Jan. 9, 1945. J. A. KRECEK ET AL 2,366,733

COMMUNICATION SYSTEM

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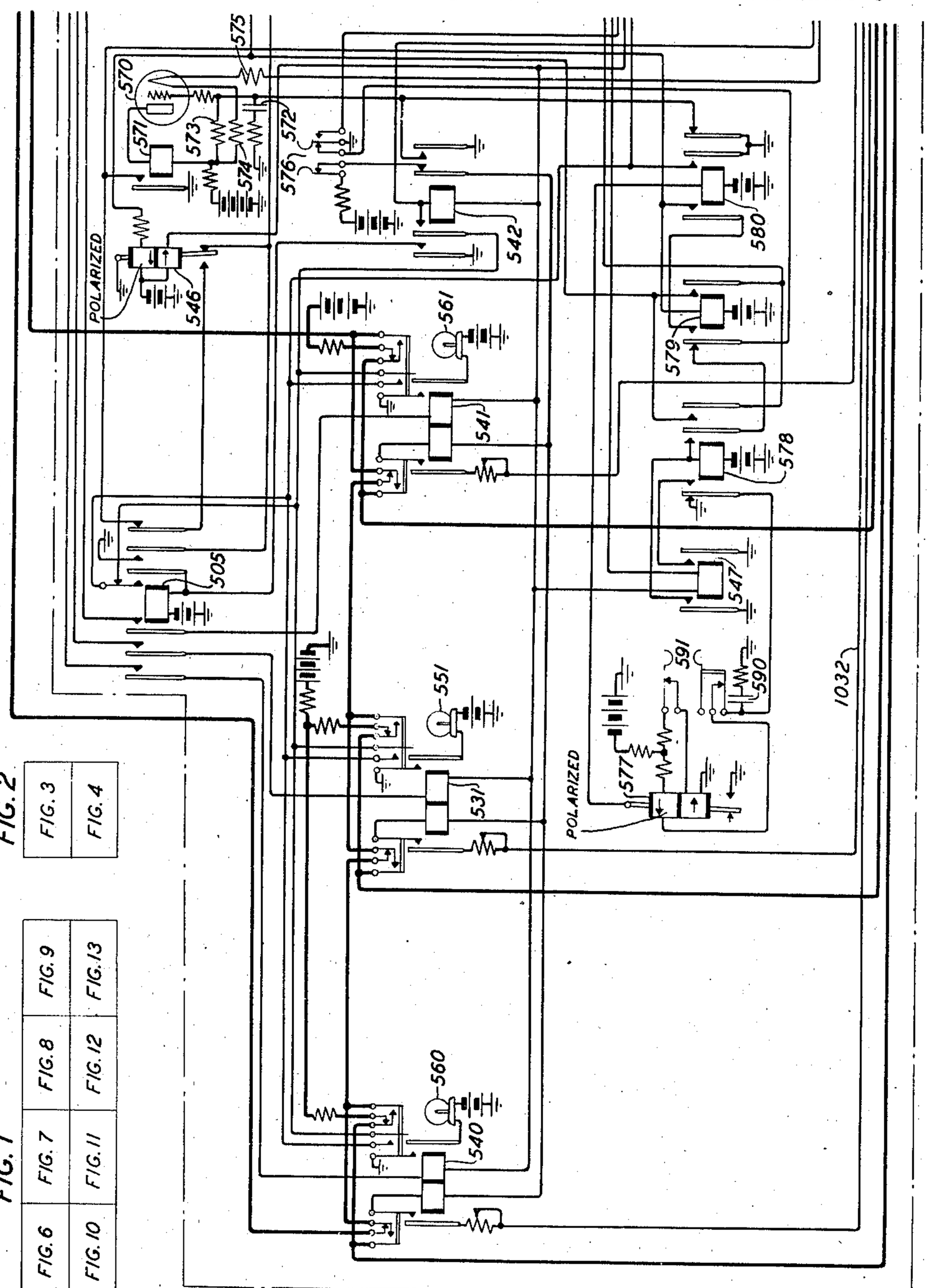

FIG. 2

FIG. 3	FIG. 4

FIG. 1

FIG. 6	FIG. 7	FIG. 8	FIG. 9
FIG. 10	FIG. 11	FIG. 12	FIG. 13
FIG. 5			

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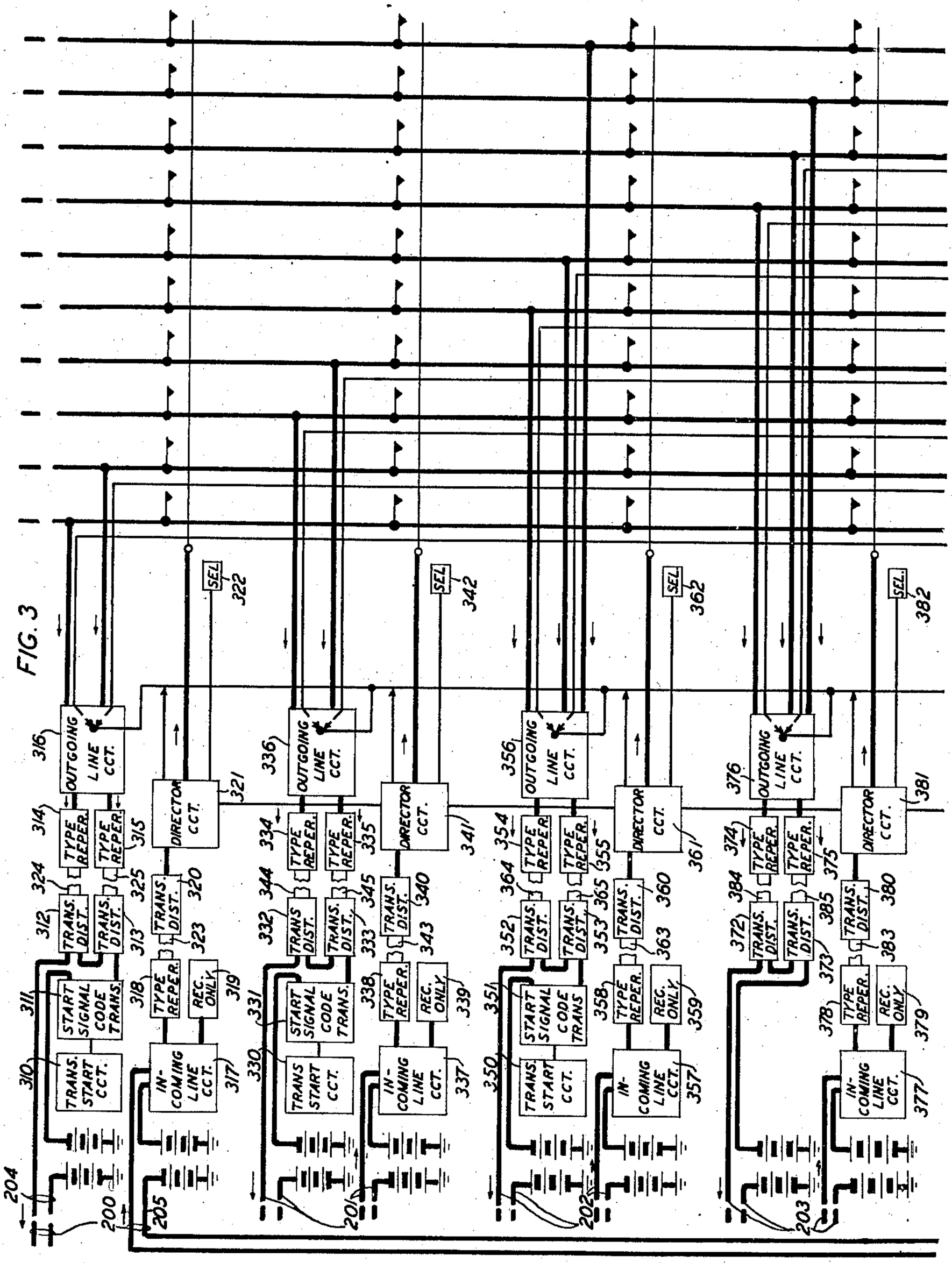
Filed Aug. 28, 1941 11 Sheets-Sheet 2

FIG. 3



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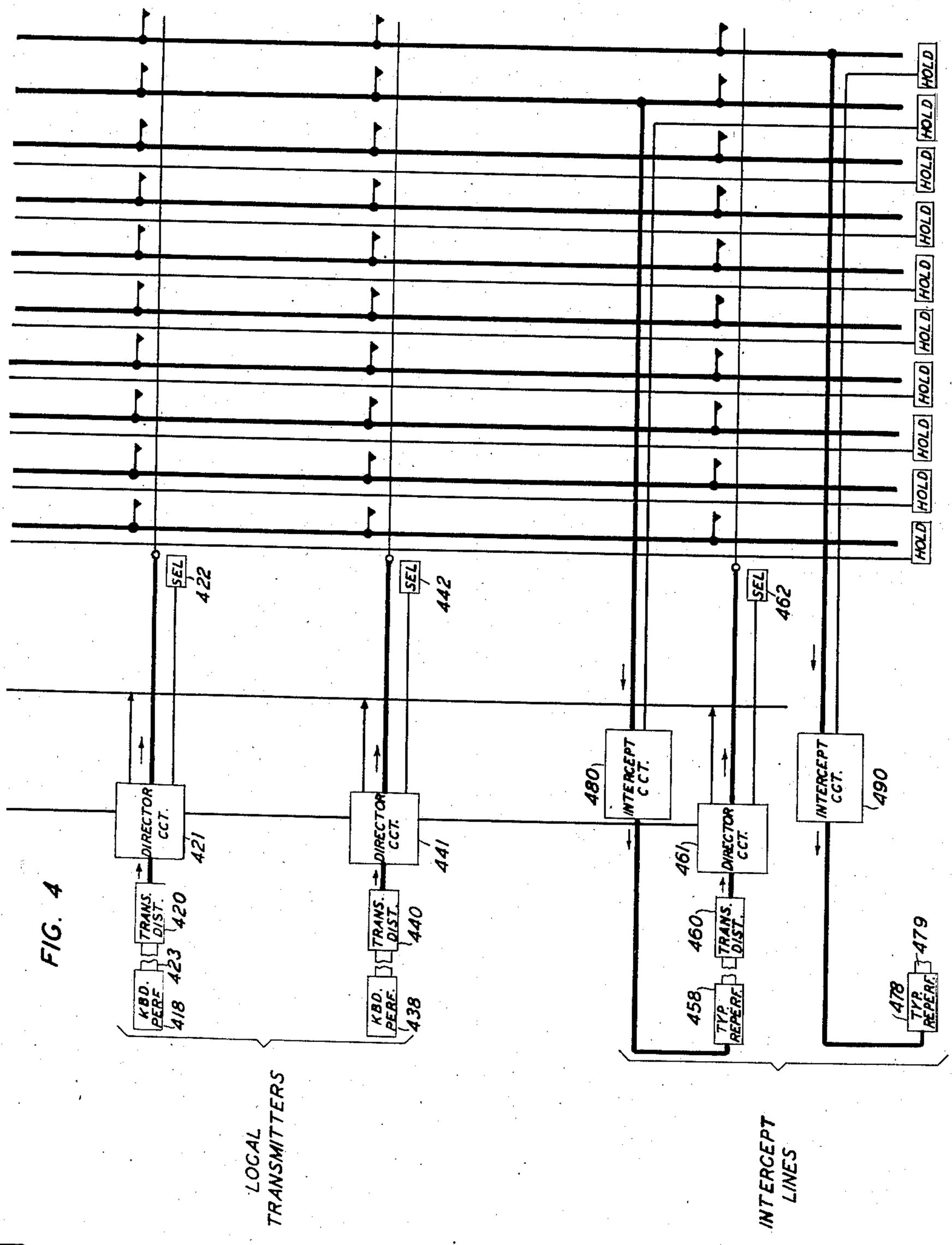

