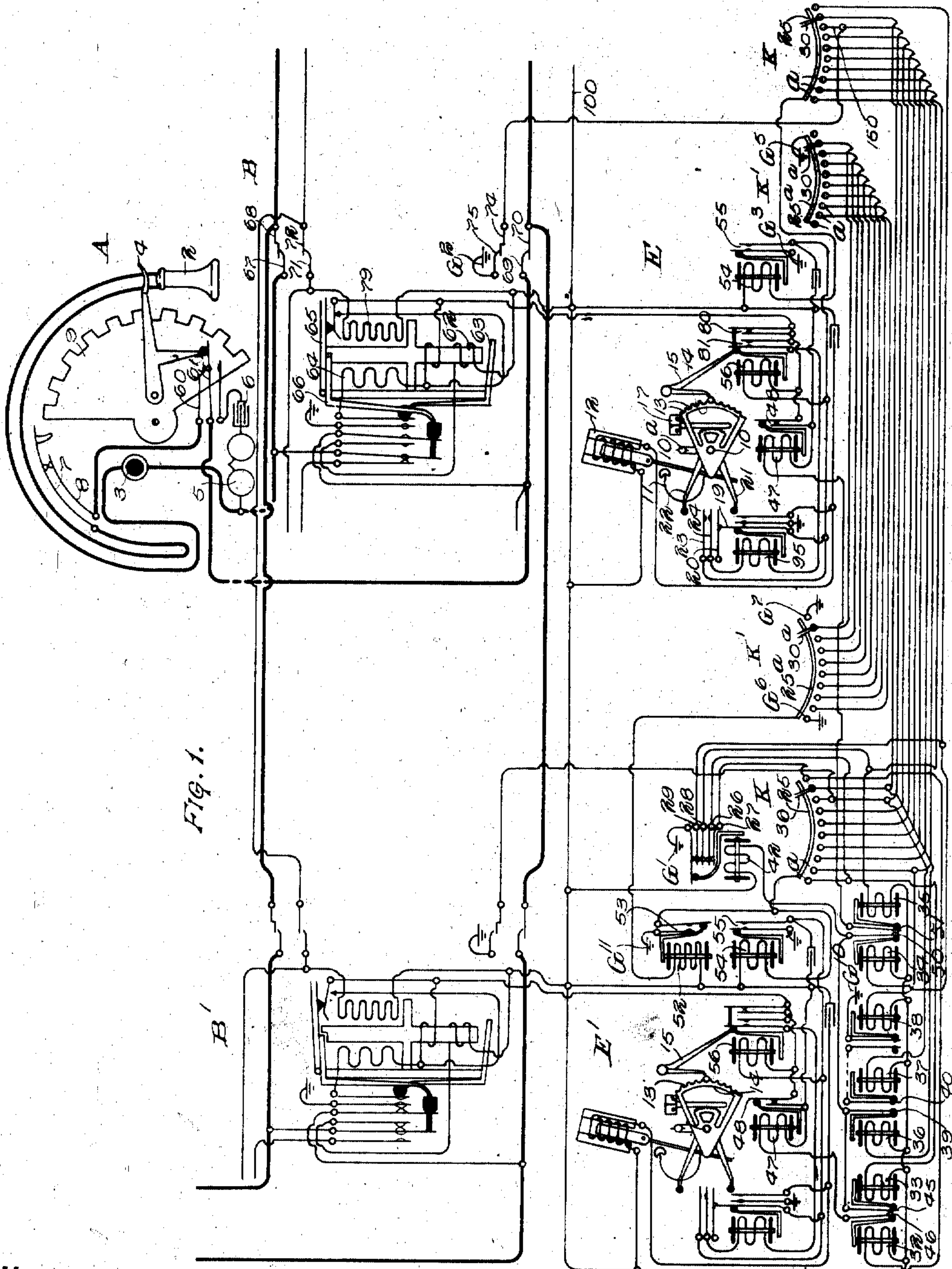


1,217,510

M. SCHWARTZ.
TELEPHONE TRUNKING SYSTEM.
APPLICATION FILED MAR. 3, 1913.

Patented Feb. 27, 1917.
3 SHEETS—SHEET 1.



