M' is stopped.

In calling a busy line it is well known that the side switch wipers of a connector of the type shown are locked in their second position to prevent connection with the

called line and to facilitate the application of the busy tone to the calling line. It follows then that the answering bridge relay 103 and the relay 106 cannot be energized and the time registers will not be started.

It has been mentioned before that in all probability but one time register would need to be employed in connection with each substation. In case it is desired to locate the time registers at their respective substations as the time register M is located, the contact springs 127, 128 and 129 of the relay 106 may be omitted on all the connectors, and also the battery B' may be omitted. In case circumstances make it more convenient to install the time registers at the exchange, the contact springs 123, 124, 125, and 126, and the retardation coils 120 and 121 may be omitted on all the connectors, and the line relays of the various switches may be made of the normal resistance.

It will be seen from the foregoing that I have provided a very simple and efficient method of controlling time registers individual to subscribers' lines, whereby each of such time registers is enabled to compute the total elapsed time of a large number of separate conversations. While I have described in the foregoing certain specific embodiments of my invention, I do not wish to be held strictly to the forms shown herein, for various modifications will no doubt suggest themselves to those skilled in the art. I desire, therefore, to include all forms and modifications of my invention which may come within the scope of the appended claims.

What I claim as my invention is:

1. In combination, a line, a time registering mechanism associated with said line, a second line, means for connecting said lines, controlling means for said register in said first line, a source of current for said lines, means for changing the current strength in said first line to operate said controlling means, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

2. In combination, a line, a second line, a source of current for said lines, means for connecting said lines, a time registering mechanism having a controlling relay in said first line, said controlling relay irresponsive to normal current in said line, means for increasing the current strength in said first line to operate said controlling relay, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism

nism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

5 3. In combination, a line, a time registering mechanism having a controlling relay in series with said line, a second line, means for connecting said lines, a source of current for said lines, means controlled over
10 said second line for changing the current strength in said first line to operate said controlling relay, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the
15 talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

20 4. In combination, a line, a time registering mechanism associated with said line, a second line, means for connecting said lines, controlling means for said register in said first line, a source of current for said lines,
25 means controlled over said second line for changing the current strength in said first line to operate said controlling means, automatic release means for said connecting means, a circuit for said release means, said
30 circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

35 5. In combination, a line, a second line, a source of current for said lines, means for connecting said lines, a time registering mechanism having a controlling relay in said first line, said controlling relay irre-
40 sponsive to normal current in said line, means controlled over said second line for increasing the current strength in said first line to operate said controlling relay, automatic release means for said connecting
45 means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and con-
50 trolled by said current changing means.

6. In combination, a line, a normally locked time registering mechanism associated with said line, controlling means in
55 said line for said register, a second line, means for connecting said lines, a source of current for said lines, means for changing the current strength in said first line, where-
60 by said controlling means is operated to unlock said register, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over

the release circuit and controlled by said 65 current changing means.

7. In combination, a line, a normally locked time registering mechanism associated with said line, controlling means in
70 said line for said register, a second line, means for connecting said lines, a source of current for said lines, means for changing the current strength in said first line, where-
75 by said controlling means is operated to unlock said register, means for relocking said register upon the release of said controlling means, automatic release means for
80 said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the
85 release circuit and controlled by said current changing means.

8. In combination, a line, a time registering mechanism associated with said line, a
90 second line, an automatic switch accessible to said first line for extending a connection to said second line, controlling means for said register in said first line, a source of current for said lines, means for changing the current strength in said first line
95 to operate said controlling means, automatic release means for said switch, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said
100 other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

9. In combination, a line, a second line, a source of current for said lines, an automatic switch accessible to said first line for
105 extending a connection to said second line, a time registering mechanism having a controlling relay in said first line, said controlling relay irresponsive to normal current in said line, means for increasing the current strength in said first line to operate
110 said controlling relay, automatic release means for said switch, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the
115 release circuit and controlled by said current changing means.