FIG. 4

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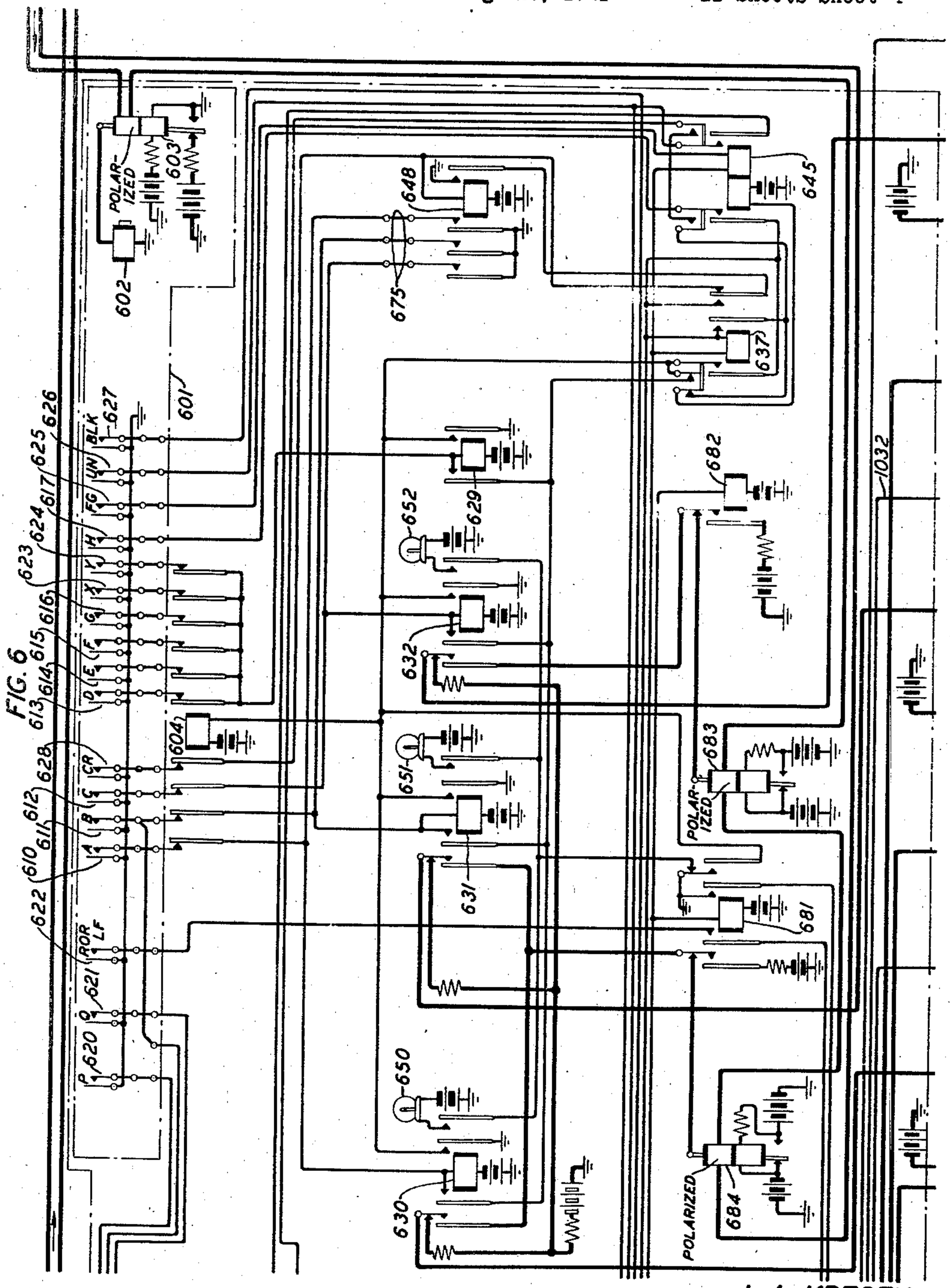

FIG. 6

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Jan. 9, 1945. J. A. KRECEK ET AL 2,366,733

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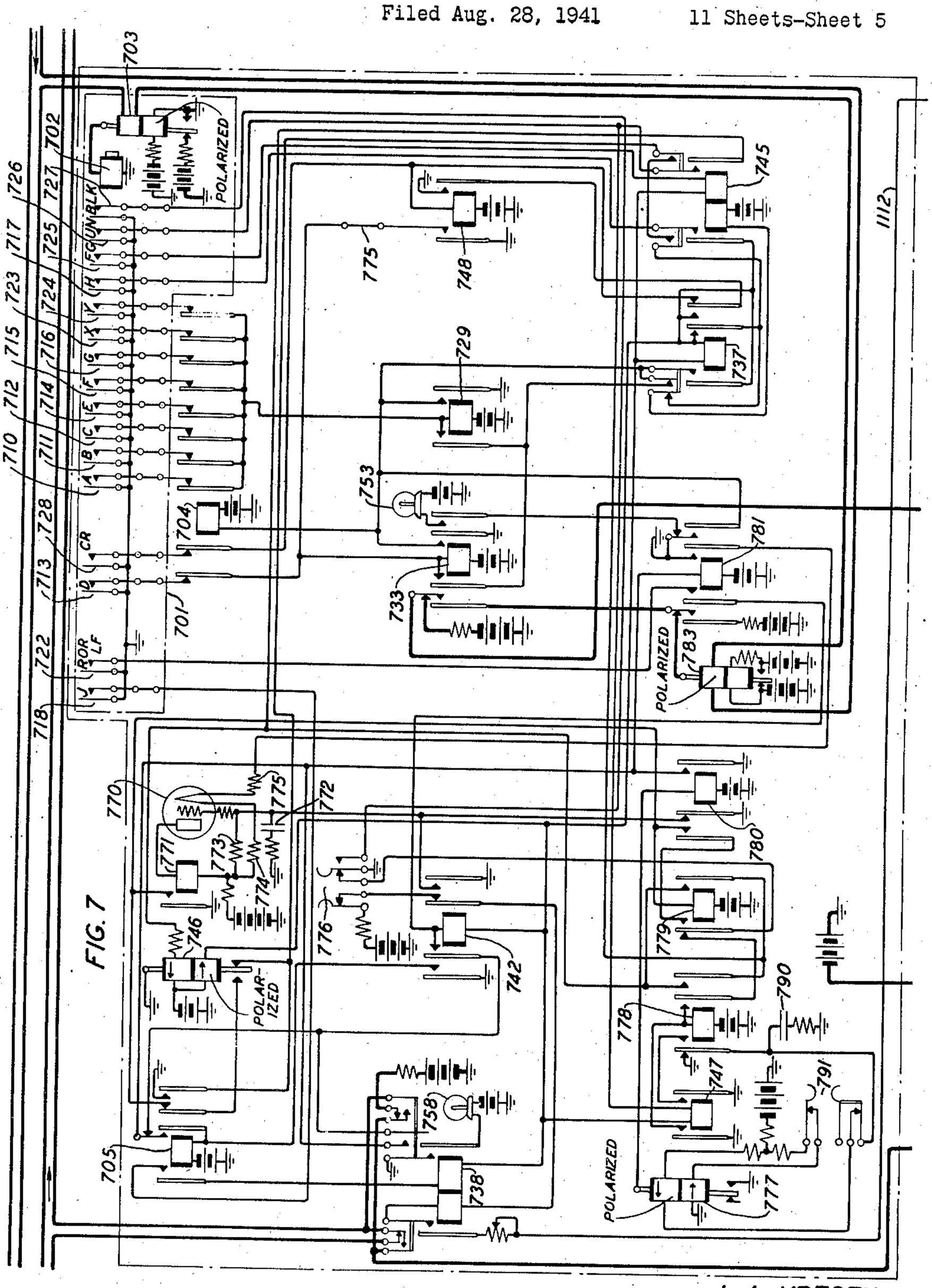

FIG. 7

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Jan. 9, 1945. J. A. KRECEK ET AL 2,366,733

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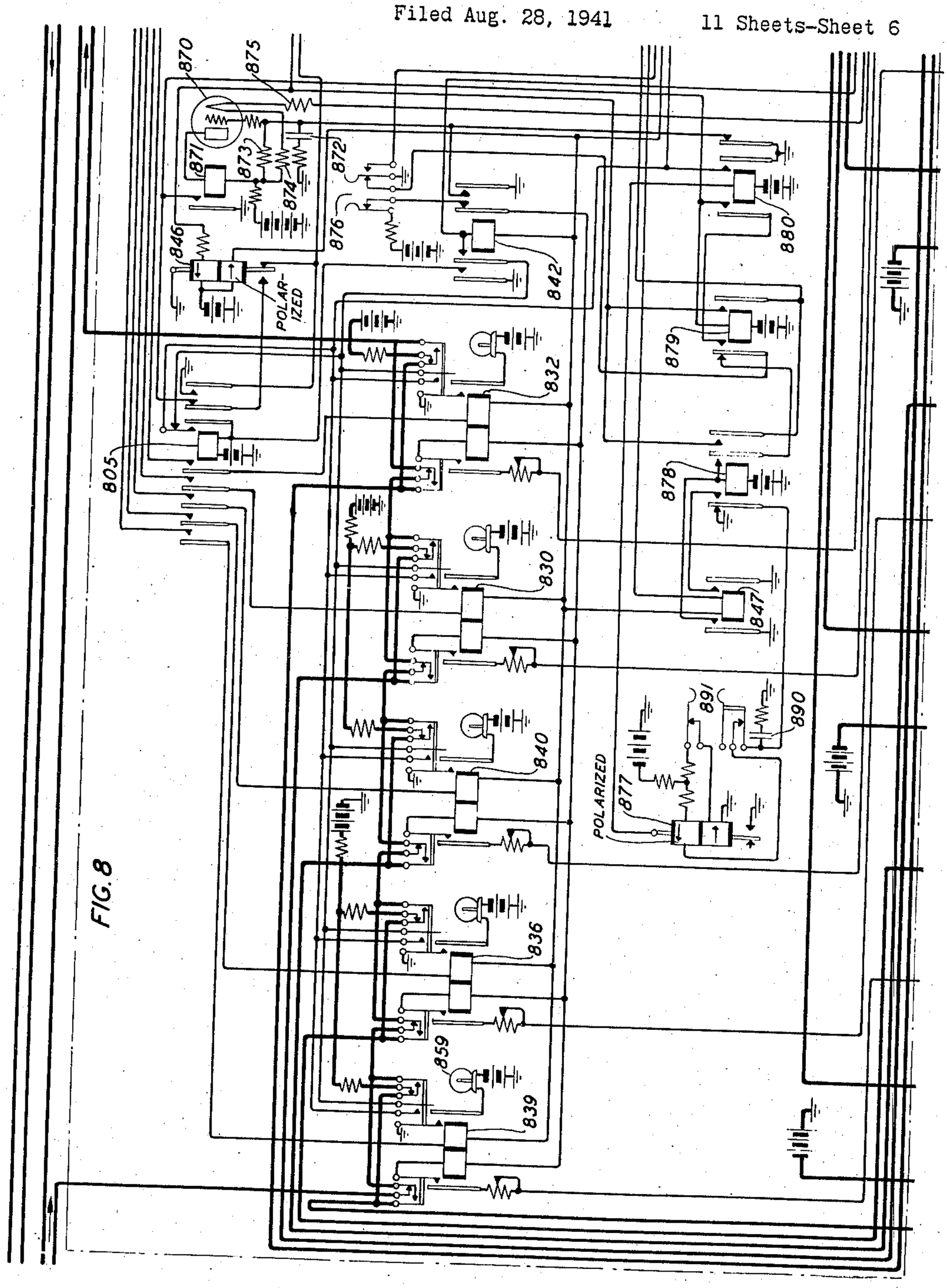

FIG. 8

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Jan. 9, 1945. J. A. KRECEK ET AL 2,366,733

