

Sept. 29, 1925.

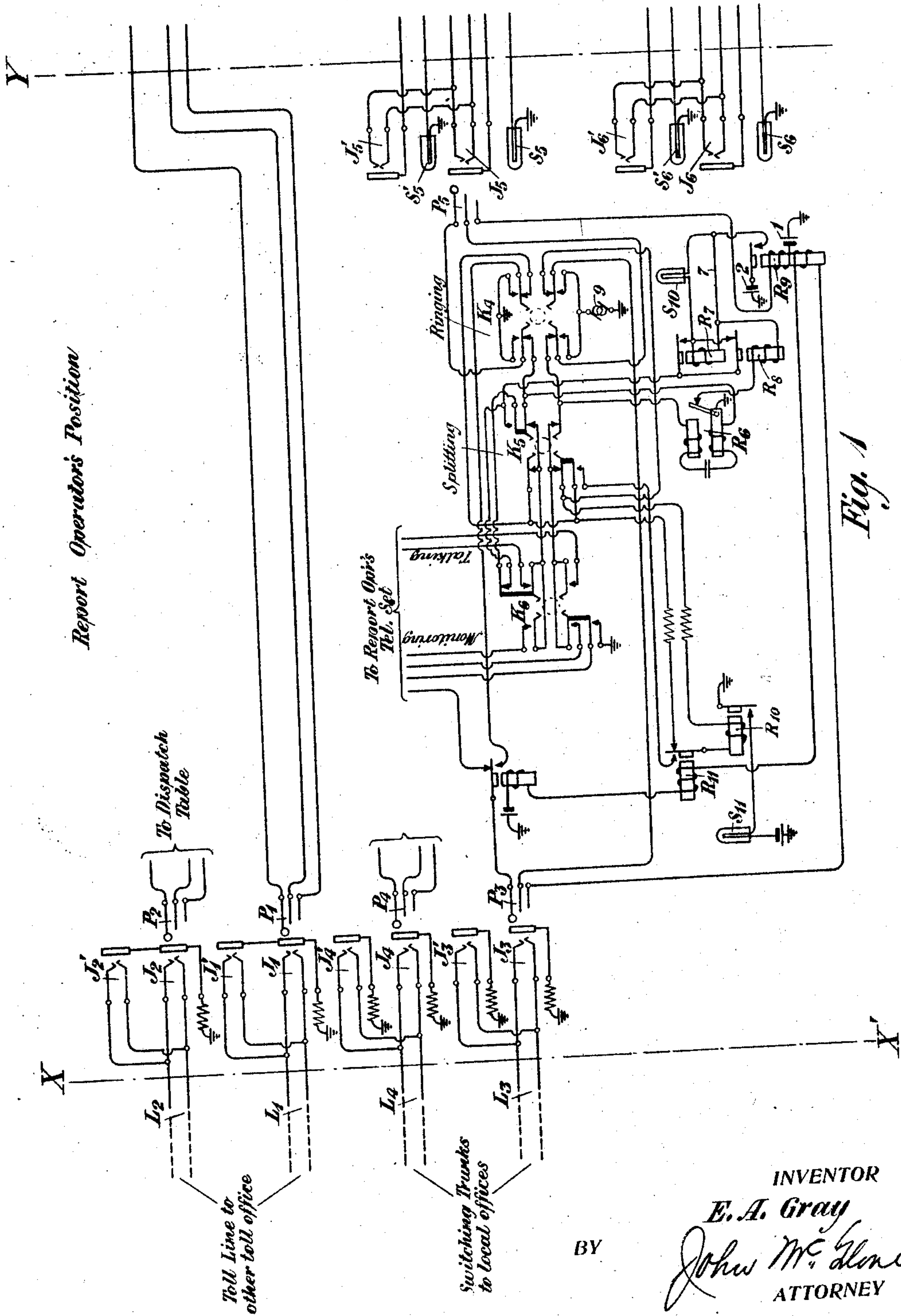
1,555,002

E. A. GRAY

TELEPHONE EXCHANGE SYSTEM

Filed June 25, 1923

4 Sheets-Sheet 1



INVENTOR

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BY

John McNamee
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Sept. 29, 1925.