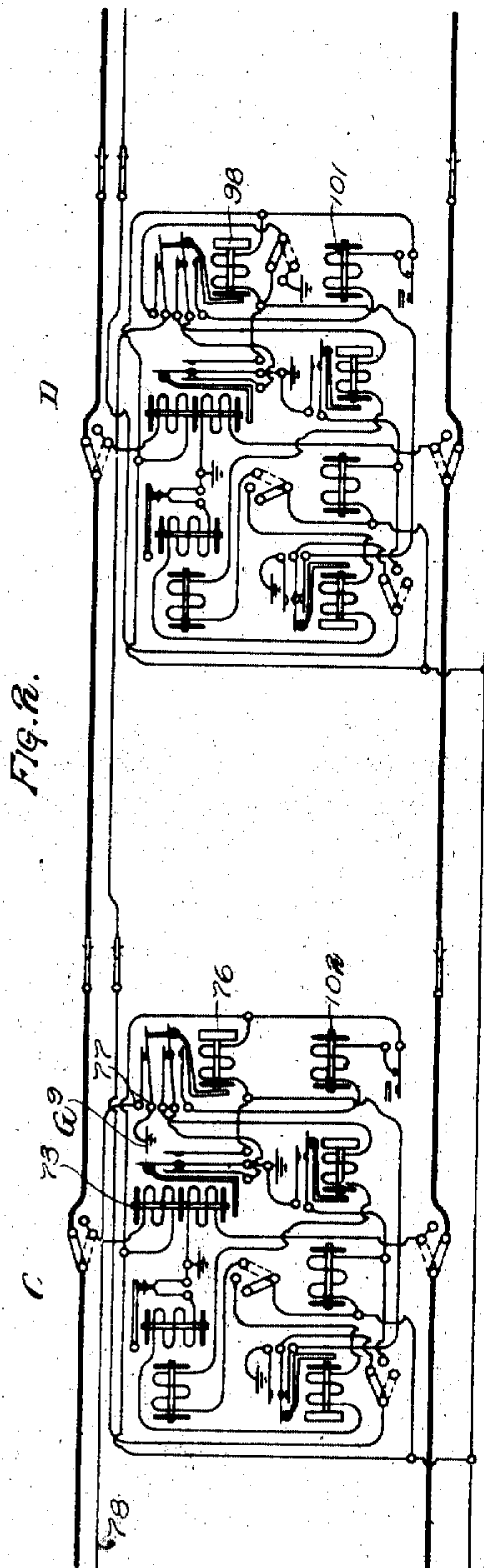
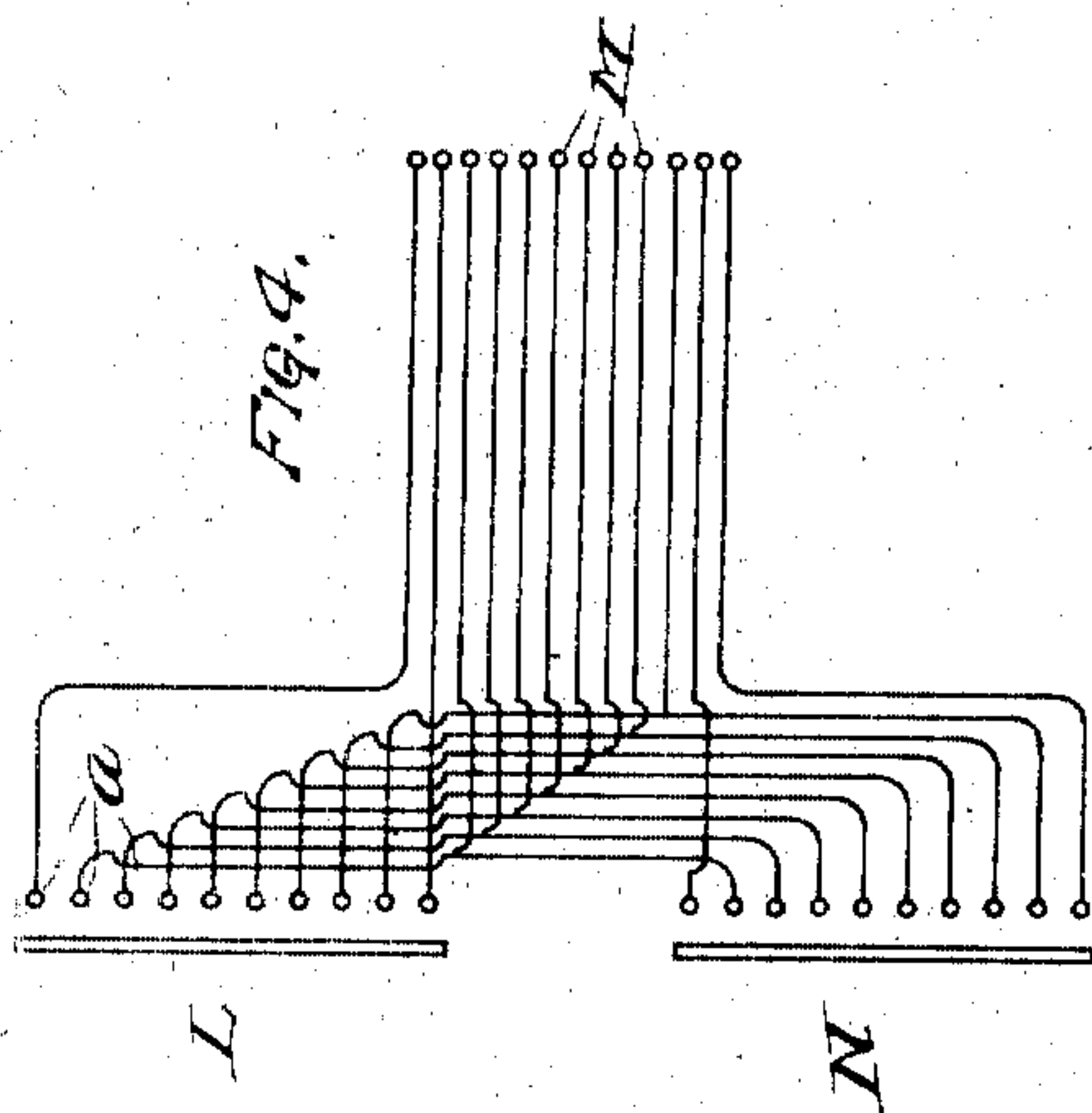
WITNESSES
A. Andersen.
Arthur J. Ray.