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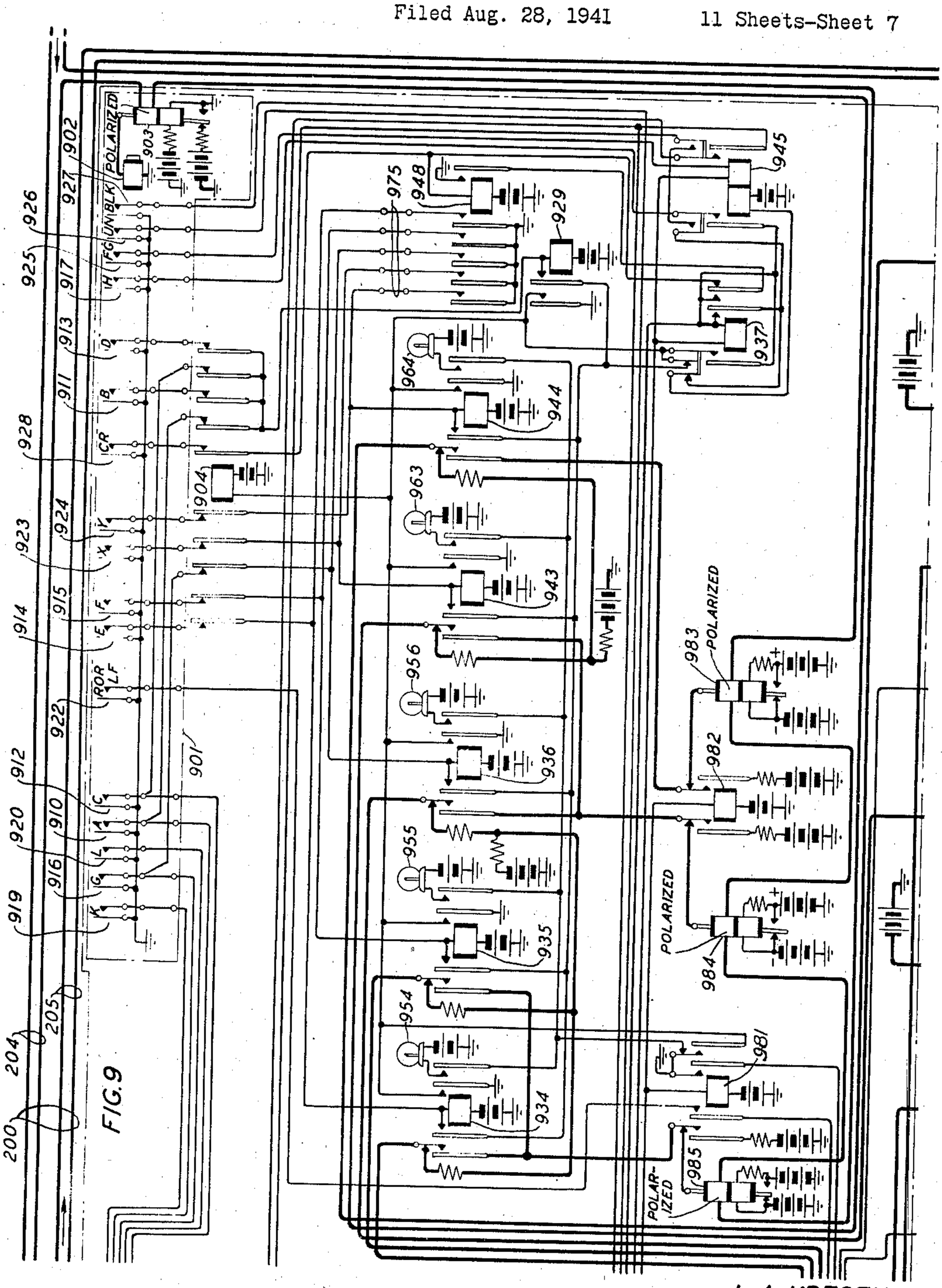

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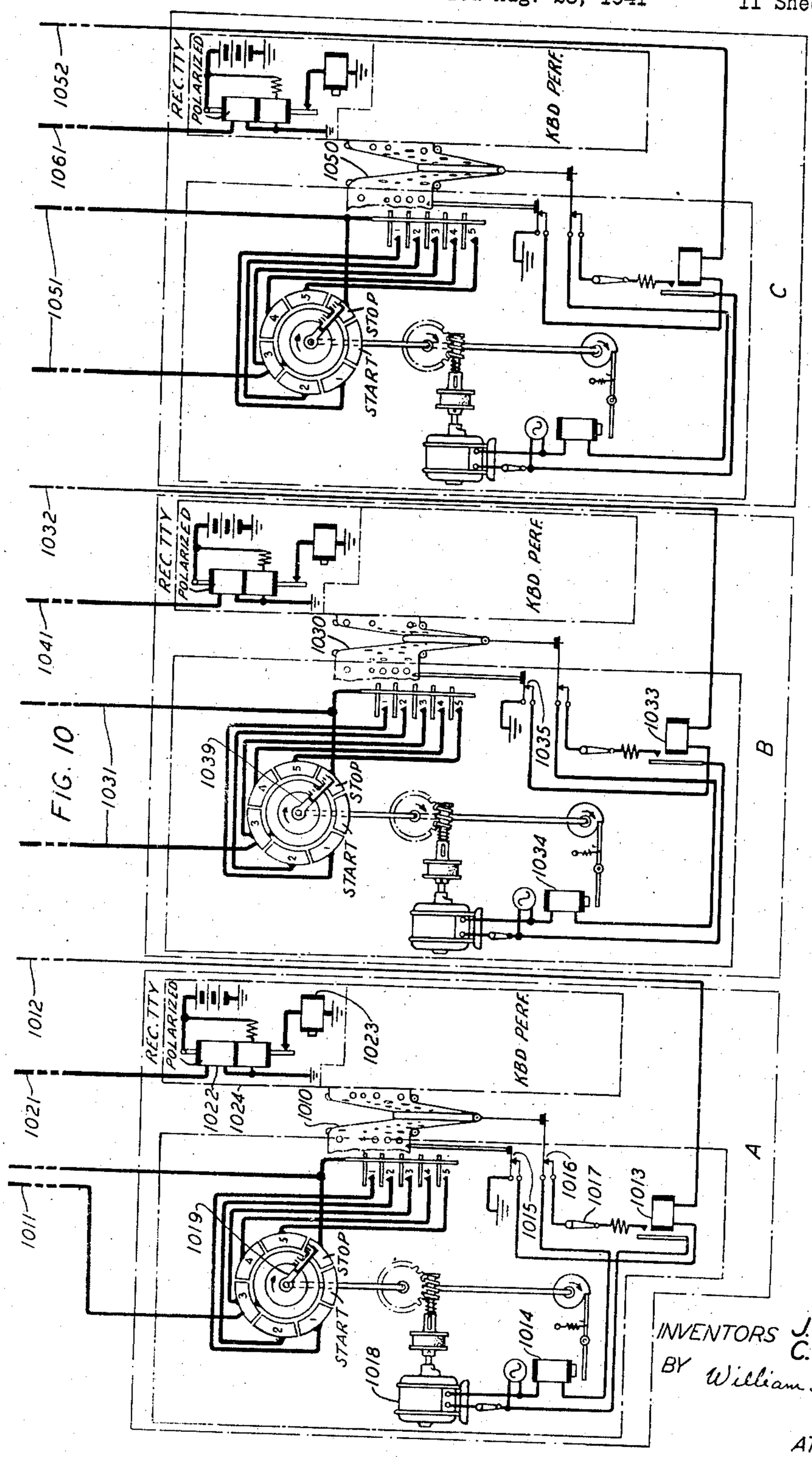

FIG. 10

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Jan. 9, 1945. J. A. KRECEK ET AL 2,366,733

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Filed Aug. 28, 1941 11 Sheets-Sheet 9

FIG. 11

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Jan. 9, 1945. J. A. KRECEK ET AL 2,366,733

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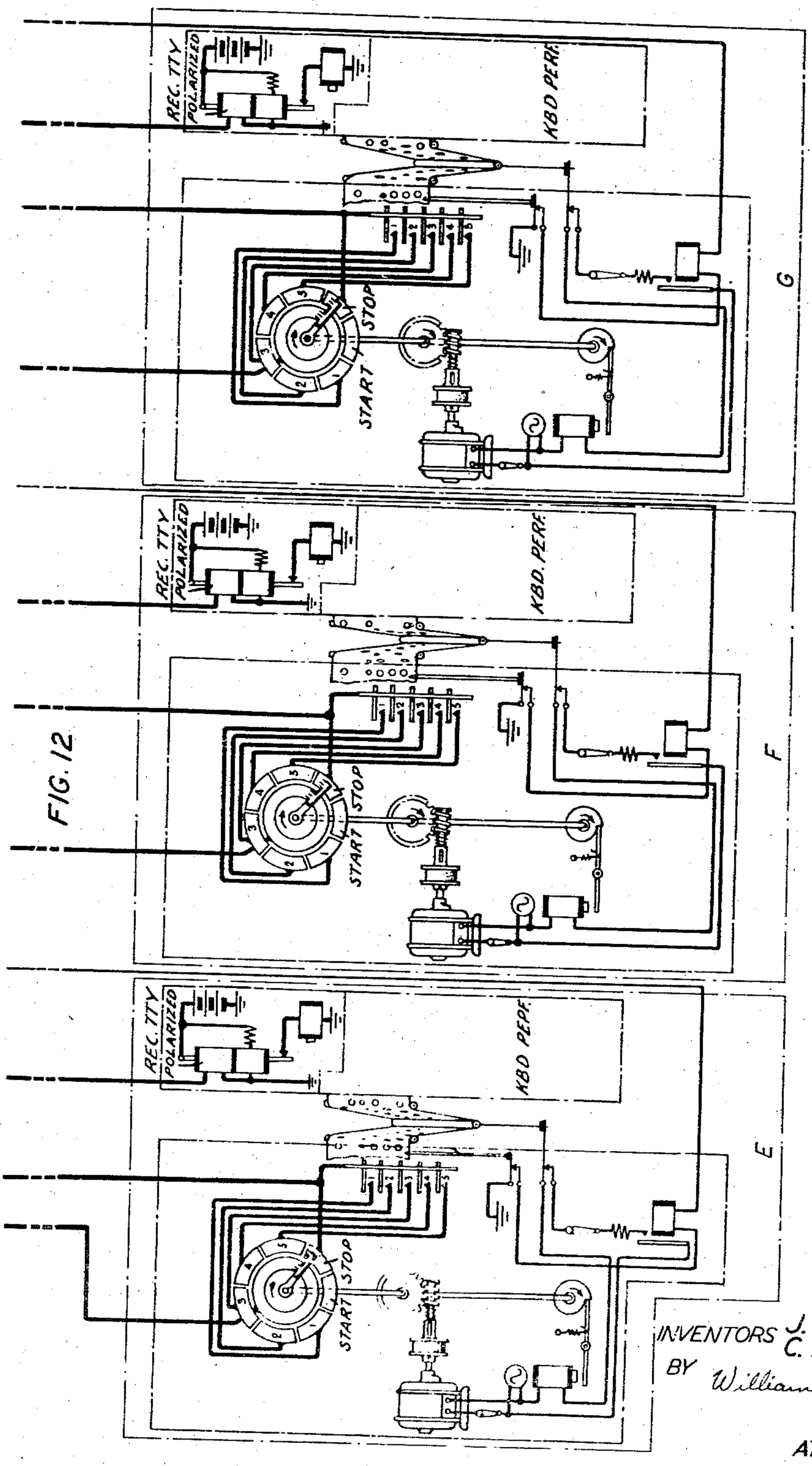

FIG. 12

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Jan. 9, 1945. J. A. KRECEK ET AL 2,366,733

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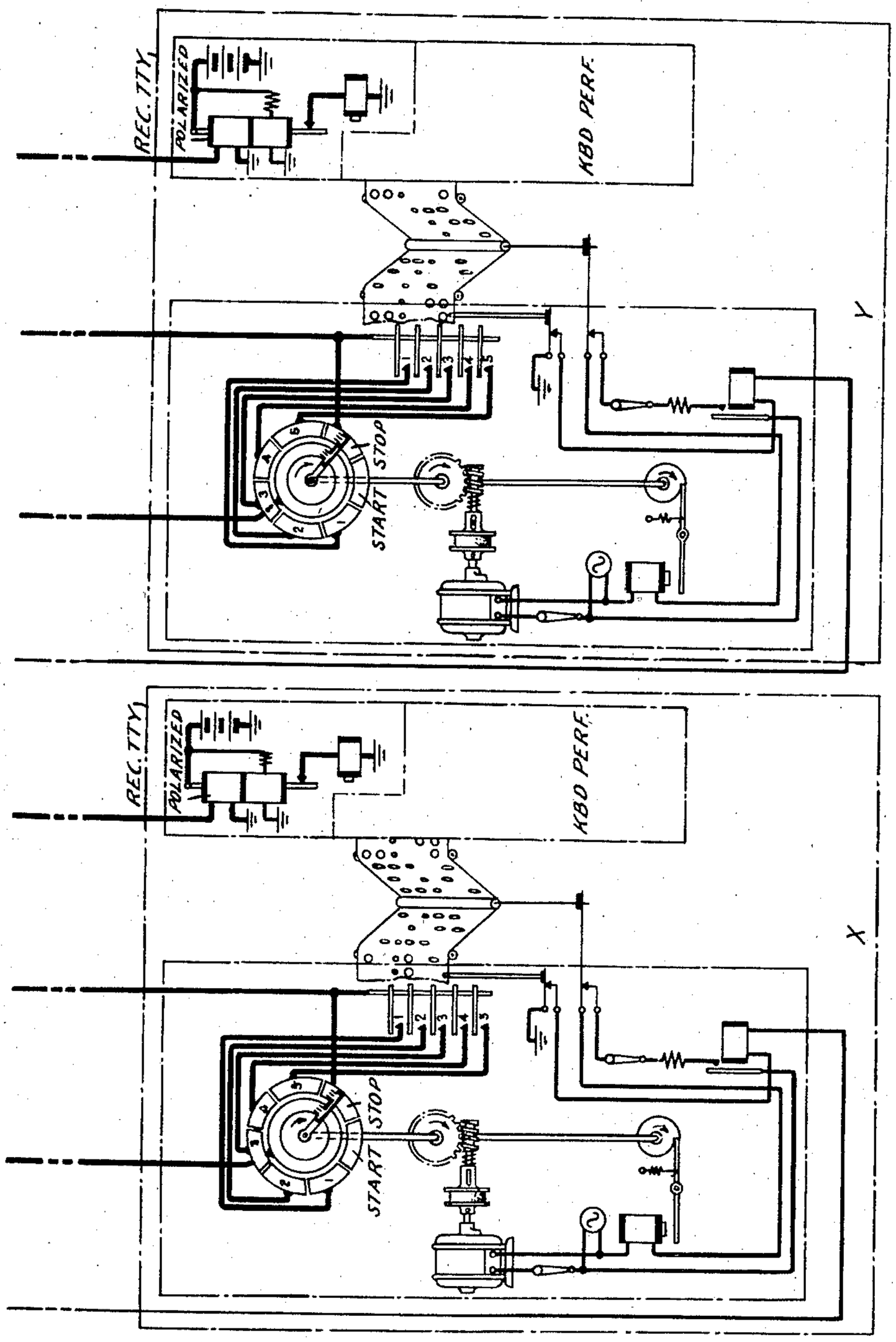