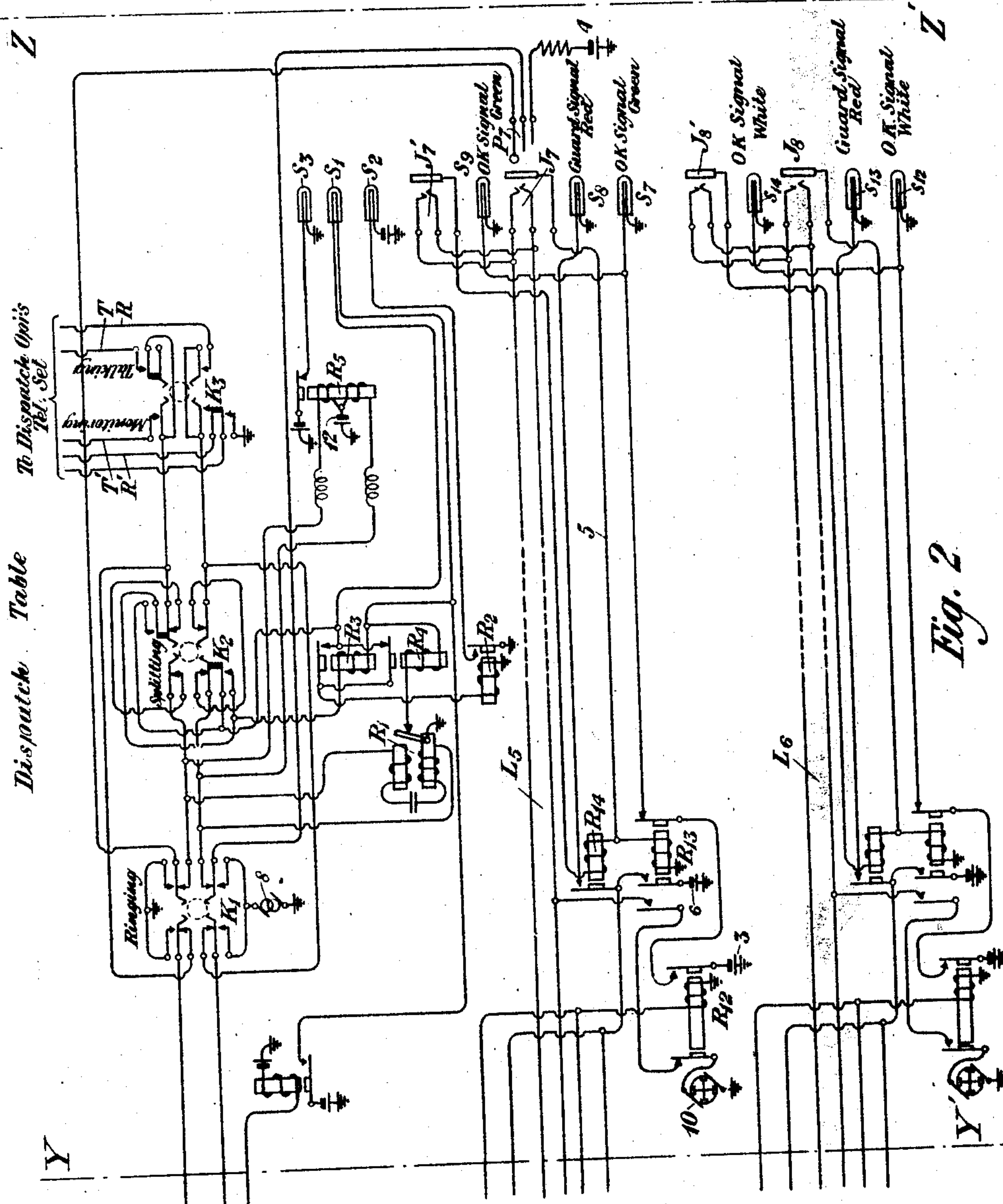
1,555,002

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TELEPHONE EXCHANGE SYSTEM

Filed June 25, 1923