10. In combination, a line, a time registering mechanism having a controlling relay in series with said line, a second line,
120 an automatic switch accessible to said first line for extending a connection to said second line, a source of current for said lines, means controlled over said second line for changing the current strength in said first
125 line to operate said controlling relay, automatic release means for said switch, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

arate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

11. In combination, a line, a time registering mechanism associated with said line, a second line, an automatic switch accessible to said first line for extending a connection to said second line, controlling means for said register in said first line, a source of current for said lines, means controlled over said second line for changing the current strength in said first line to operate said controlling means, automatic release means for said switch, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

12. In combination, a line, a second line, a source of current for said lines, an automatic switch accessible to said first line for extending a connection to said second line, a time registering mechanism having a controlling relay in said first line, said controlling relay irresponsive to normal current in said line, means controlled over said second line for increasing the current strength in said first line to operate said controlling relay, automatic release means for said switch, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

13. In combination, a line, a normally locked time registering mechanism associated with said line, controlling means in said line for said register, a second line, an automatic switch accessible to said first line for extending a connection to said second line, a source of current for said lines, means for changing the current strength in said first line, whereby said controlling means is operated to unlock said register, automatic release means for said switch, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

14. In combination, a line, a normally locked time registering mechanism associated with said line, controlling means in said line for said register, a second line, an automatic switch accessible to said first line for extending a connection to said second line, a source of current for said lines, means for changing the current strength in said first

line, whereby said controlling means is operated to unlock said register, means for relocking said register upon the release of said controlling means, automatic release means for said switch, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

15. In combination, a line, a time registering mechanism associated with said line, a second line, means for connecting said lines, controlling means for said register in said first line, a source of current for said lines, a relay in said connecting means, means for changing the current strength in said first line to operate said controlling means, said changing means comprising a shunt for said relay, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

16. In combination, a line, a time registering mechanism associated with said line, a second line, means for connecting said lines, controlling means for said register in said first line, a source of current for said lines, a relay in said connecting means, means controlled over said second line for changing the current strength in said first line to operate said controlling means, said changing means comprising a shunt for said relay, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

17. In combination, a line, a normally locked time registering mechanism associated with said line, controlling means in said line for said register, a second line, means for connecting said lines, a source of current for said lines, a relay in said connecting means, means for changing the current strength in said first line, whereby said controlling means is operated to unlock said register, said changing means comprising a shunt for said relay, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

18. In combination, a line, a normally locked time registering mechanism associ-

ated with said line, controlling means in said line for said register, a second line, means for connecting said lines, a source of current for said lines, a relay in said connecting means, means for changing the current strength in said first line, whereby said controlling means is operated to unlock said register, means for relocking said register upon the release of said controlling means, 5 said changing means comprising a shunt for said relay, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, 10 a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

19. In combination, a line, a time registering mechanism associated with said line, a 20 second line, an automatic switch accessible to said first line for extending a connection to said second line, controlling means for said register in said first line, a source of current for said lines, a relay in said switch, 25 means for changing the current strength in said first line to operate said controlling means, said changing means comprising a shunt for said relay, automatic release means for said switch, a circuit for said release 30 means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

35 20. In combination, a line, a time registering mechanism associated with said line, a second line, an automatic switch accessible to said first line for extending a connection to said second line, controlling means for 40 said register in said first line, a source of current for said lines, a relay in said switch, means controlled over said second line for changing the current strength in said first line to operate said controlling 45 means, said changing means comprising a shunt for said relay, automatic release means for said switch, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, 50 a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

21. In combination, a line, a normally locked time registering mechanism associated with said line, controlling means in 55 said line for said register, a second line, an automatic switch accessible to said first line for extending a connection to said second line, a source of current for said lines, 60 a relay in said switch, means for changing the current strength in said first line, whereby said controlling means is operated to unlock said register, said changing means comprising a shunt for said relay, automatic re- 65 lease means for said switch, a circuit for said

release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current 70 changing means.

22. In combination, a line, a normally locked time registering mechanism associated with said line, controlling means in said line for said register, a second line, an automatic 75 switch accessible to said first line for extending a connection to said second line, a source of current for said lines, a relay in said switch, means for changing the current strength in said first line, whereby said con- 80 trolling means is operated to unlock said register, means for relocking said register upon the release of said controlling means, said changing means comprising a shunt for said relay, automatic release means for said 85 switch, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and con- 90 trolled by said current changing means.