FIG. 13

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Patented Jan. 9, 1945

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UNITED STATES PATENT OFFICE

2,366,733

COMMUNICATION SYSTEM

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Application August 28, 1941, Serial No. 408,604

21 Claims. (Cl. 178—4)

This invention relates to an improved telegraph transmission switching system and to improved outlying subscriber station circuits connected to party lines extending to a central switching center.

More particularly, this invention relates to an improved outlying subscriber station circuit of the type disclosed in the copending application of Bacon et al., Serial No. 383,490, filed March 15, 1941 and is arranged to cooperate with the switching system disclosed in that application.

In accordance with the present invention, the outlying station circuit switching equipment is arranged so that the same character may be employed to select and control both the transmitting apparatus at any given station and also the receiving apparatus at the same or any other station connected to any given party line.

Another object of this invention relates to an improved conditioning or activating arrangement which requires the reception of two predetermined code combinations in succession in order to render at least a portion of the switching equipment responsive to succeeding signals and code combinations transmitted over the system.

Another feature of this invention relates to a circuit arranged for reducing the effect of false or extraneous currents upon the system by requiring a specific pattern of the succession of predetermined code combinations interposed with other signals of predetermined character and duration to condition at least certain of the switching equipment.

Another feature of this invention relates to the use of a single selector for controlling two separate, distinct and independent groups of switching devices.

Another feature of this invention relates to circuits and apparatus for cancelling the effects of the reception of certain predetermined characters when they are followed by other signals or code combinations except when they are immediately followed by other predetermined signals of special character and duration or other specified code combinations.

Another object of this invention is to provide a switching equipment at one or more of the outlying stations or switching centers of a party line for recording all of the messages at one or more of the stations when the message is preceded by switching characters not assigned to any station connected to that particular party line.

The outlying station circuits and switching equipment shown in the above-identified patent application Bacon et al. failed to respond to or record messages received at the various stations along the party line unless they were preceded by a switching character designating a particular station served by the party line indicating the station to which the message was directed. When the messages were properly addressed the message would appear and only at the particular station to which the message was designated. However, in the case of a mutilated or improperly designated or addressed message being transmitted from the switching center to a particular line, the entire message would be lost and not recorded in any of the stations. In accordance with the present invention, the circuits are arranged to cause such messages to be recorded at any one or more or all of the stations connected to the party line. Thus, in case a message is directed to the proper party line but the signal designating the particular station on the line is mutilated or lost, the message will be received at some one or more of the stations. In case the message is received at all of the stations it usually can be readily determined from the context of the message which one of the stations the message should have been transmitted to. In this case the message will be disregarded by all of the other stations but will be considered a message for the station so intended.

In case it is undesirable to record such improperly addressed messages to all of the stations, the switching equipment located near or at the respective outlying stations may be so arranged that such messages are recorded only at one or any number of the stations connected to the line. In this case, the more lightly loaded or centrally located stations will be selected. When such messages are received at these stations, the proper destination may usually be determined from the context of the message and the message retransmitted to the proper station. In case the destination of the message cannot be properly determined from the context of the message, the message may be retransmitted to the originating station or to the central switching center. In any case, the message is not entirely lost.

Another feature of this invention relates to an improved relay arrangement for cancelling the effect of the closure of certain contacts of the selecting equipment unless they are succeed-

ed by the closure of other specified or predetermined contacts of the selecting equipment.

Briefly, in accordance with the specific embodiment of this invention, a plurality of subscriber stations are associated with or connected to party lines extending to a central switching station.

Secondary switching equipment is located at or near various outlying stations of the party line. The secondary switching equipment may be individual to each of the outlying stations or it may be common to a number of outlying stations. The secondary switching equipment includes a selecting device which is permanently connected to the receiving channel of the party line and receives all of the signals transmitted from the central station over the party line. This selecting equipment is provided with contacts which are selectively closed in response to the reception of predetermined signals transmitted over the system.

This selecting equipment is arranged to control two separate, distinct and independent groups of switching devices or equipments. The first group of switching devices is arranged to operatively associate the receiving apparatus at any of the stations controlled by the particular secondary switching equipment with the party line. The second group of switching devices is arranged to start the transmitting apparatus at any of the stations controlled by the particular secondary equipment.

In general, the receiving equipment at each of the outlying stations comprises a telegraph receiving recorder of which the teletypewriter is a typical example. The transmitting apparatus at each of these stations comprises message storing apparatus such as a keyboard perforator with which the attendant may punch or perforate a tape in accordance with the message to be transmitted. The stored signals or tape are then inserted in a telegraph storage or tape controlled transmitter for transmission to the central switching station. Transmission, however, does not immediately take place.

The telegraph line extending from all of these stations to the central switching station comprises a full duplex telegraph channel capable of transmitting messages simultaneously in both directions without interference. This telegraph transmission system may be of any suitable type and include any of the low frequency or direct current telegraph transmission systems including grounded open wire lines, full metallic cable circuits, telegraph channels of composited telephone and telegraph lines, channels of time division multiplex telegraph systems, telegraph channels of low frequency or voice frequency carrier current, telegraph channels of high frequency carrier current and radio telegraph channels and any combination of these various well understood telegraph communication transmission systems. These telegraph systems may include any suitable type of terminal and intermediate repeaters, regenerative repeaters and the like, as well as gain control apparatus, level compensators, compensating networks and equalizers, all other types of such apparatus and other apparatus sometimes employed in systems of these types. All the respective types of telegraph systems operate in their usual well understood manner so that all of the details of these systems have been shown.

In order to simplify the drawings so that the features of this invention may be more readily apparent, two one-way telegraph transmission paths have been shown. One path is arranged to transmit signals from the switching center to each of the secondary switching centers located along the party line and thence to the selected outlying stations controlled thereby. The other path is arranged to transmit signals from any of the outlying stations to the central switching station.

During idle periods all of the secondary switching centers are arranged to be maintained in a condition so that the switching equipment for controlling the receiving apparatus at the respective outlying stations will be responsive to all but certain predetermined signals transmitted from the central switching station.

As set forth in the above-identified patent application of Bacon et al., each of the messages transmitted over the system is preceded by certain telegraph signals or code combinations designating the particular station to which the succeeding message is directed. Following each of the messages certain predetermined signals are transmitted indicating the completion of that message. The signals preceding each message are employed at the central switching center to direct the message to the proper party line and at the secondary switching centers of that party line, the same or at least certain of the same signals are employed to selectively and operatively associate the receiving equipment at the station to which the message is directed with the party line. The predetermined signals following the message are employed to disestablish the transmission paths and the operative connections employed in the transmission of the preceding message.

Consequently, the first signals transmitted over the receiving channel from the central station will be the switching characters preceding each message. The switching equipment at each of the outlying secondary switching centers will respond to these signals and selectively cause the proper receiving equipment to be operatively associated with the receiving channel of the party line. The reception of these switching characters causes the selecting equipment at each of the secondary stations to render the switching equipment for controlling the receiving devices at all of the stations non-responsive to further signals transmitted over the receiving channel of the party line. Thereafter the message will be transmitted to the selected receiving apparatus.

In case the first signal or code combination transmitted over the receiving channel is not assigned to any of the stations associated with the party line, none of the receiving devices at any of the stations will be operatively associated with the party line and the selecting equipment will not render the switching equipment non-responsive to further signals transmitted over the line.

Normally following the first directing signals transmitted over the line, a carriage return signal (any other suitable signal may be employed) is usually transmitted preceding the message proper in order to properly position the carriage of the receiving device for the reception of the following message. The circuits at one or more of the switching centers are arranged to respond to this carriage return signal and cause the receiving equipment at one or more of the stations controlled by the secondary switching centers to be operatively associated with the party line. In the specific embodiment of the invention shown in the drawings, connections are made so as to

cause the receiving equipment at all of the stations to be operatively associated with the receiving channel of the party line under these circumstances. Consequently, the message will be transmitted to all of the stations of the party line. The reception of the carriage return signals under these circumstances causes the switching equipment for controlling the receiving apparatus to be rendered non-responsive to any further signals transmitted over the party line.

As will be well understood by persons skilled in the art, these special circuits responsive to the carriage return or other predetermined signal may be provided at only certain of the switching centers and cause only one or more but not all of the receiving devices to be associated with the receiving channel. It is also within the scope of this invention to provide a special receiving device for receiving such messages and causing the messages to be recorded only upon this special receiving device.

In the specific embodiment of this invention shown in the drawings, the figures signal followed by an H signal is employed to indicate the end of each message. The reception of the figures signal immediately followed by an H signal causes the operative receiving equipment to be non-responsive to further signals transmitted over the receiving channel of the party line and further causes the switching equipment for controlling the receiving equipment at all of the stations to be rendered responsive to the succeeding signals transmitting over the receiving channel of the party line. Consequently, the first signals preceding the next message which will be transmitted over the receiving channel of the party line will cause the proper receiving apparatus to be operatively associated with the receiving channel. Thereafter, the circuit will operate in the manner similar to that described above.

As indicated above the attendants at each of the outlying stations will perforate the tape in accordance with the message to be transmitted to the central switching station and thereafter insert the perforated tape in the tape controlled transmitters at each of these stations. Switching signals will be perforated in the tape preceding each message and a figures signal followed by an H signal will be perforated in the tape at the end of each message. It is to be understood that suitable signals, such as letters signals, will be perforated in the tape between any of the various switching signals and between the switching signals or code combinations in the message as may be necessary to provide sufficient time for enabling the switching apparatus to function and establish the necessary transmission paths.

In order to start the transmission from any of the outlying stations, it is necessary that certain predetermined code combinations and signals be transmitted from the central station over the receiving channel. The selecting equipment at each of the secondary switching centers responds to these signals and causes the switching equipment controlled thereby to start the desired one of the transmitters whereupon the message is transmitted to the central or main transmitting center. The manner in which the transmitters are started in the specific embodiment of this invention disclosed herein is briefly as follows.

Any transmission over the receiving channel from the central switching station is first interrupted for a short interval of time following which a blank code combination is transmitted from the central station. A blank code combination comprises a code combination in which all five of the significant selecting impulses are of a spacing character. Following the blank code combination a pause of approximately .7 of a second is transmitted from the central station. During this pause the marking condition is applied to the receiving channel of the party line. A predetermined code combination such as that representing the letter R is then transmitted from the central station and when this signal is received it causes any transmitter which may be connected to or transmitting over the transmission channel to be stopped and disconnected therefrom. Following the letter R signal, a second pause of approximately .7 of a second is transmitted from the central station following which a selecting code combination is transmitted which will selectively start and operatively associate any one of the transmitters with the transmission channel of the party line. Following the transmission of this selecting code combination, transmission from the the central office will be resumed after a slight pause.