4 Sheets-Sheet 2



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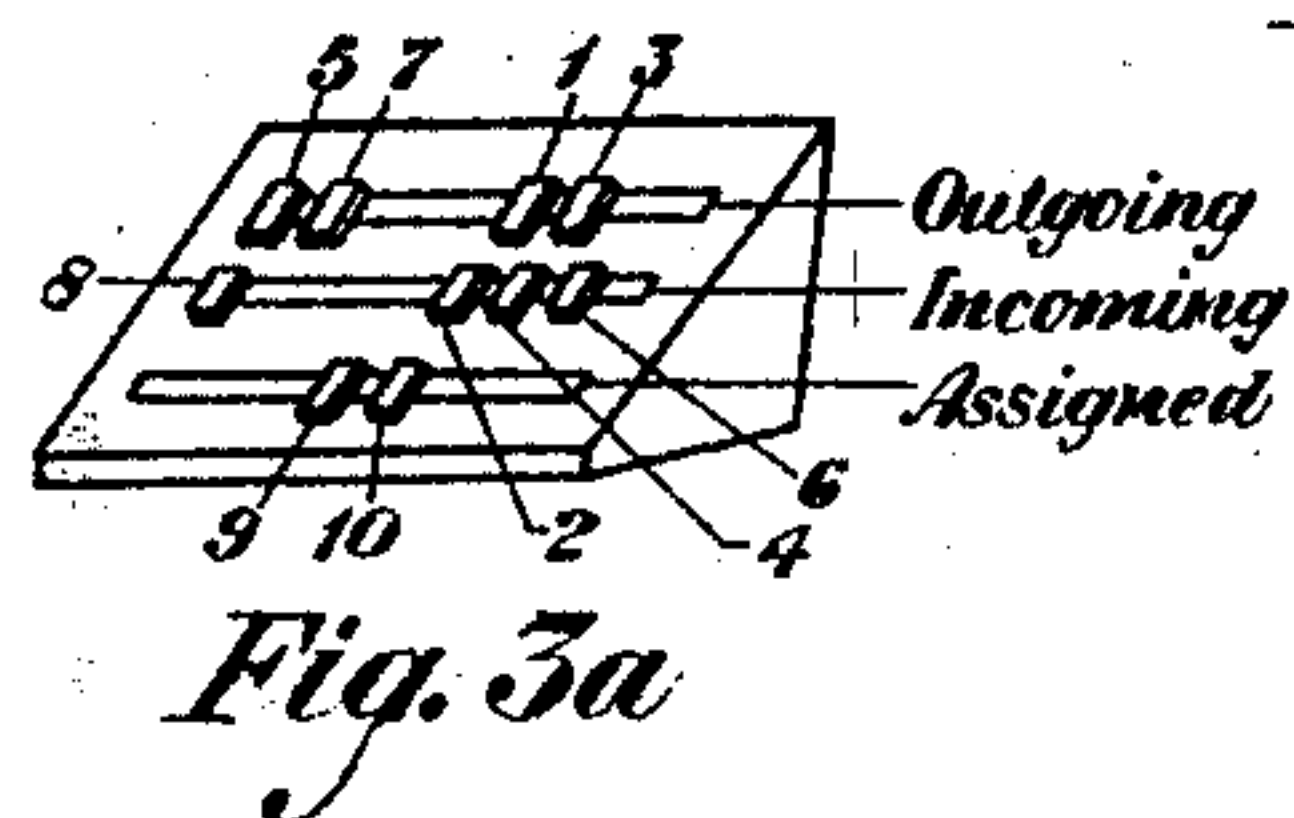
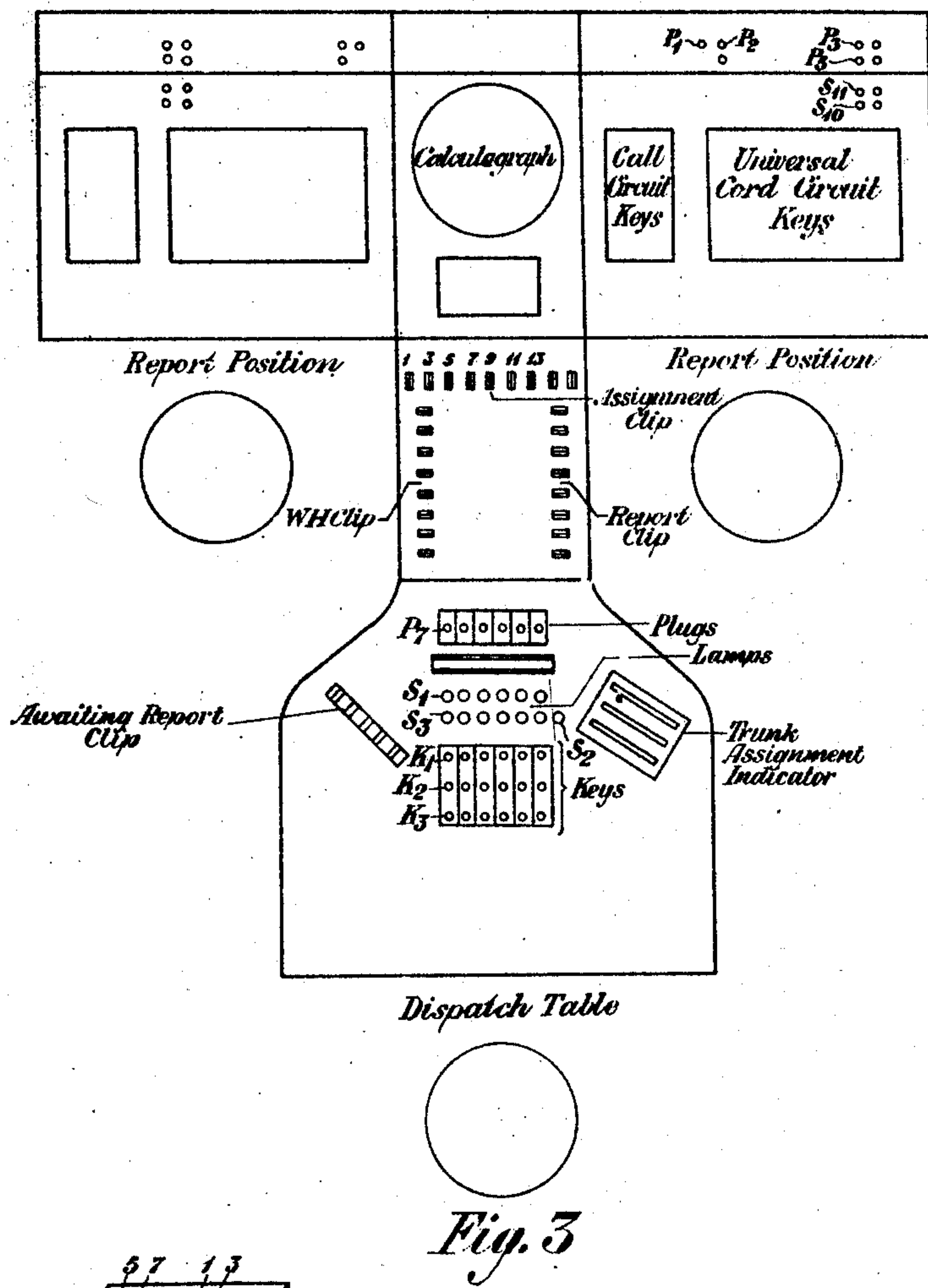
1,555,002