INVENTOR:
Michael Schwartz
By Bulkley & Durand
ATTORNEYS.

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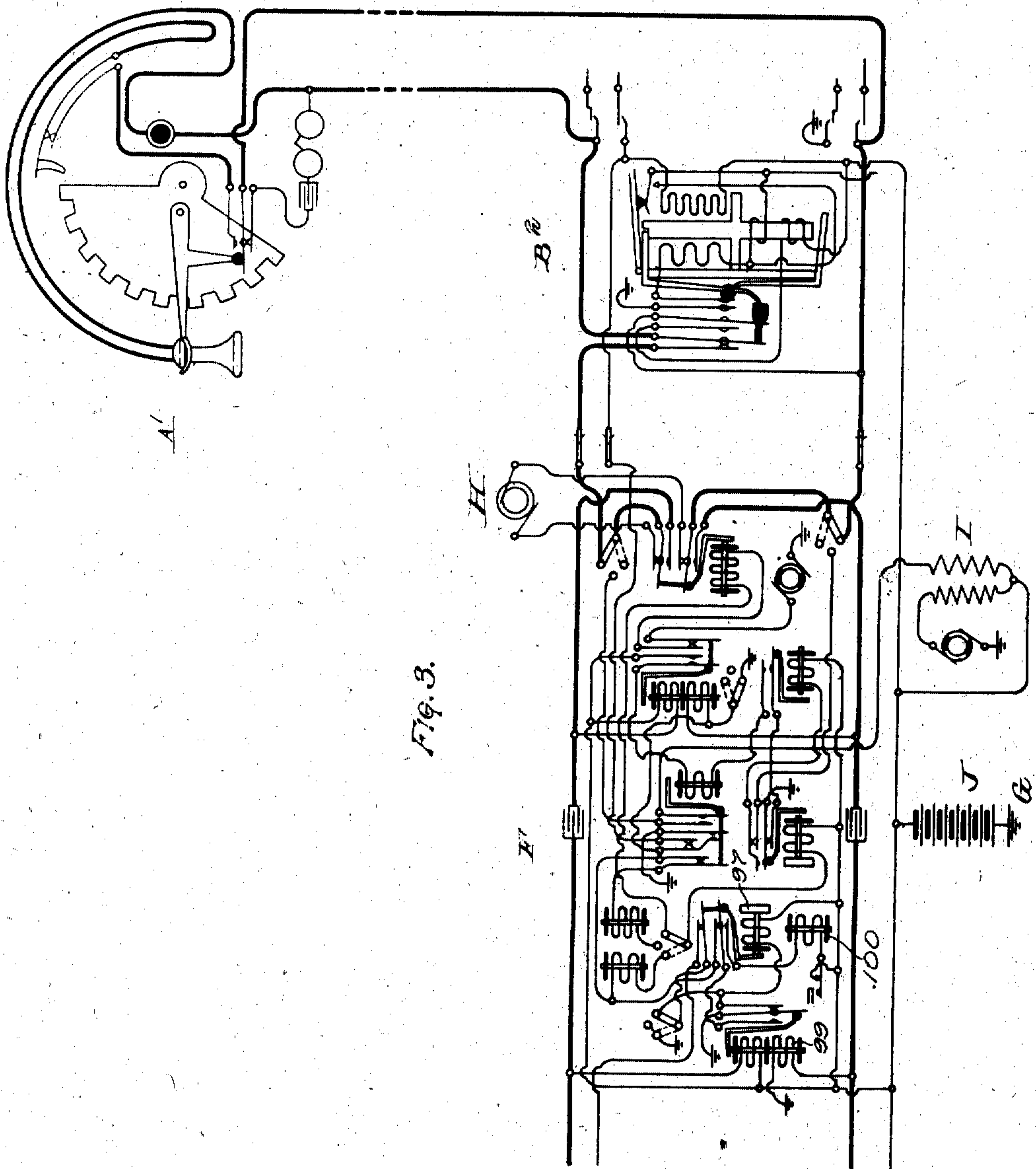
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WITNESSES

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Michael Schwartz
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ATTORNEYS

UNITED STATES PATENT OFFICE.

MICHAEL SCHWARTZ, OF CHICAGO, ILLINOIS, ASSIGNOR TO AUTOMATIC ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

TELEPHONE TRUNKING SYSTEM.

1 247,510.

Specification of Letters Patent. Patented Feb. 27, 1917.

Application filed March 3, 1913. Serial No. 751,882.

To all whom it may concern:

Be it known that I, MICHAEL SCHWARTZ, a citizen of the United States of America, and resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Telephone Trunking Systems, of which the following is a specification.

My invention relates to improvements in automatic telephone systems, and more particularly to an improved arrangement of the switches and trunks extending between these switches, whereby more efficient and effective service can be given.