The circuits at each of the secondary switching centers are so arranged that if signals are received during the pause in transmission following the blank signal, the effect of the blank signal is cancelled whereupon the circuits are reestablished as if no blank signal had been received. If following the blank signal no further signals are received during this .7 second interval, the transmission path extending from the receiving channel to any receiving equipment associated therewith is rendered ineffective so that further signals cannot be recorded as part of the message being received. If the letter R signal is not received within a predetermined time of approximately 2 to 5 seconds, the effects of the blank signal are cancelled. If the selecting code combination is not received within a similar period of time of approximately 2 to 5 seconds following the R signal, the circuits are restored to their previous conditions, that is, the transmission path between the receiving channel and the previously selected receiving apparatus is reestablished but none of the transmitters at any of the stations will be operative.

The circuits are so arranged that the transmission of messages over the receiving channel may be interrupted at any stage for the transmission of the signals for starting any of the transmitters and thereafter transmission of the message resumed without adding any characters to the message being transmitted or without deleting or mutilating any of the switching or message characters or the effects thereof upon the switching equipment controlling the reception of the message.

The foregoing objects, features and operation for the specific embodiment of the invention, the novel features of which are specifically pointed out in claims appended hereto may be more fully understood from the following description when read with reference to the attached drawings in which:

Fig. 1 shows the manner in which Figs. 5 through 13, inclusive, are positioned adjacent one another to form a typical party line circuit arrangement in accordance with this invention;

Fig. 2 shows the manner in which Figs. 3 and 4 are positioned adjacent each other for showing a suitable central line station;

Figs. 3 and 4 when positioned as shown in Fig. 2 show in outline form the various circuits on the central switching station; and

Figs. 5 through 13, inclusive, when arranged as shown in Fig. 1 show the details of the secondary switching centers and outlying stations associated with a typical party line designed in accordance with this invention.

Figs. 3 and 4 show in block form the various circuits at a typical central station similar to that disclosed in the above-identified copending patent application of Bacon et al. and are equivalent to Figs. 3 and 4 of said copending patent application. Figs. 5 through 13 are arranged to cooperate with this switching system and may be placed adjacent to Figs. 3 and 4, in which case the party line shown in Figs. 5 through 13, inclusive, is shown connected to party line **200** comprising a receiving channel **204** and transmitting channel **205**. As may be well understood by persons skilled in the art, the party line shown in Figs. 5 and 13 may cooperate equally well with any of the other party lines, such as with the party lines **201** and **202** of the central switching station shown in Fig. 3. It is also apparent that additional party lines may be provided each of which is provided with equipment similar to that shown in Figs. 5 through 13. It is to be understood that all of these party lines do not necessarily include the same number of stations or have the stations arranged in the same manner or associated with the same number of secondary switching centers. Instead, the stations and secondary switching centers may be arranged in any manner which may appear to be the most suitable in view of all of the factors in each particular case. These factors include among others geographical selection and separation of the various stations and also the traffic requirements of each of the stations. In general, sufficient stations are connected to a given party line to insure that it will operate at or near its maximum capacity for a greater portion of the time and thereby increase the efficiency of the line and reduce the cost per message transmitted thereover.

Figs. 5 through 13, inclusive, are also arranged so that they may be substituted for Figs. 6, 7, 8, 16, 17 and 18 of the above-identified patent application of Bacon et al. They also may be substituted for Figs. 26, 27, 35 and 36 and also for Figs. 44, 45, 53 and 54 of that application. When these figures are substituted for any of the groups of figures referred to above comprising party line circuits, they will cooperate with the switching equipment of said copending application in the same manner as the party lines shown described in said application. As will be readily understood by those skilled in the art, the number of stations connected to each of the lines will vary as conditions require. In addition, the apparatus at the central switch station, such as the transmitter start circuits and apparatus, may be altered and changed to cooperate with the stations connected to the respective lines.

It is deemed unnecessary to show all the details and describe the detailed operation of this switching equipment at the central switching station since it operates in substantially the same manner as described in the above-identified copending patent application of Bacon et al. and to which reference may be made for more detailed description thereof. In the following description it will be assumed that when the party line shown in Figs. 5 and 13 is connected to the party line **200** of Fig. 3, the central station equipment and circuits have been modified as required by the number of stations connected to the line, and that the central switching equipment operates substantially as described in the above-identified copending application.

Normally when power is applied to the system, the relays generally assume the position as shown in the drawings. The various motors driving the selecting equipment at the secondary switching centers, as well as motors driving the transmitters and receiving apparatus at the central switching station and at all the outlying stations, are assumed to be connected to sources of power and continuously rotating so that this equipment is all in a condition to transmit and receive messages. Similarly, all the other equipment at the central switching station is in a condition for receiving and transmitting messages over the party line.

At the central switching station the incoming messages from the transmitting channel are received either on a receiving only teletypewriter if they are intended for the central switching station or on a typing reperforator if they are intended for other stations connected to the system. In order to control this equipment an incoming line circuit **317** is provided in which the transmitting channel **205** of line **200** terminates. The tape **323** from the reperforator **318** controls the transmitter **320**. Signals recorded in tape **323** together with the tape transmitter **320**, director **321** and selector magnet **322** cause the tape transmitter **320** to be connected through the crossbar switch to the proper outgoing line circuit.

Any suitable type of the crossbar switch may be employed for establishing the connection between the transmitter **320** and the proper outgoing line circuit. The details of the crossbar switch have not been shown in full since switches of this type are well known in the prior art and the switch incorporated in this invention operates in the usual or customary manner. For a more detailed description of the mechanical and electrical features of a typical switch suitable for use in this invention, reference is made to United States Patent 2,021,329, granted to Reynolds November 19, 1935.

The outgoing line circuit is provided with two channels for receiving messages. These channels may be operated simultaneously to record different messages. When the first channel is busy recording another message, a second message will be received from the transmitting distributor over the second channel. A typing reperforator is associated with each of these channels. Thus, in Fig. 3, **314** represents the typing reperforator associated with the first channel of the outgoing line circuit **316**, while **315** represents the typing reperforator associated with the second channel of the outgoing line circuit **316**. Assuming that both channels are idle and that a message is directed to some station connected to full duplex line **200**, the message will be transmitted over the first channel of the outgoing line circuit **316** and recorded by the typing reperforator **314** in a tape **324**. Tape **324** will then control the transmitter **312**, causing the message to be transmitted over the receiving channel **204** of transmission system **200** to the desired station.

In addition to the transmitters **312** and **313** connected to the receiving channel **204** of line **200**, the transmitter control circuit **310** and associated signal code transmitter **311** are also connected to the outgoing or receiving channel **204** of the line **200**. The transmitter start circuit **310**

and the associated transmitter 311 are provided to selectively start the transmitters located at the stations served by this party line and to operatively associate them one at a time with the transmitting channel of full duplex line 200.

The other full duplex lines 201, 202 are similarly provided with terminal equipment at the central switching station. In addition, arrangements are made so that the second channel of the outgoing line circuit connected to line 202 may be disassociated with line 202 and employed to receive other messages which are improperly transmitted or for some reason improperly directed to the correct station.

Line 203 is provided with similar terminal equipment at the central station, except that the transmitter start circuit and its associated transmitter are not provided because only one station is connected to line 203. Consequently, there is no need for selectively starting the transmitter from the central station.

In addition, two local keyboard perforators 418 and 438 are provided at the central switching station for perforating tape in accordance with signals to be transmitted to other stations of the system. This tape controls the associated transmitters 420 and 440. These transmitters are in turn provided with directors 421 and 441, respectively, to enable them to be connected to the desired lines extending to the proper station. Two intercept circuits 480 and 490 are provided for receiving messages which are improperly switched or improperly transmitted over the system. Arrangements are also provided for directing messages intended for any one of the stations which may be shut down or inoperative due to trouble to either of these intercept circuits where the messages are recorded by the respective printing reperforators 458 and 478. The tape perforated by the typing reperforator 458 is employed to control transmitter 460. With the aid of the associated director 461 this transmitter may be connected to any of the outgoing line circuits under control of perforations in the tape. An interlocking circuit is provided between each of the director circuits to prevent more than one of the director circuits setting up a connection through the crossbar switch at a given instant of time. The circuits are arranged, however, so that once the circuit is established through the crossbar switch by one director, other director circuits may establish other connections through the switch without disturbing the connections already established. Busy-test arrangements are also provided to indicate whether either or both of the channels of the outgoing line circuits are busy, so that a director will be unable to connect its associated transmitter to a busy channel of an outgoing line circuit.

In the specific embodiment shown in Figs. 5 through 13, inclusive, three secondary switching centers are shown connected to the party line 200. Figs. 5 and 6 show the details of the secondary switching center most remote from the central switching station. Fig. 7 shows the details of an intermediate switching center, while Figs. 8 and 9 show in detail the circuits and switching equipment of the switching center adjacent the central switching station.

Three outlying stations are shown in Fig. 10 to be associated with and controlled by the secondary switching center shown in Figs. 5 and 6. The details of the equipment and the circuits of a single outlying station are shown in Fig. 11. The station shown in Fig. 11 is controlled by the secondary switching center shown in Fig. 7. Five outlying stations are shown in Figs. 12 and 13. These outlying stations are controlled by the secondary switching centers shown in Figs. 8 and 9.

It is to be understood that any number of switching centers may be associated with any party line and that any number of stations may be associated with any given secondary switching centers. However, traffic studies indicate that a maximum of five outlying stations controlled by one switching center and a maximum of ten stations connected to a given party line and controlled from one to ten secondary switching centers would adequately meet all of the traffic requirements of any party line likely to be encountered in commercial telegraph networks. It is to be understood, however, that there are no basic limitations to these numbers of stations or switching centers which may be associated with any given party line nor are there any limitations regarding the specific number shown in the embodiment of this invention hereinbefore described. It will be readily understood by those skilled in the art that the switching centers and outlying stations may be arranged in any desirable manner in accordance with operating, traffic and geographical considerations.

It is assumed that in the embodiment of this invention described herein the stations shown in Fig. 10 are designated by the letters A, B and C, station shown in Fig. 11 by the letter D, those in Fig. 12 by E, F and G, and the stations in Fig. 13 by the letters X and Y. Thus when any message transmitted over the receiving channel from the central switching station is preceded by any of these letters, the message will be recorded at the proper station.

The receiving channel 204 of the party line 200 extends through the line windings of line relays 903, 703 and 603 of the respective receiving selectors 901, 701 and 601 at the secondary switching centers. The receiving channel 204 also extends through the line windings of the repeating relays 983, 984, 985, 783 and 683 and 684 at the respective switching centers. All of these relays follow all of the signals transmitted from the central switching station over the receiving channel 204 of party line 200. Repeating relays 683, 684, 783, 983, 984 and 985 in following these signals normally do not repeat them to any of the stations, since the circuits through their contacts are not completed. Line relays 903, 703 and 603 repeat all the signals to the respective selector magnets 902, 702 and 602. These magnets follow the signals and selectively control a plurality of contacts in accordance with the character of these signals. The structure and manner in which this selecting equipment controls the various contacts is described in detail in United States Patents 2,120,235, granted to Beattie et al. June 14, 1938 and 2,154,547, granted to Walker April 18, 1939, which patents are hereby made a part of this application as if fully included herein. The various contacts controlled by the selectors at each of the secondary switching centers are momentarily operated each time the proper code combination or character is received by the selector magnet. However, as described hereinafter, closure of these contacts is effective to control the switching equipment at each of these stations only under certain circumstances.

Selection of an outlying station and the transmission of a message to the selected station

As pointed out above, each message is preceded by certain significant switching characters each designating the station to which the following message is directed or addressed. Assuming the first message transmitted from the transmitters **312** or **313** over the receiving channel **204** of the party line **200** is intended for station A, that is, the left-hand station shown in Fig. 10; this message will be preceded by the letter A. When the letter A signal is transmitted by one of the transmitters **312** or **313** over the receiving channel **204**, it will cause relays **903**, **703** and **603** to respond and repeat this character to the respective selecting magnets **902**, **702** and **602**. These selecting magnets will in turn cause the selecting equipment in each of these stations which is controlled by them to close the respective contacts **910**, **710** and **610**.