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TELEPHONE EXCHANGE SYSTEM

Filed June 25, 1923

4 Sheets-Sheet 3



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1,555,002

TELEPHONE EXCHANGE SYSTEM

Filed June 25, 1923

4 Sheets-Sheet 4

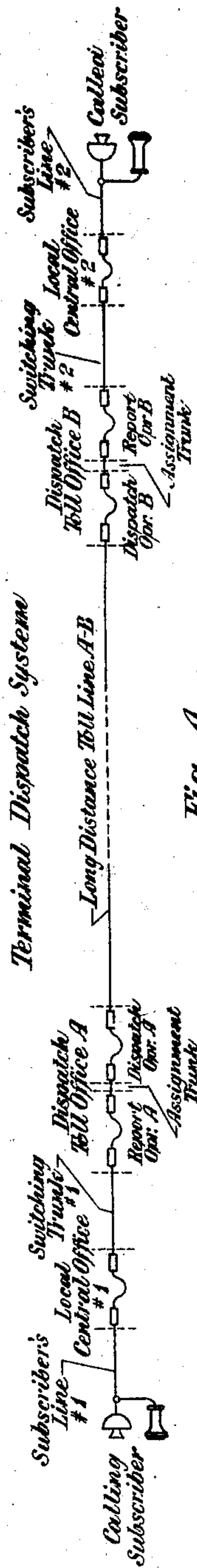


Fig. 4

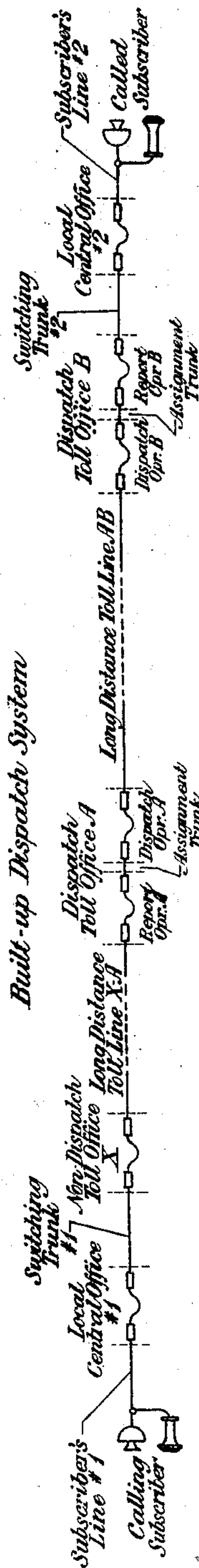


Fig. 5

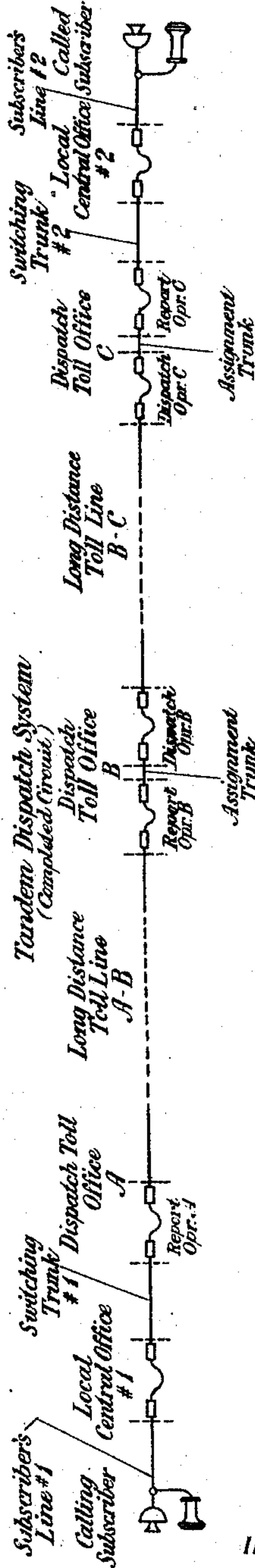


Fig. 6

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UNITED STATES PATENT OFFICE.

ERNEST A. GRAY, OF ROSLYN, NEW YORK, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

TELEPHONE-EXCHANGE SYSTEM.

Application filed June 25, 1923. Serial No. 647,676.

To all whom it may concern:

Be it known that I, ERNEST A. GRAY, residing at Roslyn, in the county of Nassau and State of New York, have invented certain Improvements in Telephone-Exchange Systems, of which the following is a specification.

This invention relates to telephone signaling systems and particularly to means for and a method of operating long distance toll telephone lines in order to increase the efficiency of such systems.

In operating long distance toll telephone lines it has been heretofore customary for the operator at the office where the call originates to signal the operator at the distant office and order that operator to establish the connection to the called telephone. In such system it is necessary for the calling operator to hold the long distance toll line until the called telephone is answered and a report is obtained. It is obvious that such a system is never very efficient inasmuch as the toll line is not available for revenue producing use during the time in which the calling operator is holding the toll line while awaiting a report from the called telephone. In the operation of toll telephone systems the total time per call consists in what may be termed the operating time plus the length of conversation. The operating time consists in the time necessary for completing all of the steps to establish a connection between the calling and the called subscriber and to put them in communication with each other. If we assume that the length of conversation is approximately fixed, it will be seen that by reducing the operating time the total time per call may be accordingly reduced. By thus effecting a reduction in the total time per call, a larger number of calls per hour may be transmitted over a given circuit whereby the efficiency of the system may be increased.

It is the object of this invention to provide means for and a method of operating a signaling circuit and particularly a long distance toll telephone system whereby greater volume of revenue producing traffic may be handled over a toll line than is now possible by the present ring-down method of operation.

This method, which is an improvement upon that disclosed in my copending application, Serial No. 504,695, filed October 1, 1921, involves the general features therein described and referred to as the dispatch method of operation. In that method the toll lines are not held by the calling or outward operators until the called telephone is answered and a report is obtained as in the ring-down method of operation, but such lines are used to pass the details of other calls up to the time when any two parties are ready to talk. It will be clearly seen from the following description that during any interval in which the toll lines are not being used by the parties for the purpose of conversation between themselves the details of a plurality of calls may be transmitted by the calling or outward dispatch operator to the called or inward dispatch operator, and similarly reports upon such calls may be transmitted by the said inward operator to the said outward operator whereby the proper terminal circuit arrangements for a plurality of calls may be established in advance of the time when a toll line is available to complete the connection. As soon as any toll line becomes available the proper terminal connections for the next call will have been established thereby minimizing the time during which any toll line is not employed for revenue producing conversation.

The dispatch method of operation normally involves the use of three operators at each end of a group of toll line circuits, one of whom is known as the dispatch operator and the others as the report operators. For the purpose of describing this system only the dispatch operator and one report operator will be referred to. The function of a report operator is to deal with subscribers and with operators at local offices through which the subscribers may be reached, receiving the calls from the subscribers through the said offices, giving reports on such calls and supervising the starting of conversation and timing of messages. The dispatch operator controls the toll line circuits between the toll offices, passing and receiving calls, reports and orders over the said circuits and connecting the subscriber's

line with the toll line circuit when both the calling and the called parties are at their telephones ready to talk.

This invention will be clearly understood from the following description when read in connection with the attached drawing of which Figures 1 and 2 represent one terminal circuit when the figures are correctly associated by placing the top of the sheet containing Fig. 1 adjacent to the bottom of the sheet containing Fig. 2. Fig. 3 shows the switchboard arrangements for carrying out the system described herein, and Fig. 3^a shows a detail thereof. Figs. 4, 5 and 6 represent schematically the circuit connections under various conditions in which the dispatch system may be involved which may be designated the terminal dispatch system, the built-up dispatch system and the tandem dispatch system, respectively. For the sake of brevity the description of this invention will be limited to the terminal dispatch system as shown in Fig. 4.

In the terminal circuit represented by Figs. 1 and 2, when associated in the manner directed, the apparatus lying between the lines X X' and Y Y' is located at the report operator's position of the switchboard and the apparatus lying between the lines Y Y' and Z Z' is located at the dispatch table. The relative arrangement of the report positions and the dispatch table is shown in Fig. 3 wherein the dispatch table is placed between and in back of two positions of the switchboard which thereby become the report positions for the said dispatch table. At each report position a plurality of toll lines such as L₁ and L₂ to other toll offices terminate in the line jacks J₁ and J₂ respectively, which have in multiple therewith at other positions of the switchboard the jacks J₁' and J₂'. Also each report position has a plurality of plugging-up cords, the plugs of which are represented by P₁ and P₂. The cord circuits of which the cords connected with P₁ and P₂ form a part extend to the dispatch table, each terminating there in a cord and plug such as P₇. For the sake of simplicity only one complete cord circuit has been shown namely that which terminates at the dispatch table in the plug P₇. This cord circuit embraces a ringing key K₁, a splitting key K₂ and a talking key K₃ which are located at the dispatch table. Bridged across the conductors of this cord circuit between the ringing and the splitting keys is the relay R₁ responsive to ringing current transmitted through the cord circuit. This relay controls the operation of the signal lamp S₁. The pilot lamp S₂, which operates whenever S₁ does, is controlled by the relay R₂ which in turn is controlled by relays R₃ and R₄. The supervisory lamp signal S₃ is controlled by the relay R₅. Associated with the talking key

K₃ is the dispatch operator's telephone set which need not be described in detail since any well known type of set may be used with this circuit.