It further relates to an improved construction of certain of the switches whereby interference is prevented.

My invention relates more specifically to a telephone system employing line switches which select an idle one of a group of trunks, which line switches are divided into groups. Heretofore it has been customary to have each of these groups of trunks individual to a particular group of line switches. A more efficient arrangement, however, and one which has been found gives just as efficient service, is to have certain of these trunks individual to each group of line switches, while other of the trunks are common to two or more groups. With such an arrangement it, of course, becomes necessary to provide means for preventing a switch of one group seizing a common trunk which is already occupied by a switch of another group.

Further specific features of my invention are the provision of a master switch for controlling each group of line switches, and the provision of means whereby the master switches which control groups of line switches which have access to the same trunk line operate in synchronism, by which means the two or more master switches thus operated in synchronism will always stand with their plungers opposite the same trunk line. Means are likewise provided whereby these master switches operate in synchronism only when they are working over the common trunks, but operate independently of each other when they are operating on the individual trunks.

These and other objects of my invention will be more readily understood by reference to the accompanying drawings, in which—

Figures 1, 2 and 3 taken together represent a complete circuit connection between

a calling substation A (Fig. 1) and a called substation A' (Fig. 3).

Fig. 4 is a diagrammatic sketch of the arrangement of trunks leading from the line switches to the first selectors.

The telephone system shown herein is of the same type as that shown and described in British patent to A. E. Keith No. 1421 of 1910, except that no secondary trunking switches are employed between the subscribers' individual switches and the first selectors. In this system the connection between the calling and called subscribers is established through the medium of a preliminary trunk selecting switch B, first selector C, second selector D and a connector F. The first selector C is the switch which operates in response to the operation of the substation calling device for the first digit of the called number.

The first selector is not permanently connected with the calling line, but the subscriber obtains connection thereto by means of the above-mentioned preliminary trunk-selecting switch B, which is individual to the subscriber's line and which is operated immediately upon the removal of his receiver. Said switches are arranged in groups, each group having common access to a given number of trunk lines, usually ten, which lead directly to first selectors. I have, however, shown herein a system in which some of the trunk lines leading to first selectors are common to a plurality of groups of line switches, and certain other trunk lines are individual to a single group. For example, in Fig. 4 there are represented two groups of trunk terminals N and L, each group belonging to a separate group of line switches. Some of the trunks, in this case the first and last, in each of the groups N and L lead to individual first selectors, while the remaining trunks are multiplied between the two groups, so that two terminals, one in each group, are connected to the same trunk line and therefore to a single selector M.

The automatic substation shown herein may be of any suitable or approved type of automatic substation. Referring especially to substation A, it comprises the usual receiver 2, transmitter 3, switch hook 4, ringer 5 and condenser 6. Being an automatic substation it is also provided with an automatic calling device. The calling device

may be of the type shown and described in British patent to S. G. S. Dicker No. 29,654 of 1910. As shown herein, however, the calling device is represented diagrammatically by a pair of impulse springs 7 and 8 and a toothed impulse wheel 9. The latter may be controlled by the subscriber through the medium of a dial (not shown) provided with finger holes in the well-known manner.

10 The preselecting or line switches referred to above, as is well known, are each provided with a plunger which, when idle, is always maintained opposite the bank terminal of the idle trunk by a so-called master switch,

15 The master switches E and E' control plungers of separate groups of line switches, the line switch B belonging to the group which is controlled by the master switch E. The same explanation will apply to the line switch B' and its relation to the master switch E'.

20 The said master switch is somewhat different from that shown in said British Patent No. 1421 of 1910, being similar to that shown in French Patent No. 449,234 issued to the Automatic Electric Company. As shown in Fig. 1, the usual plunger guide shaft 10^a, through the medium of which the master switch controls the plungers, is connected with the rotary shaft 10 in such a manner

25 that as the shaft 10 rotates back and forth the plunger guide shaft 10^a is caused to oscillate about said shaft 10 as an axis. The shaft 10 is adapted to be rotated in one direction by a spring 11 and in the other direction against the opposition of said spring by a solenoid 12. Secured to the shaft 10

30 there is a cam member 14 provided with notches 13, one for each trunk line to which the line switches have access. The shaft is normally locked against rotation in either direction by the engagement of the lever 15 with one of the notches 13. The lever 15 is controlled by the armature of the relay 56 in such a manner that when said relay is

35 energized the lever is withdrawn from the cam so as to unlock the shaft 10. The speed of rotation of the shaft 10, and necessarily the plunger guide shaft 10^a, is controlled by a suitable governor 17. Associated with

40 the master switch there is a relay 95 the springs of which, upon being brought together, are locked in their operated positions by the engagement of the spring 19 with the detent on the under side of the spring 20. The springs are unlocked by the

45 arm 21 when the shaft 10 reaches the limit of its travel in one direction. When the shaft 10 reaches the limit of its travel in the other direction, the arm 22 forces the spring 23 into engagement with the spring 24. As has heretofore been stated, the two master switches E and E' control separate groups of line switch plungers, and each master switch, unlike the usual type, is provided