The closure of contacts **910** completes a circuit for the operation of relay **929** from ground through the momentarily closed contacts **910** the second right-hand break contacts of relay **904** to battery through the winding of relay **929**. Relay **929** in operating completes a circuit for maintaining itself operated from battery through its winding and inner operated contacts, the left-hand inner break contacts of relay **937** and the outer operated contacts of relay **929** to ground. Relay **929** in operating also completes a circuit for the operation of relay **904** from ground through its outer operated contacts to battery through the winding of relay **904**. Relay **904** operates and interrupts the circuits between contacts of the selecting mechanism **901** and the switching relays at stations shown in Fig. 9 which control the receiving devices associated with this control station. In other words, further operation of any of these contacts is ineffective to operate any of the switching relays at this point. Consequently, none of the stations controlled from the secondary switching center shown in Figs. 8 and 9 will receive any of the message signals following this A signal. It is to be noted that the selector magnet **902** will follow all of the signals transmitted over the receiving channel of the party line and cause the corresponding contacts to momentarily close. However, this selector when responding to these signals will not alter the switching circuits until certain predetermined signals have been received as will be described hereinafter.

Similarly relay **703** at the intermediate secondary switching center will respond to the letter A signal and repeat it to the selector magnet **702**. This magnet causes selector mechanism **701** to momentarily close contacts **710** and complete a circuit for the operation of relay **729**. Relay **729** in operating completes a circuit for maintaining itself operated under control of relay **737** and also completes a circuit for the operation of relay **704**. Relay **704** in operating disconnects the contacts controlled by selector **701** from the switching relays which control the receiving apparatus located at the station shown in Fig. 11. Consequently, the message will not be recorded by this receiving apparatus.

The relay **603** also responds to the letter A signal transmitted from the central switching station and repeats this signal combination to the selector magnet **602**. Selector magnet **602** in responding to this code combination causes contacts **610** of selector **601** to be momentarily operated. In this case the momentary operation of contacts **610** cause the operation of relay **630** by current flowing in a circuit from battery through the winding of relay **630** to ground through the left-hand break contacts of relay **604** and the operated contacts **610**. Relay **630** in operating completes a circuit for maintaining itself operated from battery through its winding and left-hand inner operated contacts and the left-hand inner break contacts of relay **637** to ground through the right-hand inner operated contacts of relay **630**.

Relay **630** in operating completes a circuit for the operation of relay **604** from battery through the winding of relay **604** to ground through the right-hand inner operated contacts of relay **630**. Relay **604** in operating interrupts the circuits extending between the contacts controlled by the selector **601** and the switching relays for controlling the receiving apparatus of the subscriber stations served by the secondary switching center shown in Figs. 5 and 6. Thereafter the operation of any of these contacts in response to the respective code combinations will produce no further effect upon the switching circuits or relays at this station.

Relay **630** in operating also completes a circuit for lighting lamp **650** from ground through the right-hand outer break contacts of relay **681** and the right-hand outer operated contacts of relay **630** to battery through lamp **650**. Lamp **650** in lighting indicates to the attendant that the station associated therewith, namely, station A shown in Fig. 10, is operatively associated with or connected to the receiving channel of the party line.

Operation of relay **630** also connects the armature of the repeating relay **684** to line **1021**. Consequently, when relay **684** follows the message signals of the following message it will repeat these signals over the conductor **1021** to station A. The transmission path from the armature of relay **684** may be traced from the contacts and armature of relay **684**, through the outer left-hand break contacts of relay **681** through the outer left-hand operated contacts of relay **630**, conductor **1021** to station A and line winding of relay **1022** to ground. At station A relay **1022** will follow these signals and repeat them to magnet **1023**. This magnet will cause the signals to be recorded by the receiving device **1024** at station A. Thus the signals following the letter A signal will all be received by the receiving device **1024** at station A.

Following the transmission of the A signal from one or the other of transmitters **312** and **313** from the central switching station one or more letters signals may be transmitted to provide sufficient time for the operation of the various relays and circuits described above. Normally a carriage return signal, a line feed signal and another letters signal will be transmitted immediately following these signals to insure that the receiving device **1024** which is usually a page printing telegraph instrument will be in the proper condition and position to receive the following message signals. Thereafter the message will be transmitted to the receiving apparatus at station A and be recorded thereby. As it is pointed out above, circuits will remain in this condition so long as this message is being transmitted to the station. It should be noted that the same code combinations which were initially used to control the switching relays and circuits may be transmitted during the message without changing the connections or the switching apparatus. In the specific example under consideration, the letter A which was used to establish

the transmission path to station A may be transmitted a number of times during the message without further affecting the circuits or any of the secondary switching stations. Similarly, characters designating the other stations connected to the party line may be transmitted during the transmission at the message without affecting the circuits at or to any of these stations.

At the end of this message a figures signal will be transmitted followed by an H signal. It should be noted that should a figures signal be transmitted during the message which is followed by some signal other than an H signal, the effect of the figures signal will be cancelled.

The operation of the circuits under these conditions is as follows: Upon the transmission of a figures signal contacts **625** of the selector **601** will momentarily close. Momentary closure of these contacts completes the circuit for the operation of relay **645** from ground through the closed contacts **625**, right-hand winding of relay **645** to battery through the lower winding of relay **546**. As indicated current flowing through the lower winding of relay **546**, which is a polarized relay, is in such a direction as to maintain its armature in its right-hand position as shown in the drawings. Relay **645** in operating completes a circuit for maintaining itself operated from battery through its left-hand winding, the left-hand outer break contacts of relay **637**, the left-hand and right-hand outer operated contacts of relay **645** to ground through the right-hand contact and armature of relay **546**. Operation of relay **645** also completes a circuit from ground through the universal contacts **626** and right-hand inner operated contacts of relay **645** to battery through the upper winding of relay **546**. Current flowing in this circuit tends to cause the armature of relay **546** to be operated to its left-hand position. However, this current produces an effect upon relay **546** which is weaker than the effect produced upon relay **546** by the current flowing through the lower winding of this relay. Consequently, relay **546** is maintained in the position shown on the drawings at this time.

Contacts **626** are closed once for each code combination received by the selector mechanism **601**. These contacts, however, do not close until after the other contacts close if the particular code combination received is one that normally controls any of these other contacts. In addition the contact **626** opens before any of the other contacts open. Consequently, the circuit through the lower winding of relay **546** is closed first and maintained closed for a short interval of time after the circuit through the upper winding of this relay is interrupted. Consequently relay **546** will be maintained in the position shown in the drawings.

If the following code combination transmitted over the receiving channel **204** of the party line **200** is any code combination other than a blank code, a figures combination or an H code combination, relay **546** will be operated to its left-hand position and interrupt the locking circuit of relay **645** which permits this relay to release. The circuit for the operation of relay **546** at this time may be traced from ground through the operated universal contacts **626**, the right-hand inner operated contacts of relay **645** to battery through the upper winding of relay **546**. Current flowing in this path will cause the armature of relay **546** to be operated to its left-hand position and interrupt the locking circuit of relay **645**. It should be noted that the only possible circuits through the lower winding of relay **546** at this time are the circuits which extend through either the figures contacts **625**, blank contacts **627**, and the H combination **617**. The operation of the circuit when the particular code combination is a figures code combination is substantially the same as described above when the first figures code combination was transmitted over the system. If the particular code combination happens to be a blank code combination, the circuit will operate as described hereinafter. If the particular code combination is an H combination, the circuit will operate to disconnect the receiving equipment at station A.

Assuming that the code combination following the figures code combination is neither an H code combination nor a blank combination, the operation of relay **546** as described above interrupts the locking circuit of relay **645** and permits this relay to release. Release of relay **645** returns the circuit to its preyious condition and cancels the effect of the reception of the figures code combination in so far as the switching equipment of the secondary switching center shown in Figs. 5 and 6 is concerned. Thereafter as many upper case characters including the H character or code combination may be transmitted over the system and recorded by the receiving device shown at station A without affecting the switching equipment or the transmission circuits extending to station A.

The selecting equipment at the intermediate secondary switching stations such as shown in Fig. 7 responds in a similar manner to the transmission of the figure signal followed by any signal other than a blank signal or an H signal. Relay **745** will be operated and then later released by the operation of relay **746**.

Likewise relay **945** will be operated at the first secondary switching center in response to the reception of the figures signal. Thereafter relay **846** will be operated to its left-hand position in response to the following code combination which under the assumed condition is neither an H signal nor a blank signal. The operation of relay **846** interrupts the locking circuit of relay **945** and this permits this relay to release and cancel the effect of the figures signal upon the switching circuits.

It should be noted that the receiving apparatus connected to the receiving channel receives and properly responds to the figures signal but the effects of this signal upon the receiving apparatus is not cancelled as described above with reference to the switching equipment. The effect of the figures signal upon the receiving apparatus is cancelled only in response to a "letters" signal and sometimes in response to a character spacing or other predetermined signal.

Assuming now that a code combination immediately following the figures code combination is an H code combination, when this code combination is received by the selector magnet **602**, it will cause the selector mechanism to momentarily close contacts **617**. Closure of contacts **617** at this time completes a circuit through the lower winding of relay **546** for maintaining its armature in the position shown. This circuit may be traced from ground through the closed contacts **617**, the left-hand inner operated contacts of relay **645**, winding of relay **637** to battery through the lower winding of relay **546**. Relay **637** operates due to current flowing through this circuit and relay **546** is maintained in the posi-

tion shown in the drawings even when contacts 626 close a short interval of time after contacts 617 close. This subsequent closure of contacts 626 completes a circuit through the upper winding of relay 546. However, since the circuit is also completed through the lower winding of the relay at this time relay 546 will be maintained in the position shown where it maintains the locking circuit for relay 645 and also for relay 637.

Relay 637 when operated completes a circuit for maintaining itself operated from battery through the lower winding of relay 546, winding of relay 637, the right-hand inner operated contacts of relay 637, the right-hand and left-hand outer operated contacts of relay 645 to ground through the right-hand contact and armature of relay 546.

Relay 637 in operating interrupts the locking circuit of relay 630 and thus permits this relay to release. The operation of relay 637 however maintains a circuit through the winding of relay 604 closed and thus maintains relay 604 operated as long as relay 637 remains operated. The operation of relay 637 also interrupts the locking circuit of the figures relay 645 and thus permits this relay to release. Release of relay 645 interrupts both the operating and the locking circuit of relay 637 and permits this relay to release. The release of relays 637 and 645 interrupt the holding circuit of relay 604 and permits this relay to release. Thus the circuit at the secondary switching center shown in Figs. 5 and 6 is returned to the same condition as it was in beginning and is thus ready to respond to a directing character which will be transmitted preceding the next message transmitted over the receiving channel 204 of partly line 200.

The circuits at the other secondary switching centers shown in Fig. 7 and Figs. 8 and 9 respond in a similar manner and first cause the operation of relays 745 and 737, the release of relays 729, 745, 737, 704 in the order named and thus restore the circuit to its original condition. In a similar manner the circuits at the other secondary switching center shown in Figs. 8 and 9 are also restored to their initial condition in response to the figures code combination immediately followed by an H code combination transmitted at the end of the message which was transmitted to station A.

Assume now that the switching characters preceding the next message which has been routed by the switching equipment at the central switching station to this line will be preceded by a first character which will not be the letter A, B, C, D, E, F, G, X or Y. Under these circumstances none of the contacts 610 through 616, inclusive, or 623 or 624 will operate in response to this first character. Neither will any of the contacts 710 through 716 inclusive or 723 or 724 operate in response to the first character. Likewise none of the contacts 910 through 916 or 923 or 924 will operate in response to the first characters transmitted over the receiving channel 204. Consequently, none of the switching relays controlled by these contacts will operate to connect any of the receiving devices at any of the receiving stations to the receiving channel. As pointed out above, following the first signals transmitted over the receiving channel one or more letter signals are usually transmitted in order to provide sufficient time for the switching circuits to function. Following the transmission of the letter signals a carriage return signal and a line feed signal followed by a letters signal are usually transmitted in order to properly position the carriage at the receiving instrument at the station to which the message is directed. If none of the switching contacts controlled by the selectors at the various stations have been operated when the carriage return signal is transmitted over the system, the selecting equipment at each of the secondary switching centers will respond to this signal and cause the respective contacts 628, 728 and 928 to momentarily close and complete circuits for the operation of relay 648 at the most remote secondary switching center, relay 748 at the intermediate switching center, relay 948 at the first switching center. The circuit for the operation of relay 648 may be traced from ground through the closed contacts 628, the inner left-hand break contacts of relay 604 to battery through the winding of relay 648. Relay 648 in operating completes a circuit for maintaining itself operated from battery through the winding of relay 648, the right-hand outer break contacts of relay 637 to ground through the right-hand operated contacts of relay 648. As shown in the drawings the operation of relay 648 will complete circuits for the operation of relays 630, 631 and 632 because all of the straps 675 are shown provided between the contacts of relay 648 and the windings of these relays. Consequently, the operation of relay 648 will cause each of these relays to operate which in turn will cause the receiving equipment at each of the stations, A, B and C to be operatively associated with the receiving channel 204. Consequently, all of these stations will receive the following message transmitted from the central switching station.