At the report operator's position there also terminate the lines L₃ and L₄ which represent switching trunks to local central offices where the subscribers' lines terminate. These switching trunks serve to connect the subscribers with the long distance toll offices. These lines L₃ and L₄ may also represent long distance ring-down trunks to other toll offices not operated upon the dispatch system. These lines terminate in the jacks J₃ and J₄, respectively, at the report positions which have in multiple therewith the jacks J₃' and J₄' respectively at other switchboard positions. Extending from each report position to the dispatch table is a plurality of trunks, which terminate at each place in a plurality of jacks having signal lamps associated therewith. These trunks which are designated assignment trunks are represented by L₅ and L₆ which terminate at the report position in the jacks J₅ and J₆, respectively, having the jacks J₅' and J₆' multiplied at the adjacent report position. The signal lamps S₅ and S₅' are associated with the jacks J₅ and J₅' at the respective report positions and similarly are the lamp signals S₆ and S₆'. Also at each report position is a plurality of toll cord circuits similar to that terminating in plugs P₃ and P₅. Each of these cord circuits has the usual ringing splitting and talking keys designated K₄, K₅ and K₆, respectively, and a plurality of relays such as R₆ to R₁₁ inclusive. The object of the toll cord circuits just described is to establish a connection between the switching trunks such as L₃ and L₄ and the assignment trunks such as L₅ and L₆, the purpose and the manner of doing which will be clear from subsequent description.

The assignment trunks represented, for example, by L₅ terminate at the dispatch table in jacks such as J₇ which have other jacks such as J₇' in multiple therewith at other dispatch tables. The jack J₇, which is located at what may be termed the home table, has associated therewith two lamp signals designated S₇ and S₈ which are controlled in part by the operation of the relays R₁₂, R₁₃ and R₁₄. The multiple jack J₇' has also a lamp signal S₉ associated therewith. The jack J₇, or its multiple J₇', is adapted to have inserted therein a plug such as P₇ of the cord circuit that extends from the dispatch table of the report position at the switchboard terminating therein in a plug P₁ which is intended to be inserted in a jack such as J₁ of the line L₁ thereby establishing a connection over the dispatch toll line L₁ with the distant toll office.

It is to be understood that at the distant toll office the circuit arrangement and the

position of the operators will be exactly identical with that described above.

Having in mind the foregoing description of the circuit arrangement of a dispatch toll system, the method of operating the terminal dispatch system will now be described.

Terminal dispatch system.

A schematic circuit of the terminal dispatch system is shown in Fig. 4. In this system, the calling subscriber's line designated No. 1 is connected at the local central office No. 1 with a switching trunk No. 1 extending from the said central office to the dispatch toll office A (which thereby becomes the outward office) terminating therein in a jack at a report position of the switchboard. This switching trunk is connected by means of a cord circuit with an assignment trunk extending to the dispatch position, which trunk is there connected by means of a cord circuit with the long distance toll line extending to the dispatch toll office B (which becomes the inward office). At the latter office the toll line is similarly connected with an assignment trunk extending to the report position, which trunk is there connected with a switching trunk No. 2 extending to the local central office No. 2, at which terminates the called subscriber's line No. 2. The circuit just described represents the complete talking connection between the calling and the called subscribers. It is designated a terminal dispatch system because the calling and called subscribers lie within the zones for which the long distance telephone service is provided by the toll offices A and B, that is to say, the routing of the call requires no other toll offices.

The method of operating such a system is as follows: When a calling subscriber located in the zone of office A desires to talk with another subscriber in the zone of office B, the said calling subscriber is connected by his operator at the local central office No. 1 with a recording operator at the toll office A. The recording operator notes upon a ticket the name, address or telephone number of the called party and also the name and telephone number of the calling party. This ticket is transmitted to the report operator, at whose position the dispatch toll lines between A and B terminate. The report operator at A places the ticket in the report clip upon the dispatch table, as shown in Fig. 3. The dispatch operator at A takes the ticket and passes the details of the call to the dispatch operator at B, who records the details on a serially numbered ticket, which serial number is given to and noted by the dispatch operator at A upon her ticket. The dispatch operator at B at the same time assigns the particular call to an assignment trunk extending between the dispatch table and a report position at the switchboard.

Both dispatch operators note the trunk assignment upon the backs of their respective tickets and place the tickets in an unnumbered clip at the rear of the dispatch table and to the right-hand side thereof. The use of assignment trunks having the same number simplifies the procedure.

The report operator at A takes the ticket from its clip and orders up the subscriber's line. The manner of doing this will be clearly understood from the circuit diagram shown in Figs. 1 and 2. The report operator at A inserts the plug P_3 in a jack J_3 of the switching trunk L_3 which extends to the local office. This may be either a ring-down or an order wire trunk. Regardless of the character of the trunk, the report operator tells the local operator to connect the calling subscriber's line with the said trunk. The subscriber is not called at this time but the line is held under the control of the report operator. The report operator then inserts the other plug P_5 of this cord circuit in the jack J_5 of the assignment trunk L_5 that extends to the dispatch table and terminates there in a jack J_7 . When the plug P_5 is inserted in the jack J_5 current will flow from the battery 1 associated with the relay R_9 through the sleeve contacts of the plug P_5 and the jack J_5 and through the winding of the relay R_{12} to ground, thereby operating relays R_9 and R_{12} . The signal lamp S_{10} , associated with the cord P_5 would tend to light upon the operation of relay R_9 but the current flow therethrough from the battery 2 would be shunted through conductor 7 and accordingly the lamp remains dim. The operation of relay R_{12} associated with the assignment trunk L_5 removes a ground from its left-hand contact and connects the grounded battery 3 with its right-hand contact. Consequently, current will flow from battery 3 through the right-hand contacts of relays R_{12} and R_{13} and through the signal lamps S_7 and S_9 to ground thereby lighting the said signal lamps. It should be pointed out that certain assignment trunks are used for outgoing calls, that is, calls going out from office A to another office and other assignment trunks are used only for calls incoming to office A from another office. For the purpose of describing this invention trunk L_5 has been assumed to be an outgoing assignment trunk and L_6 an incoming assignment trunk. In order to enable the dispatch operator to readily distinguish the assignment trunks assigned to outgoing or incoming calls, inasmuch as the operating practice varies slightly, the lamp caps upon the O. K. signal lamps, such as S_7 and S_9 associated with the trunk L_5 , are colored green while the caps for the similar lamps S_{12} and S_{14} associated with the incoming assignment trunk L_6 are colored white. At the dispatch toll office B, the assignment trunk