50 with an auxiliary bank of contacts K' comprising the common segment 25^a and individual contacts *a*, in addition to the usual bank of contacts K comprising the common segment 25 and individual contacts *a*. Both wipers of said banks are mounted on the same shaft and operate in synchronism. In general, the operation of the master switch is as follows:

75 Whenever a trunk line is seized by a line switch the relay 56 is energized to unlock the shaft 10, the spring 11 thereupon rotating the shaft 10 to cause the plunger shaft to move the idle plungers away from the trunk just seized to a position opposite an idle trunk line. When the idle trunk line is reached the relay 56 deenergizes and again locks the shaft. In the course of the operation of the system, when the plungers reach a position opposite the last trunk line the arm 22 forces the springs 23 and 24 into contact, so that when this trunk is seized the circuit of the relay 95 is closed. The relay 95 thereupon energizes and the springs operated thereby become locked in their operated positions. This closes the circuit of the solenoid 12, which rotates the shaft 10 back in the opposite direction, bringing all the plungers which are in engagement with the plunger shaft back to a position opposite the first trunk line and restoring tension to the spring 11. When the plungers reach their starting positions the arm 21 unlocks the springs of the relay 95, which permits the solenoid to deenergize and the plunger shaft to come to rest. The master switches E and E' are alike, corresponding parts being represented by the same reference numerals. The contacts of the banks K of the master switches E and E', with the exception of the first and last, are wired in multiple. The first and last contacts of the bank K of the master switch E' are wired to the springs 26 and 27, respectively, and the first and last contacts of the bank K of the master switch E to the springs 28 and 29, all of which are normally grounded at G'. In like manner, the contacts of the banks K' of the two master switches, with the exception of the first and last, are also wired in multiple. The first and last contacts of the bank K' of the master switch E' are connected to ground, while the first and last contacts of the bank K' of the master switch E have no connection whatever. This arrangement is in accordance with the trunking diagram shown in Fig. 4. The wipers 30 and 30^a of the master switches E and E' keep the common segments 25 and 25^a in electrical connection with the individual contacts *a* in their respective banks, corresponding to the trunk line before which the plungers of the idle switches are resting. It has already been stated that the first and last contacts of both banks K are separately and temporarily grounded at G'. In addition to this, the re-

lays 32, 33, 34 and 35 are also wired to said first and last contacts and to battery. It will therefore be seen that said relays will be energized all the time the four terminals are grounded at G' . In connection with the relays 32, 33, 34 and 35 there are eight other chain relays, only three of which are shown in the accompanying drawings, which are wired, one by one, to each of the eight multiple trunk lines, each being energized as the ground potential is placed on the contacts a of either of the master switch banks K in a manner hereinafter described. When a call is initiated the circuits involved in connection with the master switches E and E' are as follows:

As is well known, the plunger of the line switch B of the calling line is normally held opposite the terminal of an idle trunk line. When the calling subscriber removes his receiver preparatory to making a call, the closure of the hook switch springs 60 and 61 completes a bridge across the calling line through the transmitter and receiver, whereupon the line winding 62 of the switch B becomes energized. The winding 62, upon energizing, attracts the armature 63, whereby the circuit of the operating winding 64 is closed. The winding 64, upon energizing, attracts the plunger arm 65 and the cut-off armature 66. The armature 66 operates to disconnect the line winding 62 from the line, while the plunger arm 65 causes the plunger to be thrust into the group of contact springs forming the terminal of the trunk line before which it is being held and forces the springs 67, 68, 69, 70, 71, 72, 73 and 74 into contact in pairs, as shown. The engagement of the springs 67 and 69 with the springs 68 and 70, respectively, extends the line circuit through to the first selector C , while the springs 73 and 74 engage to automatically move the wipers 30 onto an idle trunk line in the following manner:

When the springs 73 and 74 are forced into contact by the plunger of the line switch, a circuit is closed from ground G^2 through said springs, master switch bank contact 150, wiper 30, common segment 25 and the relay 54 to battery lead 100. The relay 54, upon energizing, completes a circuit through the relay 56, whereupon said relay energizes to separate the springs 80, close contact between the springs 81 and withdraw the locking dog 15 out of engagement with one of the notches 13 of the cam 14. As soon as the cam is unlocked the spring 11 causes the plunger guide shaft 10^a to oscillate and to move the plungers of the idle line switches away from the trunk line just seized by the switch B .

Upon the plunger of the switch B engaging with the trunk terminal opposite which it has just been resting, the switch B becomes free from the guide shaft 10^a, and is