23. In combination, a line, a time registering mechanism having a controlling re- lay in series with said line, a second line, means for connecting said lines, a source of 95 current for said lines, a second relay in said connecting means, means controlled over said second line for changing the current strength in said first line to operate said controlling relay, said changing means 100 comprising a shunt for said second relay, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, an- other time registering mechanism, a circuit 105 for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

24. In combination, a line, a time registering mechanism having a controlling re- 110 lay in series with said line, a second line, an automatic switch accessible to said first line for extending a connection to said second line, a source of current for said lines, a second relay in said switch, means con- 115 trolled over said second line for changing the current strength in said first line to operate said controlling relay, said changing means comprising a shunt for said second relay, automatic release means for said 120 switch, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and con- 125 trolled by said current changing means.

25. In combination, a line, a second line, a source of current for said lines, means for connecting said lines, a relay in said con- 130 necting means, a time registering mecha-

nism having a controlling relay in said first line, said controlling relay irresponsive to normal current in said line, means for increasing the current strength in said first line to operate said controlling relay, said increasing means comprising a shunt for said first relay, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

26. In combination, a line, a second line, a source of current for said lines, means for connecting said lines, a relay in said connecting means, a time registering mechanism having a controlling relay in said first line, said controlling relay irresponsive to normal current in said line, means controlled over said second line for increasing the current strength in said first line to operate said controlling relay, said increasing means comprising a shunt for said first relay, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

27. In combination, a line, a second line, a source of current for said lines, an automatic switch accessible to said first line for extending a connection to said second line, a relay in said switch, a time registering mechanism having a controlling relay in said first line, said controlling relay irresponsive to normal current in said line, means for increasing the current strength in said first line to operate said controlling relay, said increasing means comprising a shunt for said first relay, automatic release means for said switch, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

28. In combination, a line, a second line, a source of current for said lines, an automatic switch accessible to said first line for extending a connection to said second line, a relay in said switch, a time registering mechanism having a controlling relay in said first line, said controlling relay irresponsive to normal current in said line, means controlled over said line for increasing the current strength in said first line to operate said controlling relay, said increasing means comprising a shunt for said first relay, automatic release means for said switch, a circuit for said release means, said

circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

29. In combination, a line, a time registering mechanism associated with said line, a second line, means for connecting said lines, a circuit included in said connecting means which includes a controlling relay for said registering mechanism, a source of current for said lines and for said circuit, means for changing the current strength in said circuit to operate said controlling relay, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

30. In combination, a line, a time registering mechanism associated with said line, a second line, means for connecting said lines, a source of current for said lines, a circuit in said connecting means including a controlling relay for said mechanism, said controlling relay irresponsive to normal current in said circuit, means for changing the current strength in said circuit to operate said controlling relay, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

31. In combination, a line, a normally locked time registering mechanism associated with said line, a second line, means for connecting said lines, a circuit in said connecting means which includes a controlling relay for said registering mechanism, a source of current for said lines and for said circuit, means for changing the current strength in said circuit, whereby said controlling relay is operated to unlock said registering mechanism, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

32. In combination, a line, a normally locked time registering mechanism associated with said line, a second line, means for connecting said lines, a circuit in said connecting means which includes a controlling relay for said registering mechanism, a source of current for said lines, and for said circuit, means for changing the current strength in said circuit, whereby said controlling relay is operated to unlock said reg-

istering mechanism, means for relocking said registering mechanism upon the release of said controlling relay, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

33. In combination, a line, a time registering mechanism associated with said line, a second line, an automatic switch associated with said first line for extending a connection to said second line, a circuit associated with said switch which includes a controlling relay for said registering mechanism, a source of current for said lines and for said circuit, means for changing the current strength in said circuit to operate said controlling relay, automatic release means for said switch, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

34. In combination, a line, a time registering mechanism associated with said line, a second line, an automatic switch associated with said first line for extending a connection to said second line, a source of current for said lines, a circuit associated with said switch including a controlling relay for said register, said controlling relay irresponsive to normal current in said circuit, means for changing the current strength in said circuit to operate said controlling relay, automatic release means for said switch, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

35. In combination, a line, a normally locked time registering mechanism associated with said line, a second line, an automatic switch associated with said first line for extending a connection to said second line, a circuit associated with said switch which includes a controlling relay for said registering mechanism, a source of current for said lines and for said circuit, means for changing the current strength in said circuit, whereby said controlling relay is operated to unlock said registering mechanism, automatic release means for said switch, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

36. In combination, a line, a normally locked time registering mechanism associated with said line, a second line, an automatic switch associated with said first line for extending a connection to said second line, a circuit associated with said switch which includes a controlling relay for said registering mechanism, a source of current for said lines and for said circuit, means for changing the current strength in said circuit, whereby said controlling relay is operated to unlock said registering mechanism, means for relocking said registering mechanism upon the release of said controlling relay, automatic release means for said switch, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said current changing means.