there designated also as L_5 will have white O. K. signal lamps because trunk L_5 at that office is an incoming trunk. And in similar manner the assignment trunk also designated L_6 at office B will have green O. K. lamp signals because it is an outgoing trunk at office B. It will accordingly be seen that when the dispatch operator at B assigned, for example, trunk L_6 to the call that had been transmitted to her and both dispatch operators had noted this trunk number on the backs of their respective tickets, that this number means an incoming trunk at office B and an outgoing trunk at office A, although both trunks have the same designating number.

When the report operator at A has secured the calling party's line and has connected it with the proper assignment trunk, she places the ticket in that assignment clip at the rear of the dispatch table which bears the same number as the assignment trunk and simultaneously she takes from that clip a tag bearing the number of the trunk and places this tag in a clip in front of the cords connected with the plugs P_3 and P_5 . This tag serves as a means for readily identifying the call associated with this cord circuit.

At the toll office B the procedure is somewhat similar. The report operator at B takes the ticket from the unnumbered clip and inserts a plug similar to P_3 into a jack similar to J_3 of a line similar to L_3 and calls the operator at the central office where the called party's line terminates. If the report operator at B reaches the called party and he is ready she advises him that he will be called again in a few minutes and when he hangs up his receiver she inserts a plug of the cord circuit corresponding to P_5 in a jack corresponding to J_6 of the assignment trunk bearing the number L_5 , which operates the O. K. signal at the dispatch table B. It should be remembered, however, that since this is an incoming call at office B the assignment trunk there has a white lamp cap over the O. K. signal lamp. If the report operator at B has secured the called party in the manner described she places the ticket in the ticket-clip in front of the cords of the cord circuit connecting the switching trunk to the assignment trunk. If, on the other hand, the report operator is unable to reach the called party, she will note upon the ticket such report as she has been able to obtain and place the ticket in the report clip at the right-hand side of the dispatch table. The method of handling such reports will be described later.

As soon as the dispatch operator at B receives the white lamp signal indicating that the called subscriber has been reached, the dispatch operator at B, using any non-busy toll line such as L_1 or L_2 , passes to the A dispatch operator an order such as "O. K.

L_5 " indicating not only that she has secured the called party's line but also that such party is available for receiving the call. The dispatch operator at A upon receiving the green lamp signal S_7 will accordingly assign a toll line to this call assuming, of course, that a toll line is available. The dispatch operator at A will insert the plug P_7 in the jack J_7 , thereby connecting the toll line L_1 with the assignment trunk. She then operates her ringing key K_1 in a right-hand direction so as to ring the calling subscribers and at the same instant operates the splitting key K_2 of the cord circuit connected with the plug P_7 so as to keep the line L_1 effectively disconnected from the assignment trunk in order that this toll line may continue to be used for further interoffice business. Upon the insertion of the plug P_7 in the jack J_7 current will flow from battery 4 through the sleeve contacts of the plug P_7 and jack J_7 over conductor 5 and through the winding of relay R_{13} to ground, thereby operating the said relay. By the opening of its right-hand contact the O. K. signal lamp at the dispatch table is extinguished. By the closing of its inner left-hand contact current flows from battery 6 through the guard lamps S_5 and S_5' associated with jacks J_5 and J_5' . The operation of the lamp S_5 informs the report operator that a toll line has been assigned to this call.

When the dispatch operator at A inserts the plug P_7 in the jack J_7 , she operates the ringing and splitting keys K_1 and K_2 of the cord circuit connecting the toll line with the assignment trunk. The operation of the splitting key tends to keep the toll line effectively disconnected from the terminal circuit and therefore renders it practicable to use this toll line for transmitting new calls between the dispatch operators at A and B. The operation of the ringing keys K_1 applies ringing current from the source 8 over the tip and ring conductors of the cord connected with the plug P_7 , thence over the assignment trunk L_5 , thence through the cord circuit at the report operator's position and over the switching trunk L_3 and the subscriber's line to the calling subscriber's station thereby ringing the distant subscriber's station. This ringing current operates relay R_6 associated with the cord circuit at the report operator's position which removes the shunt path around the signal lamp S_{10} causing this lamp to light.

The report operator at A, upon seeing the toll cord signal S_{10} lighted, notes from the number check in the spiral clip associated with the cord pair the assignment trunk number. She then removes the ticket from the numbered spiral corresponding to the assignment trunk number on top of the dispatch table and returns the number check to its numbered spiral. As soon as the calling

subscriber answers by removing his receiver from its hook, the subscriber's supervisory lamp signal S_{11} will operate as the result of the operation of the relay R_{10} . The report operator will advise the calling party that she is ready with the called party, and when the calling party orders the connection established, the report operator operates the splitting key K_5 of her cord circuit and simultaneously rings over the assignment trunk by operating the ringing key K_4 in a left-hand direction. The ringing current applied to the assignment trunk L_5 from the source 9 will be transmitted to the cord circuit at the dispatch table, but will not pass on to the toll line because the splitting key K_2 at the dispatch table is operated. This ringing current will, however, energize the relay R_1 associated with this cord circuit which will remove the shunt path around the lamp S_1 thereby permitting the said lamp to light and will apprise the dispatch operator at A that the subscriber has answered and is ready to go ahead with the call.