not affected by its movement at this time. After the plungers have been moved a short distance the master switch wiper 30 passes off the grounded contact 150, which also allows the relay 54 to deenergize and break the circuit of the relay 56. Upon the deenergizing of the relay 56 the dog 15 drops back into one of the notches 13, thereby locking the shaft 10 and bringing the plungers to rest in front of the next idle trunk line. There is also completed a circuit through the chain relay 37 connected to the trunk line that has just been engaged to battery. Upon said relay energizing, its armature moves the spring 40 over half way to meet the spring 39. When the next trunk line is engaged the chain relay 36 connected therewith will also energize, whereby its armature is attracted and pushes the spring 39 over to meet and make contact with the spring 40. The same operation is repeated upon the engagement of each trunk, and should none of those previously engaged become idle in the meantime, there would be a complete circuit from ground G^{10} through the armature springs 39, 40, etc., of the eight chain relays to the relay 42 and to battery. Upon the energization of the relay 42 ground battery is removed from the first and last contacts of both the banks K . Upon ground battery being removed from said contacts the wipers 30 are allowed to remain upon and engage with the individual trunk lines. It is clearly seen that unless the eight multiple trunk lines are busy, it is impossible for the wipers 30 of their respective master switches to remain in engagement with said individual trunks. The two wipers 30 of the master switches E and E' are moved together while traveling over the eight multiple trunks—that is, the wipers of both master switches rest on corresponding contacts. The means for accomplishing this is in the auxiliary banks K' , the operation of which will be fully described hereinafter. Since the trunk line which is shown as having been seized by the line switch B is one of the multiple trunk lines, it will therefore be seen that when the contact between the springs 73 and 74 is closed to energize the relay 54 and cause the master switch E to move its plungers to an idle trunk line, the relay 54 of the master switch E' will also be energized in the same manner, and the master switch E' will move its plungers to an idle trunk line also.

The manner in which the banks K' insure that the wipers of the two master switches shall rest on corresponding contacts is as follows: The banks K' have, as has already been stated, eight of their contacts multipled together, while the first and last contacts of the bank K' of the master switch E' are grounded at G^9 and G^7 , and the first and last contacts of the bank K' of the

master switch E have no connection whatever. Connected to the common segment 25^a of the master switch E' there is a relay 52, which is of high resistance and is permanently connected to battery. This relay is energized all the time the wipers 30^a of the master switches E and E' are resting on the corresponding contacts of their respective banks, whereby a circuit is completed from ground G⁵ to the common segments 25^a and wipers 30^a of the master switches E and E' and through the relay 52 to battery. When said relay 52 is energized the contact 53 is broken and ground battery at G¹¹ is held off from the relay 54. This condition is maintained only when the wipers 30^a are resting on corresponding contacts. Thus, since the relay 52, when deenergized, closes the circuit of the starting relay 54 of the master switch E', it will be seen that said master switch will be unable to come to rest unless its wiper 30^a is in engagement with the contact which is engaged by the wiper 30^a of the master switch E.

Assuming that the eight multiple trunk lines are busy and the wipers 30 of both master switches are standing opposite corresponding idle individual trunks, and that a subscriber occupies one of these said trunks, say of the master switch E, the remaining idle plungers, which are controlled by this master switch only will rotate to find an idle trunk, which will be the other individual trunk line in this particular group, leaving the plungers which are controlled by the master switch E' stationary and still opposite an idle individual trunk of said master switch E'. When this trunk is eventually seized the idle plungers controlled by the master switch E' will likewise be automatically rotated onto the remaining individual trunk lines in its group in a manner heretofore explained. When the eight multiple trunk lines become busy and the wiper 30^a of the master switch E' is rotated onto one of the idle individual trunk contacts of the bank K', the relay 52 is held energized to keep the master switch from oscillating back and forth. For example, if the wiper 30^a passes onto the contact connected to ground G⁷, the energizing circuit for the relay 52 extends from ground G⁷ through the wiper 30^a, common segment 25^a and the relay 52 to battery 100. Of course, if the master switch stops on the contact connected to ground G⁶, the energizing circuit for the relay 52 extends from ground G⁶ instead of from ground G⁷ over the circuit just traced.

There are now assumed to be engaged ten trunk lines, leaving two still vacant, one in each group. When one of these said trunks is engaged, say, for instance, the remaining trunk in the group to which the line switches B' have access, all the contacts a

will be grounded. Therefore the wiper 30 of the master switch E' would oscillate back and forth but for the provision of the relay 47, which cuts off battery current from the master switch E', as well as from the operative windings of the line switches B', the circuit being as follows: from ground G¹⁰ through the armature contacts of the eight chain relays 36, 37, 38, etc., through the armature contacts of the individual chain relays 32 and 33, and relay 47 to the battery lead 100. Upon the relay 47 energizing the contact at the spring 48 is broken, at which time the circuits of the relay 56 and the operative windings of the line switches B' are opened. Upon the failure of the relay 56 to operate the lever 15 remains locked in engagement with the cam 14, thereby preventing the plunger guide shaft from oscillating in the usual manner and arresting all attempts to operate said switches.

When the remaining individual trunk line of the group to which the line switches B have access is engaged, the master switch E operates in the same manner as described in connection with the master switch E'. The circuit in this instance is completed from ground G¹⁰ through the armature contacts of the eight chain relays 36, 37, 38, etc., through the armature contact of the individual chain relays 34 and 35 to the relay 47 of the master switch E and to battery.

The line switch B² and the substation A' are in all respects the same as the line switch B and the substation A.

At H (Fig. 3) there is shown a ringing current generator and at I a busy signaling device is represented. At J there is shown a battery having one terminal grounded at G for supplying current for operating the central office apparatus and for talking purposes.