In a similar manner relay 748 completes a circuit for the operation of relay 733 and the relay 733 in turn operatively associates the receiving equipment at the station shown in Fig. 11 with the receiving channel 204.

Likewise the operation of relay 948 at the first secondary switching center completes circuits for the operation of relays 934, 935, 936, 943 and 944, the operation of which relays operatively associate the receiving equipment of all of the stations shown in Figs. 12 and 13 with the receiving channel of the party line.

The operation of all of these switching relays at each of the secondary switching centers completes the circuits for maintaining themselves operated under control of the respective relays 637, 737 and 937. The message following the carriage return signal will then be recorded by the receiving apparatus of all of the stations associated with the party line. In general this message will be intended for some one of the stations connected to the party line and the attendants at the respective station can usually readily determine from the context of the message the particular station for which it is intended and the message received in the other stations will be ignored and the message considered a proper one at the proper station. In case a message is intended for some other station than the one of the stations of this party line, the attendants at one or more of the stations may be assigned the duty of transmitting the message either back to the central switching station or to the station for which it is intended or to the originating station.

Provision has also been made to enable such messages to be directed to any one or more but not all of the stations connected to any given party line. In order to accomplish this the straps

or connections **675**, **775** and **975** are provided for only those stations to which it is desired to transmit the message under these circumstances. Consequently, when the relays **648**, **748** and **948** operate, they will only operate the switching relays, the circuits of which are strapped to the contacts of the respective relays **648**, **748** and **948**. Consequently only the stations controlled by these operated relays will receive the message.

At the conclusion of the message the figures signal followed by the H signal will be transmitted to the circuits at each of the secondary switching centers which will respond to these signals in the same manner as described above and restore the circuits and equipment to its original idle or normal condition.

It is also possible to broadcast any message to all stations of any given party line by transmitting a carriage return signal or, any other specifically designated code combination, which will cause the relays **648**, **748** and **948** or relays similar to these relays to operate at each of the secondary switching centers. If these relays are thus operated instead of the relays individual to each of the stations, they will cause all of the individual relays to be operated as described above and cause the message to be recorded at each of the stations served by the party line. Similarly by suitable connecting contacts on these relays and the individual relays described above any group of the stations associated with the respective party line may be selected for the simultaneous transmission of messages thereto. Additional relays and circuits for accomplishing this have not been shown since they would be quite obvious to any one skilled in the art and could and would be supplied by such persons when the need arises. The windings of relays **468**, **748** and **948** or of the additional relays would be connected through contacts of relay **604** to other contacts controlled by the selector mechanism as desired. The contacts of these relays would be connected to the windings of the desired individual relays as described above.

Starting a transmitter

At any time during transmission of a message from the central station to any of the outlying stations it is possible to interrupt the transmission then in progress and send transmitter start signals over the receiving channel **204** of the party line **200**.

As pointed out above, the attendants at each of the outlying stations will perforate the tape in accordance with the messages to be transmitted and insert the perforated tapes in the transmitter. Thereafter the message will be transmitted under control of the central station. Normally, the operator at the central switching station will control a special circuit so that it will send out a group of signals interspersed with pauses of predetermined duration constituting a definite pattern of signaling conditions for starting the transmitters at each of the stations served by the party line either in rotation or selectively under control of the operator. Assume for example that the attendant at station D has operated her keyboard to punch or perforate tape **1110** in accordance with a message to be transmitted from the station shown in Fig. 11. It is understood, of course, that switching or directing signals will be perforated in the tape prior to the message and that the figures signal immediately followed by an H signal will be perforated in the tape at the end of the message. The perforated tape is then inserted in the transmitter. The insertion of the tape in the transmitter causes contacts **1115** to close. The closure of these contacts merely partially prepares a circuit for the operation of relay **1113**.

Assume further that a message is in progress of being transmitted from the central switching station to the receiving equipment shown at station B. Under these circumstances, if the operator desires to start the transmitter at station D she will operate certain switches or other apparatus at the switching station to initiate the operation of the transmitter start circuit and equipment whereupon the transmission in progress over the receiving channel **204** from the central station to station B is first interrupted by stopping the transmitter at the central switching station. After the transmission has been stopped for a short interval of time of the order of a half of a second or a second, a blank code combination is transmitted from the transmitter start circuit over the system. In the blank code combination the five significant selecting impulses are all spacing. This blank code combination when transmitted over the receiving channel **204** is received by the receiving apparatus at station B. This apparatus however in responding to this code combination does not print any character nor does it advance the printing position a character space or respond in any other manner to this blank code combination.

The selector magnets **602**, **702** and **902** also respond to this blank code combination and cause their respective selector equipments to momentarily close the respective blank contacts **627**, **727** and **927**. The closure of contacts **627** completes a circuit for the operation of relay **547** from battery through the lower winding of relay **546**, winding of relay **547** to ground through the closed contacts of **627**. The operation of relay **547** completes the circuit for the operation of relay **578** which relay in turn completes the circuit for maintaining itself operated from battery through its winding and right-hand inner operated contacts and the left-hand break contacts of relay **579** to ground through the right-hand break contacts of key **576**. The operation of relay **578** extends a circuit from battery through the upper winding of relay **546** to the universal contacts **626**. However, since a circuit was previously completed through the lower winding of relay **546** and remains completed through the lower winding of this relay until after the universal contacts **626** open, relay **546** is maintained in the position shown. Later when contacts **627** open relay **547** will release and interrupt the circuit through the upper winding of relay **577**.

Normally relay **577** is maintained in the position shown by current flowing in a circuit from battery through its upper winding, lower contacts of key **591** to ground through the left-hand break contacts of relay **578**. A circuit is also completed through the lower winding of relay **577** tending to operate its armature to its right-hand position. However, the effect of the current flowing through the lower winding of this relay is much less than the effect of the current flowing through the upper winding of this relay. Consequently, relay **577** is normally maintained in the position shown in the drawings.

When relay **547** releases as described above it interrupts the circuit through the upper winding of relay **577**. The armature of relay **577** does not

immediately move to its right-hand position because condenser 590 starts to charge to battery potential through the upper winding of relay 577. The charging current of condenser 590 flowing through the upper winding of relay 577 is sufficient to maintain the armature of relay 577 in its left-hand position for a period of time approximately one-half of a second. At the end of this time the charging current of condenser 590 flowing through the upper winding of relay 577 will fall to such value that the current flowing through the lower winding of this relay will cause the armature of relay 577 to be operated to its right-hand position.

If any signals other than figures signals or blank signals are received during this one-half of a second interval relay 546 will be operated to its left-hand position in a circuit extending from battery through its upper winding to ground through the right-hand outer operated contacts of relay 578 and universal contacts 626. The operation of relay 546 at this time completes the circuit for the operation of relay 579 from battery through the winding of relay 579, the right-hand outer break contacts of relay 505 to ground through the left-hand contact and armature of relay 546. Relay 579 in operating interrupts the locking circuit of relay 578 which relay releases. Upon the termination of the closure of contacts 626 relay 546 will release and in turn releases relay 579 thus cancelling the effect of the blank signal and restoring the circuit to its previous condition.

Assuming that no signals are received during this interval, as will usually be the case when the transmitter start signals are transmitted from the central switching station, the operation of relay 577 completes an obvious circuit for the operation of relay 580. Relay 580 in turn completes a circuit for the operation of relays 681 and 682. Relays 681 and 682 interrupt the transmission circuit to all of the stations A, B or C which may have previously been receiving a message. Under the assumed condition, in which station B had been connected to the receiving channel, operation of relay 681 will interrupt this connection and maintain the receiving instrument at station B in its marking condition so that this instrument will not receive the remaining transmitter start signals transmitted over the receiving channel 204 of the party line 200. Consequently, these signals will not be added to the message which was in the progress of being received and recorded at station B. Relay 681, in operating also interrupts the circuit of lamp 651 and thus extinguishes this lamp.

Operation of relay 681 completes an obvious circuit for the operation of relay 604 which in turn prevents the closure of any of the contacts controlled by the selector 601 from operating any of the switching relays controlling the receiving apparatus at any of the stations shown in Fig. 10.

Relay 681 in addition completes the filament circuit of vacuum tube 570 and thus energizes this tube. The operation of relay 580 as described above removes ground from the right-hand terminal of condenser 572 and thus permits this condenser to start to charge to a positive potential through the high resistance 573. The potential of the right-hand terminal of condenser 572 controls the potential of the grid of tube 570. The constants of the charging resistance 573 and condenser 572 together with the constants of tube 570 and resistances 574 and 575 are such that it requires approximately a second and a half for condenser 572 to acquire a sufficient charge to cause tube 570 to pass sufficient current to operate relay 571.

During this second and a half time interval the letter R signal is usually received from the transmitter start apparatus at the central switching station. If this signal has not been received by this time relay 571 will operate and complete a circuit for the operation of relay 579. The operation of relay 579 at this time interrupts the locking circuit of relay 578 which releases and causes relay 577 to move to the position shown in the drawings. The release of relay 577 in turn causes relay 580 to release which in turn causes relays 681 and 682 to release and connects ground to the right-hand terminal of condenser 572 thus causing relay 571 to release. Release of relay 571 permits relay 579 to release and restore the circuit to the same condition that it was in prior to the reception of the blank signal. The release of relays 681 and 682 at this time reestablish any of the circuits from the receiving channel 204 to the receiving instruments at the stations shown in Fig. 10 that had been previously connected to this channel at the time the blank signal was received. Thus under the assumed condition in which station B had been receiving a message prior to the reception of the blank signal the circuit to station B will be reestablished upon the release of relay 681. Thereafter, the remainder of the message will be transmitted over the receiving channel and recorded by the receiving device at station B.

In other words if the proper signals are not received at the proper time or if the pauses are too long or too short, i. e., if the pattern of signaling conditions is mutilated or materially altered it will be ineffective to start any of the transmitters.

Assume now that the R signal is received and relay 542 will be operated prior to the operation of relay 571, the circuit for the operation of relay 542 may be traced from ground through the selector contacts 622, which are closed in response to the reception of the R signal, the left-hand inner operated contacts of relay 681, winding of relay 542 to battery through the lower winding of relay 546. A short interval of time after contacts 622 close, contacts 626 will close and complete a circuit through the upper winding of relay 546. Relay 546, however, will be maintained in the position shown due to current flowing in the above traced circuit through its lower winding.

Operation of relay 542 at this time interrupts the locking circuits of all of the relays 540, 531 and 541 and thus permits any of these relays to release which may have been locked operated when this R signal is received. The release of these relays will interrupt certain of the locking circuits of relay 542 and cause any of the transmitters at stations A, B or C to stop as will be described hereinafter. The operation of relay 542 also completes a circuit for maintaining itself operated from battery through the lower winding of relay 546, the winding of relay 542, the left-hand inner operated contacts of relay 542 to ground through the inner right-hand break contacts of relay 505 and the right-hand inner operated contacts of relay 580.

The operation of relay 542 also connects ground to the right-hand terminal of condenser 572 and thus completely discharges this terminal of the condenser and prevents relay 571 from operating. Relay 542 also completes an obvious

circuit for the operation of relay 505. Relay 505 in operating interrupts the locking circuit of relay 542 and permits this relay to release when contacts 622 open. Relay 505 in operating completes a circuit for maintaining itself operated under control of relay 580. This locking circuit may be traced from battery through the winding of relay 505 and its right-hand inner operated contacts to ground through the right-hand inner operated contacts of relay 580.

The release of relay 542, when contacts 622 open, removes ground from the right-hand terminal of condenser 572 and thus permits this condenser to again start to charge to a positive potential. If no further signals are received during the following time interval of approximately one and a half seconds, condenser 572 will be charged to the potential required to cause relay 571 to operate and operate relay 579. The operation of relay 579 causes the circuits at this station to be restored to their condition prior to the reception of the blank signal. In other words the effects of the blank signal and the R signal are cancelled in so far as the switching equipment at this particular station are concerned.

Thus prior to the second one and one-half second time interval relays 505 and 604 are operated. The operation of relay 604 disconnects the switching relays for controlling the receiving apparatus at stations A, B and C from the control contacts of the selector 601. Relay 505 when operated connects the switching relays for controlling the transmitting apparatus at stations A, B and C to the control contacts of the selector 601. By employing these two relays one to disconnect the contacts from the switching relays for controlling the receiving apparatus and the other to connect the contacts to the switching relays for controlling the transmitting apparatus, it is possible to use the same contacts to control either the receiving apparatus or the transmitting equipment located at these stations.