While these operations have been going on at the dispatch office A, similar operations have been carried on at B. As soon as the dispatch operator at B received from the dispatch operator A an assignment of a toll line, she inserted the plug of her cord circuit corresponding to P_7 in a jack corresponding to J_7 and operated the ringing and splitting keys of her cord circuit in a manner similar to that described above. The application of ringing current not only operated the bell at the called station but also operates a toll cord supervisory signal lamp corresponding to S_{10} at the report operator's position at the B office. Upon seeing this lamp lighted, the B report operator removes the ticket from the spiral clip associated with the cord pair at her position, and as soon as the called subscriber answers, as indicated by the subscriber's supervisory signal similar to S_{11} , she advises the party that she is ready with the calling subscriber. As soon as she is ordered by the called party to go ahead, she operates her splitting key and then rings over the assignment trunk by operating her ringing key corresponding to K_4 . As the result of this ringing operation, the signal lamp corresponding to S_1 at the dispatch table at office B will be operated.

The dispatch operator at B, upon noticing the operation of the signal lamp S_1 , says to the dispatch operator at A that she is ready on the line L_1 .

The dispatch operator A also having received the signal from her report operator by the operation of the lamp S_1 , tells the dispatch operator B to go ahead on the line L_1 . The passing of the "ready" and the "go ahead" orders may be done by either dispatch operator. The first dispatch operator

who notes the toll cord supervisory signal such as S_1 lighted passes the "ready" order, which is followed by the other dispatch operator's "go ahead" as soon as she notes her corresponding signal.

The dispatch operator A again operates her ringing key K_1 , which transmits ringing current over the assignment trunk L_5 and operates the relay R_6 associated with the cord circuit at the report operator's position whereby the supervisory lamp S_{10} is lighted. This ringing current will not pass over the switching trunk to the subscriber who is then at his telephone, because it will be remembered that the splitting key K_5 at the report operator's position is operated so as to split the cord circuit. The dispatch operator at A also restores her splitting key K_2 to its normal position, so that the toll line L_1 is effectively connected over the assignment trunk L_5 to the report operator's position.

As soon as the report operator A sees the toll cord supervisory lamp S_{10} lighted, she operates her splitting key K_5 in the opposite direction so as to connect her telephone set with that side of the cord circuit connected with the assignment trunk L_5 thereby connecting her with the called party.

While these operations have been going on at the A dispatch office, similar operations have been carried on at the B office. There the dispatch operator operated her ringing key corresponding to K_1 as soon as she received the "go ahead" signal from the dispatch operator at A and simultaneously restored her splitting key corresponding to K_2 to its normal position. The ringing current operated a lamp similar to S_{10} at the report operator's position at B, and upon the receipt of this signal the report operator restored her splitting key to normal and supervised the connection sufficiently to see that such connection had been properly established. These operations at offices A and B are carried out practically simultaneously, so that the report operator B will have restored her splitting key to its normal position by the time that the report operator A has operated her splitting key in such direction as to enable her to talk with the called party.

As soon as the report operator at A meets the called party, which therefore insures that the talking connection is properly established, she restores her splitting key to its former position, thereby connecting her telephone set with that part of the cord circuit connected with the calling party and tells the calling party to go ahead. The report operator then restores her splitting key to its normal position thereby connecting the calling and called parties.

As soon as the calling and the called parties terminate their conversation and hang up their receivers, the subscribers dis-

connect signals such as S_{11} and S_3 are operated in the cord circuit at the report position and also in the cord circuit at the dispatch position at both ends of the line. The operation of the disconnect signal at the dispatch tables gives to the respective dispatch operators the information that the toll line is clear and available for reassignment, so that these dispatch operators do not have to wait for the receipt of such information from their corresponding report positions. If a report operator such as at "A" disconnects her cord circuit from the assignment trunk by withdrawing the plug P_5 from the jack J_5 , the dispatch operator at A would be so advised by the flashing of the signal lamp S_3 . The withdrawal of the plug P_5 from the jack J_5 disconnects battery 1 from the winding of relay R_{12} . The release of relay R_{12} closes its left-hand and opens its right-hand contacts. A circuit is therefore established which includes the grounded interrupter 10, left-hand contact of relay R_{12} , outer left-hand contact of relay R_{13} , ring contact of jack J_7 and plug P_7 , ring conductor of cord circuit at dispatch table, contact of key K_1 , winding of relay R_5 and grounded battery 12. Relay R_5 would be intermittently operated and the lamp signal S_3 would flash, thus attracting the attention of the A dispatch operator. This insures the prompt releasing of the toll lines for other calls.

When the report operator at B is unable to reach the called party, that is to say, the called telephone is not answered, or, if answered, the called party is not there, the procedure is different from that just described. The B report operator notes upon her ticket such report as she has been able to obtain and places the ticket in the report clip at the right-hand side of the B dispatch table. The dispatch operator at B takes the ticket and transmits the report to the dispatch operator at A over any non-busy toll line. In transmitting this report the B dispatch operator gives the A dispatch operator the serial number and the assignment trunk number of the call which enables the A operator to readily locate the ticket relating to this call. The A dispatch operator takes the ticket from the assignment clip at back of her table, leaving the number of the assignment trunk to which it had been assigned, and after noting thereon the report received from the B dispatch operator she inserts the ticket vertically in the same numbered assignment clip. Since the normal position of tickets placed in the clips upon the dispatch tables is horizontal, the attention of the report operator at A will be attracted. This operator will then take the ticket, and will ring the calling party's telephone by operating the key K_4 . It will be remembered that the report operator at

A has previously established a circuit connection with the calling party but has not rung over the line. When the calling party answers, the report operator gives her the report regarding the call, and then files the ticket. The number check which the A report operator had previously inserted in the clip in front of the cord pair associated with this calling party's line is returned to the assignment clip having the corresponding number.

To enable each of the dispatch operators to determine quickly the status of the assignment trunks between her dispatch table and the corresponding report positions, a trunk assignment indicator is provided. Such an indicator is shown in position upon the dispatch table in Fig. 3 and in detail in Fig. 3^a. This indicator consists of a block having a sloping face containing, in its simplest form, three slots. Associated with these slots are a number of buttons so arranged as to slide easily along the said slots and to be readily removable therefrom. The upper slot holds only those buttons bearing numbers corresponding to the outgoing assignment trunks. In like manner, the middle slot holds those buttons corresponding to the incoming trunks. Since the outgoing trunks at office A are odd numbered and the incoming trunks even numbered the corresponding buttons will be so numbered. The lowest slot is intended to hold the buttons of both types of trunks after the trunks have been assigned.