Having given a general description of the apparatus, it will now be explained how the subscriber of the calling substation A may obtain connection with the subscriber of the called substation A', the number of which latter will be assumed to be 2220.

It has already been stated that when a subscriber removes his receiver preparatory to making a call the closure of the hook springs 60 and 61 completes a bridge across the calling line through the transmitter and receiver, whereupon the calling subscriber's line switch plunger operates to engage with the idle trunk line before which it is being held, and forces the springs 67—68, 69—70, 71—72, and 73—74 into contact in pairs. The engagement of the springs 67 and 69 with the springs 68 and 70, respectively, extends the line circuit through to the first selector C.

The line relay 73 of the switch C thereby becomes energized and closes the circuit of the relay 76. The relay 76, upon energizing,

completes a circuit from ground G^2 through the springs 77, conductor 78, springs 71 and 72 and the holding winding 79 of the switch B. When the bank springs 75 and 74 of the switch B are forced into contact by the operation of said switch, circuits are involved which operate the master switches E and E', which have already been explained. The line is, therefore, now extended to the first selector C and the calling subscriber operates his calling device in the well-known manner for the successive digits of the number of the called line. The switch C responds to the impulses for the first digit, the second selector D responds to the impulses for the second digit and the connector F responds to the impulses for the last two digits to extend the connection toward the called line.

The operation of these switches is, in general, well understood in the art and is fully described in British Patent No. 1421 of 1910, hereinbefore referred to, and it is not thought necessary to describe the same in detail herein.

After a conversation is completed the entire connection is automatically released by the hanging up of the receiver at the calling substation. This is brought about in the following manner: During the time the conversation is being carried on the release relays 97, 98 and 76 of the switches F, D and C are maintained energized by a circuit which is closed through the springs of the connector line relay 99. When the calling subscriber hangs up his receiver the relay 99 deenergizes and breaks the circuit of the relays 97, 98 and 76. The relays 97, 98 and 76, upon deenergizing, operate to close the circuit of the release magnets 100, 101 and 102 of their respective switches. The release magnets, upon energizing, immediately restore the switches to normal position. The relay 76 of the selector C, upon deenergizing, also destroys the holding circuits of the winding 79 of the switch B, whereupon the plunger of said switch is permitted to be restored to normal position and all the apparatus employed in the connection is left in readiness for another call.

While I have illustrated my invention in connection with one particular type of telephone system and in connection with switches of a particular type, it is to be understood, of course, that my invention is of broader scope and that I do not wish to be limited to such detailed constructions. Furthermore, while I have shown trunk lines extending from the line switches divided into groups of ten, two of which are individual to a group while eight are common, it is, of course, understood that this is merely an arbitrary selection and that the number of individual and common trunks can be varied to suit the working conditions.

What I claim as my invention is:—

1. In a telephone system, a plurality of groups of trunk lines, means including master switches operating over said trunk lines to automatically select an idle one of said trunks, and means whereby a plurality of said master switches may be operated in synchronism.

2. In a telephone system, groups of subscribers' lines, trunk lines individual to said groups of subscribers' lines, other trunk lines common to a plurality of groups of subscribers' lines, means associated with each group of lines for automatically selecting idle trunks, and means for causing a plurality of said selecting means to operate in synchronism.

3. In a telephone system, groups of subscribers' lines, a plurality of trunk lines, certain of said trunk lines being individual to each of said groups of subscribers' lines, while other of said trunks are common to a plurality of groups, means for selecting an idle trunk, and means for preventing one of said trunks individual to a group being selected until all of the common trunks for this group are in use.

4. In a telephone system, a plurality of groups of subscribers' lines, trunking switches individual to said lines for selecting idle trunk lines, trunk lines common to all of said groups, trunk lines individual to each of said groups, and means for preventing the selection of an individual trunk whenever one of the common trunks is idle.

5. In a telephone system, two groups of subscribers' lines, a master switch and a group of trunking switches for each group of lines, a bank of contacts and a wiper for each master switch, a relay adapted when deenergized to close the starting circuit of one of the master switches, and an energizing circuit for said relay including corresponding contacts of both banks.

6. In a telephone system, a plurality of groups of lines, trunking switches for said lines divided into corresponding groups, trunks for said trunking switches, said trunks divided into groups individual to each of the groups of switches, trunks common to all of the groups, and means for maintaining the individual trunks of a group inaccessible to its switches as long as any of the common trunks are idle.

7. In a telephone system, a plurality of groups of lines, trunking switches for said lines divided into corresponding groups, trunks for said trunking switches, said trunks divided into groups individual to each of the groups of switches, trunks common to all of the groups, means for maintaining the individual trunks of a group inaccessible to its switches as long as any of the common trunks are idle, and means for making the individual trunks of a group

accessible to the switches of said trunks when all of the common trunks are busy.

8. In a telephone system, a plurality of groups of lines, trunking switches for said
5 lines divided into corresponding groups, trunks for said trunking switches, said trunks divided into groups individual to each of the groups of switches, trunks common to all of the groups, means for main-
10 taining the individual trunks of a group inaccessible to its switches as long as any of the common trunks are idle, means for making the individual trunks of a group accessible to the switches of said trunks when all
15 of the common trunks are busy, means for rendering switches of a group inoperative when all the individual and all of the common trunks are busy, means for restoring such switches to operative condition if any
20 one of the individual trunks of that group become idle, and means for restoring to operative condition switches of said group and switches of any other group rendered inoperative for similar reasons if any common
25 trunk becomes idle while such switches are in such inoperative condition.