37. In combination, a line, a time registering mechanism associated with said line, a second line, means for connecting said lines, controlling means for said register in said first line, a source of current for said lines, and a relay for changing the current strength in said first line to operate said controlling means, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said relay.

38. In combination, a line, a second line, a source of current for said lines, means for connecting said lines, a time registering mechanism having a controlling relay in said first line, said controlling relay irresponsive to normal current in said line, and a relay for increasing the current strength in said first line to operate said controlling relay, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said relay.

39. In combination, a line, a time registering mechanism having a controlling relay in series with said line, a second line, means for connecting said lines, a source of current for said lines, and a relay controlled over said second line for changing the current strength in said first line to operate said controlling relay, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said relay.

40. In combination, a line, a normally

locked time registering mechanism associated with said line, controlling means in said line for said register, a second line, means for connecting said lines, a source of current for said lines, and a relay for changing the current strength in said first line, whereby said controlling means is operated to unlock said register, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said relay.

41. In combination, a line, a time registering mechanism associated with said line, a second line, means for connecting said lines, a circuit included in said connecting means which includes a controlling relay for said registering mechanism, a source of current for said lines and for said circuit, and a relay for changing the current strength in said circuit to operate said controlling relay, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, said last circuit extending over the release circuit and controlled by said relay.

42. In combination, a line, a time registering mechanism associated with said line, a second line, means for connecting said lines, a source of current for said lines, a circuit in said connecting means including a controlling relay for said mechanism, said controlling relay irresponsive to normal current in said circuit, and a relay for changing the current strength in said circuit to operate said controlling relay, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said relay.

43. In combination, a line, a normally locked time registering mechanism associated with said line, a second line, means for connecting said lines, a circuit in said connecting means which includes a controlling relay for said registering mechanism, a source of current for said lines and for said circuit, and a relay for changing the current strength in said circuit, whereby said controlling relay is operated to unlock said registering mechanism, automatic release means for said connecting means, a circuit for said release means, said circuit separate from the talking circuit, another time

registering mechanism, a circuit for said other mechanism, said last circuit extending over the release circuit and controlled by said relay.

44. In combination, a line, a time registering mechanism for said line, an automatic switch individual to said line, another time registering mechanism for said switch, another automatic switch for completing a connection from said line to another line, a relay in said other switch and means responsive to the operation of said relay for operating said registering mechanisms.

45. In combination, a calling subscriber's line, a called subscriber's line, means for establishing a talking circuit between said lines, a time registering device individual to the calling subscriber's line, another time registering device associated with said subscriber for operating both of said mechanisms.

46. In combination, a line, a time registering mechanism for said line, an automatic switch individual to said line, another time registering mechanism for said switch, another automatic switch for completing a connection from said line to another line, a relay in said other switch, and means responsive to the operation of said relay for operating said registering mechanisms, by increasing the flow of current therethrough.

47. In combination, a calling subscriber's line, a called subscriber's line, means for establishing a talking circuit between said lines, a time registering device individual to the calling subscriber's line, another time registering device associated with said subscriber for operating both of said mechanisms one over the talking circuit and the other over a circuit independent of said talking circuit.

48. In combination, a calling subscriber's line, a called subscriber's line, means for establishing a talking circuit between said lines, a time registering device individual to the calling subscriber's line, another time registering device associated with said subscriber for operating both of said mechanisms, one by an increased flow of current over the talking circuit and the other by an increased flow of current over a circuit independent of the talking circuit.

Signed by me at Chicago, Cook county, Illinois, this 20th day of August, 1915.

GEORGE A. YANOCHOWSKI.

Witnesses:

CHAS. M. CANDY.
M. HAMILTON.