The method of using the indicator in order to keep track of the various assignment trunks is as follows: The buttons corresponding to trunks which have not been assigned to any call are grouped at the right-hand end of the upper and middle slots. After a call has been passed, for example, from the dispatch operator at A to the dispatch operator at B and an assignment trunk has been assigned to that call, the operator at A will remove the button having the number of the assigned trunk from the upper slot and place it in the lower slot. As soon as a toll line has been assigned for the completion of the call associated with that particular assignment trunk the button corresponding to this trunk is placed in the upper slot but at the left-hand side thereof. By glancing at this indicator the dispatch operator can tell instantly the status of her assignment trunks. Thus, for example, in the indicator represented by Fig. 3^a, trunks 1 and 3 of the outgoing group and trunks 2, 4 and 6 of the incoming groups are unassigned; trunks 9 and 10 have been assigned to particular calls but no toll line has been assigned for the completion of the connection; trunks 5 and 7 of the outgoing groups and trunk 8 of the incoming group have been connected

with toll lines. As soon as any of the calls have been completed over trunks 5, 7 or 8 the corresponding button will be moved from the left-hand toward the right-hand side of the upper or middle slot.

By means of an indicator performing the functions just described, each dispatch operator is thereby enabled to quickly determine the status of any of her assignment trunks.

During periods of heavy traffic, calls are passed between dispatch operators faster than they can be completed. Consequently W. Hs. obtained as hereinbefore described accumulate waiting circuits. As each toll line is released, it is assigned to the next W. H. in order, and for each such assignment there is, of course, one assignment interval as it might be termed, that is, the period from the making of an assignment until both parties concerned are at their telephones ready to talk. During the assignment interval the dispatch operators use the toll line to pass new calls, which in turn create new W. Hs. and to receive reports on calls previously passed. In practice it develops that these assignment periods are usually of sufficient length to maintain W. Hs. ahead of the available toll lines as long as new business continues to come in heavily. The fundamental principle upon which the dispatch method of operation is based is to utilize the assignment periods to the utmost for the purpose of passing a plurality of calls in advance of the time when such calls can be completed, thereby creating a reservoir of parties ready to talk as soon as the toll lines are available. Since in practice it has proved possible during periods of traffic congestion to keep W. Hs. continually awaiting assignment, the lost circuit time per message, that is to say, the time not available for conversation, has been approximately reduced to the minimum required to bring to their telephone the persons known to be available. The application of the aforementioned fundamental principle which underlies the method and means in which this invention is embodied, results in greatly increasing the circuit efficiency of the dispatch system of operation by cutting down the amount of lost circuit time (time not available for conversation) which in the ring-down method of operation and in other known methods of operation heretofore employed was relatively large and therefore resulted in low operating efficiency.

It has been found in practice that if W. H. reports are allowed to accumulate so that there is too long a delay in establishing the circuit connection one or both of the parties involved will not be available after the assignment has been made to a toll line trunk. To avoid these cancelled as-

signments which reduce the efficiency of the operation, it has been found desirable to pass no new calls between the dispatch operators after the number of W. Hs. awaiting assignment to toll lines is equal to twice the number of toll circuits in the dispatch group, until the number of W. Hs. has been reduced to the number of circuits in the group.

Although this invention has been described as embodied in a certain arrangement of means, it is to be understood that it is not so limited but is capable of embodiment in other and different means without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. In a despatch toll telephone system of the character described, the method which consists in transmitting over any non-busy toll line from the outward to the inward despatch operator the details of a toll telephone call, obtaining a report regarding the called party, holding the called party's line if that party accepts the call, transmitting over any non-busy toll line from the inward to the outward despatch operator a report concerning the said call, assigning a toll line for ultimate use in establishing a circuit for the said call, building up proper terminal arrangements for completion of the said call, and maintaining the terminal circuits effectively disconnected from the said toll line until the calling and the called parties are ready to talk, whereby the said toll line is available to the despatch operators for the transmittal of further calls, reports, etc., after such assignment has been made and substantially up to the time when the parties begin talking.

2. In a despatch toll telephone system of the character described, the method which consists in recording the details of a toll telephone call, transmitting such record over any non-busy toll line to the despatch operator at the called office, assigning a serial number to such call and also assigning the said call to an idle assignment trunk, taking up without ringing the calling subscriber's line, establishing a connection with the called party and holding the said party's line, transmitting a report from the called toll office to the calling toll office over any non-busy toll line that the called party is available, assigning the said call to any non-busy toll line, ringing the calling and the called parties from their respective despatch tables, supervising the said calls by the respective report operators, signaling the respective despatch operators that the parties are ready, transmitting a "ready with" signal by the despatch operator who first receives a signal from her report operator that her party is ready, transmitting a "go ahead" signal by that despatch operator

who last receives such a signal, and then effectively connecting both parties with the toll line.

3. In a despatch toll telephone system
5 characterized by two tollboards, connected
by a plurality of toll lines, each board having a despatch table and a report position
thereat, assignment trunks connecting said
table and said position, switching trunks
10 extending from said boards to local central
offices, cord circuits to connect the said
switching trunks with the said assignment
trunks and cord circuits to connect the said
assignment trunks with the said toll lines,
15 the method of operating the said system
which consists in transmitting over any
non-busy toll line a call from the outward
despatch operator to the inward despatch
operator and releasing the said line, getting

a report upon the said call by the inward
report operator, transmitting over any non-
busy toll line a report upon the said call by
the inward despatch operator to the out-
ward despatch operator and releasing the
said toll line, and calling the respective
parties to their telephones but maintaining
said terminal circuits effectively disconnect-
ed from the assigned toll line until both
parties are at their telephones and are ready
to talk whereby the use of the said toll lines
for the transmission of new calls and new
reports may be continued up to the time
when the parties begin to talk.

In testimony whereof, I have signed my
name to this specification this 22nd day of
June, 1923.

ERNEST A. GRAY.