9. In a telephone system, trunking switches divided into groups, a master switch for controlling the switches in each group, trunks
30 common to said groups of trunking switches, means associated with said master switches for enabling them to preselect for the trunking switches the trunk next available for use, means for enabling a trunking switch to
35 seize the trunk thus designated and to then initiate the operation of its master switch in preselecting the next trunk, means for initiating the operation of the master switch of another group, and means for continuing
40 the operation of said second master switch until it reaches a position for designating the same trunk designated by the first master switch.

10. In a telephone trunking system, a pair
45 of groups of trunking switches, a plurality of trunks common to the switches of said groups for trunking purposes, trunk selecting means for each group, trunks individual to each group, and means controlled by the
50 group of common trunks for making the other group of trunks busy.

11. In a telephone trunking system, a pair of groups of trunking switches, a plurality of trunks common to the switches of said
55 groups for trunking purposes, trunk selecting means for each group, trunks individual to each group, and means controlled by the group of common trunks for making the other group of trunks busy, busy test circuits for some of said trunks, said last means
60 controlled over said busy test circuits.

12. In a telephone trunking system, a pair of groups of trunking switches, a plurality of trunks common to the switches of
65 said groups for trunking purposes, trunk se-

lecting means for each group, trunks individual to each group, and means controlled by the group of common trunks for making the other group of trunks busy, busy test circuits for said common trunks, said last
70 means controlled through the medium of said busy test circuits.

13. In a telephone trunking system, a pair of groups of trunking switches, a plurality of trunks common to the switches of said
75 groups for trunking purposes, trunk selecting means for each group, trunks individual to each group, means controlled by the group of common trunks for making the other group of trunks busy, a busy test circuit for
80 one of said common trunks, said last means controlled through the medium of said busy test circuit.

14. In a telephone trunking system, a pair of groups of trunking switches, a plurality
85 of trunks common to the switches of said groups for trunking purposes, trunk selecting means for each group common to the group, trunks individual to each group, and means controlled by the group of common
90 trunks for making the other group busy.

15. In a telephone trunking system, a pair of groups of trunking switches, a plurality of trunks common to the switches of said
95 groups for trunking purposes, trunk selecting means for each group common to the group, trunks individual to each group, means controlled by the group of common trunks for making the other group busy, and busy test circuits for some of said
100 trunks, said last means controlled over said busy test circuits.

16. In a telephone trunking system, a pair of groups of trunking switches, a plurality of trunks common to the switches of said
105 groups for trunking purposes, trunk selecting means for each group common to the group, trunks individual to each group, means controlled by the group of common trunks for making the other group busy, and busy test circuits for said common
110 trunks, said last means controlled through the medium of said busy test circuits.

17. In a telephone trunking system, a pair of groups of trunking switches, a plurality
115 of trunks common to the switches of said groups for trunking purposes, trunk selecting means for each group common to the group, trunks individual to each group, means controlled by the group of common
120 trunks for making the other group busy, and a busy test circuit for one of said common trunks, said last means controlled through the medium of said busy test circuit.
125

18. In a telephone trunking system, a pair of groups of trunking switches, a plurality of trunks common to the switches of said
130 groups for trunking purposes, trunk selecting means for each group comprising a com-

mon element in each group for assigning to the switches an idle trunk, trunks individual to each group, and means controlled by the group of common trunks for making the other group of trunks busy.

19. In a telephone trunking system, a pair of groups of trunking switches, trunks individual to one of said groups of switches for trunking, and trunks common to both groups of switches for trunking, trunk selecting means for each group, and means for making the individual trunks inaccessible to the switches, said means under the control of said common group.

20. In a telephone trunking system, a pair of groups of trunking switches, trunks individual to one of said groups of switches for trunking, and trunks common to both groups of switches for trunking, trunk selecting means for each group, means for making the individual trunks inaccessible to the switches, said means under the control of said common group, a busy test circuit for each trunk, means for applying a busy test potential to one of the trunks of one of said groups when seized by one of said switches to make the seized trunk busy, and means

under the control of all of the trunks of the other group for applying a busy test potential to the same trunk.

21. In a telephone trunking system, a pair of groups of trunking switches, trunks individual to one of said groups of switches for trunking, and trunks common to both groups of switches for trunking, trunk selecting means for each group, means for making the individual trunks inaccessible to the switches, said means under the control of said common group, a busy test circuit for each trunk, means for applying a busy test potential to one of the trunks of one of said groups when seized by one of said switches to make the seized trunk busy, and other means for applying a busy test potential to the same trunk to make the trunk busy, said other means under the control of all of the trunks in the other group for removing said busy potential.

Signed by me at Chicago, Cook county, Illinois, this 22nd day of February, 1913.

MICHAEL SCHWARTZ.

Witnesses:

H. A. SWENARTON,
J. NORBY.