Normally during this second one and one-half second interval a selecting code combination will be transmitted over the receiving channel and received by the selector magnet 602. When this combination is received by this magnet, it will cause the corresponding contacts operated by it to momentarily close. If it is assumed that this code combination represents the letter B, contacts 611 will momentarily close and complete a circuit for the operation of relay 531 from ground through contacts 611, left center operated contacts of relay 505, the right-hand winding of relay 531 to battery through the lower winding of relay 546. A short interval of time later a circuit will be completed through the upper winding of relay 546, the operated contacts of relay 578 and the universal contacts 626. However, as described above relay 546 will remain in the position shown at this time. Relay 531 in operating completes a circuit for lighting lamp 551 to indicate to the attendant that the transmitting apparatus at station B is operatively associated with the transmission channel extending to the central switching station. The operation of relay 531 also operatively associates the transmitting equipment at station B with the transmission channel and disconnects the apparatus at station A from the channel extending to the central switching station. In other words, the connection or operative association of any transmitting apparatus with the transmitting channel extending to the central switching station disconnects or interrupts the transmission path extending to more remote stations so that any disturbance arising on the transmitting path more remote from the central switching stations than the transmitter transmitting will not interfere with or disturb the transmission to the central switching station.

It should be noted that under the assumed conditions contacts 611 were employed first to establish an operative connection between the receiving channel and the receiving apparatus of station B and then at a later time to cause the transmitting apparatus at station B to be operatively associated with the transmitting channel. Thus the same set of contacts controlled by the same selector in response to the same code combination will produce different switching effects depending upon the type of activating or conditioning signals received by such selecting equipment immediately preceding the code combination employed to control the switching apparatus.

The operation of relay 531 as described above also completes a locking circuit extending from battery through the left-hand break contacts of key 576, right-hand inner break contacts of relay 542, the left-hand winding and inner operated contacts of relay 531 over conductor 1032 extending to station B then through the winding of relay 1033 to ground through contacts 1035. These contacts will be closed if tape 1030 has been inserted in the transmitter. Under these circumstances, relay 531 is maintained operated and relay 1033 is operated. The operation of relay 1033 completes a circuit for the operation of the transmitter start magnet 1034 at station B and thus releases the transmitter brush arm 1039 and causes the transmitter to transmit the switching signals and the following message stored in tape 1030.

At the end of the second one and one-half second interval, condenser 572 will be charged to a sufficiently high positive potential to cause relay 571 to operate. The operation of relay 571 completes a circuit for the operation of relay 579 and the operation of relay 579 in turn restores the circuit to its condition prior to the reception of the blank signal except that relay 531 is maintained operated due to the current flowing in its locking winding as described above. The release of relay 681 will then reestablish the transmission path between the receiving device at station B and receiving channel 204 of the party line, so upon the resumption of the transmission of the message to station B the remainder of this message will be transmitted to and received at station B without any additions, deletions or mutilations.

If it is assumed that it is desired to start the transmitter at station D instead of the one at station B then the letter J signal will be transmitted during the second one and one-half second interval. When the J signal is received by the selector magnet 602, none of the contacts controlled thereby will be closed since no contact is provided for the letter J. If a contact happens to be provided for this letter, it will not be connected to any of the switching relays.

Consequently none of the switching relays 540, 531, 541 will operate so none of the transmitters at stations A, B or C will be operatively associated with the transmission channel and none of them will transmit any message material stored in their respective tapes even though these tapes

have been previously inserted in the transmitters. Then at the end of this time interval relay 571 will operate as described above and cause relay 579 to operate and restore the circuits to the condition they were in prior to the reception of the blank signal.

Turning now to the operation of the selecting switching equipment at the intermediate switching center shown in Fig. 7, it will be readily understood by those skilled in the art that the selector equipment 701 operates in a manner similar to that at the more remote secondary switching center such as 601. Here the selector magnet 702 receives the same signals as received by the selector magnet 601 and causes the corresponding contacts to momentarily close. The blank signal causes contacts 727 to close and operate relay 747. Relay 747 causes relay 778 to operate. The release of relay 747 upon the opening of contacts 727 then interrupts the circuit through the upper winding of relay 777 and permits condenser 790 to start the charge. If any signals are received during the charging interval of this condenser relay 746 will be operated to its left-hand position and cause relay 779 to operate and restore the circuits to the same condition they were in prior to the reception of the blank signal.

If no signals are received during this interval, as will be the usual case, relay 777 operates to its right-hand position and completes a circuit for the operation of relay 780. Relay 780 causes relay 781 to operate and this relay in turn completes an obvious circuit for the operation of relay 704. The operation of relays 780 and 781 condition tube 770 and initiate the charging of condenser 772. If no signals are received during the charging time of condenser 772 which is approximately one and one-half seconds, relay 771 will operate and complete a circuit for the operation of relay 779, which relay in operating causes the circuits to be restored to the same condition they were in prior to the reception of the blank signal.

However, during this time interval of a second and a half the R signal is usually transmitted over the receiving channel of the party line. When this signal is received by the selector magnet 702, it will cause contacts 722 to be momentarily closed. The closure of these contacts cause relay 742 to operate and interrupt the locking circuit of relay 738 the release of which opens up the operating circuit of relay 1113 over the conductor 1112 extending to station D. Relay 742 also completes a circuit for the operation of relay 705 which relay locks operated under control of relay 780. The operation of relay 742 also connects ground to the right-hand terminal of condenser 772 and thus discharging the condenser and preventing the operation of relay 771. Upon the release of relay 742, which relay will release only after contacts 722 have opened and relay 705 operated and relay 738 released, the charging cycle of the condenser 772 is again initiated.

During this second interval of time a J signal will be received which will cause contacts 718 to be closed and complete a circuit for the operation of relay 738. Relay 738 in operating completes a circuit for lighting lamp 758 to indicate to the attendant that the transmitter at station D is operatively associated with the transmission channel extending to the central switching station. The operation of relay 738 also extends the transmission channel from the tape controlled transmitter shown in Fig. 11 to the central switching station over the transmitting channel 205 of the party line 200. The operation of relay 738 also disconnects or disassociates the transmission channel 205 of party line 200 extending to the more remote secondary switching centers from the transmitting channel of this party line extending to the central office. This prevents any interference or extraneous currents arising upon the channel more remote than the intermediate switching station from affecting or interfering with the transmission from this station to the central switching station.

The operation of relay 738 also completes a circuit for operating relay 1113 and for maintaining itself operated from battery through the left-hand contacts of key 776, the inner right-hand break contacts of relay 742, left-hand winding and left-hand inner operated contacts of relay 738 over conductor 1112 through the winding of relay 1113 to ground through contacts 1115. As pointed out above, assuming that station D has message material to transmit, tape 1110 will be inserted in the transmitter so that contacts 1115 will be closed.

At the end of the second second and a half time interval relay 771 will operate and complete a circuit for the operation of relay 779. Relay 779 will thereupon restore the circuits and relays of the second switching station to the same condition they were in prior to the reception of the blank signal except that relay 738 is now locked operated.

The operation of relay 1113 at station D completes a circuit for the operation of the start magnet 1114 from the source of power 1120 through the winding of magnet 1114, tape control contacts 1116, switch 1117 and contacts of relay 1113. It is assumed that the tape control contacts 1116 will be closed at this time since there should be an adequate supply of tape available for the transmission of the message. The operation of magnet 1114 withdraws its armature from engagement with the stop cam 1178 and permits the transmitter shaft carrying the brush arm 1119 and cam 1177 to rotate.

Motor 1118 is continuously operating as indicated above tending to drive the transmitter shaft through the friction clutch 1179 and gears 1180. However, it is normally prevented from doing this by the armature of relay 1114 which engages the stop cam 1178. Upon the operation of this magnet its armature is withdrawn and the shaft permitted to be rotated by motor 1118. As the shaft rotates cam 1177 will rotate and permit lever 1176 to rotate in a clockwise direction as viewed in Fig. 11. This will permit plate 1170 to be rotated also in a clockwise direction. Rotation of the plate 1170 permits the extensions 1171 of levers 1172 to move to the right and thus rotate levers 1172 in a counter-clockwise direction. The rotation of these levers causes the pins attached to the ends of them to rise and engage the tape. The pins which find holes or perforations in the tape over them will go through these perforations and cause their respective contacts to be operated. The pins which find no perforations or punches in the tape will be restrained by the tape so their respective contacts will not close. Thereafter during the rotation of brush arm 1119 the signals representing the particular code combinations perforated in this tape will be transmitted over the transmitting channel of party line 200 to the central switching station.

Near the completion of the transmission of this code combination, cam 1177 will return to the position shown in the drawings and operate lever 1176, plate 1170 and members 1172 in the opposite direction to that described above and withdraw the pins from engagement with the tape 1110. At this time lever 1173 is rotated in a clockwise direction so that it lowers the feed pawl 1174 which engages the feed ratchet 1175 and causes the tape 1110 to be advanced so that the next set of perforations will be over the sensing pins. Upon the continued rotation of the transmitter shaft the above-described operation of the transmitter is repeated thus causing the signals stored in tape 1110 to be transmitted from the transmission channel to the central switching station.

The above-described cycle of the transmitter is continued so long as the supply of perforated tape is available for transmission so that contacts 1115 and 1116 remain closed. If the supply of perforated tape available for transmission is reduced below a predetermined minimum, the contacts 1116 will open and interrupt the circuit of the start magnet 1114 which will release and stop the transmission. So long as this condition exists the circuit will remain in the position described unless the circuits of the central switching station function to change them.

As described in the above-identified copending application of Bacon et al., the central office switching circuits will function after approximately thirty seconds under these circumstances to disassociate the transmitter shown in Fig. 11 from the transmitting channel and start some other transmitter.

If the contacts 1116 reclose during this time interval, transmission will be resumed. At the end of the transmission of each message a figures signal followed by an H signal is transmitted as described above. However these signals do not in any way affect the switching equipment which establishes the transmission path from this transmitter to the transmission channel extending to the central office. Neither do they affect any of the circuits controlling the operation of the transmitter at station D. Consequently the next message preceded by its directing signals will be immediately transmitted to the central switching station.

Generally the attendant at the station D will tear tape 1110 at the end of the last message available for transmission from station D. This means that after the last message has been transmitted from the station the end of tape 1110 will pass through at least a portion of the transmitter. When the end of the tape passes the position which controls contacts 1115 these contacts will open and interrupt the circuit of relays 1113 and 738 thus permitting these relays to release. Release of relay 1113 interrupts the circuit of the start magnet 1114 which thereupon releases and stops the transmitter at station D. Release of relay 738 disassociated the transmitter at station D from the transmission channel extending to the central switching station and thus restores the switching equipment controlling the transmitter at station D to its normal or idle condition. Upon the cessation of reception of signals at the central station over the transmitting channel the equipment at this point will indicate to the operator thereat that another transmitter should be started and automatically causes another transmitter to be started as described in the above-identified patent application of Bacon et al.

The circuits at the first secondary switching center respond much in the same way as described above with reference to the intermediate and more remote secondary switching centers and causes their respective transmitters to be started upon the reception of the code combinations assigned to start these transmitters. It is to be noted that as shown in Fig. 9 the G signal is employed both to associate the receiving equipment at station G with the receiving channel and the start transmitter at station F. Similarly the letter A signal which is employed to associate the receiver at station A with the receiving channel is also employed to start the transmitter at station X. Similarly the letter C signal which is employed to associate the receiver at station C with the receiving channel is also employed to start the transmitter at station Y.

It is to be understood that the contacts controlled by the various selectors at the secondary switching centers may be associated with or assigned to any of the code combinations which may be desirable. However it is essential that the contacts which control the starting of the transmitters be assigned to code combinations which will be transmitted by the transmitter start circuits at the central switching station. No effort has been made to make the letters which have been assigned to the starting of the various transmitters of the foregoing description correspond with the letters transmitted by the start circuit in the above-identified patent application of Bacon et al. It is to be understood that as described in that copending application the particular characters transmitted by the central switching station may be altered as desired so that they may be made to correspond to those assumed in the foregoing description. It is also possible to rearrange the cross-connections between the contacts of the two control relays such as 505 and 604 at the secondary switching centers to correspond to the signals transmitted from the transmitter start circuit described in the above-identified patent application. As will be readily understood by those skilled in the art, the transmitter start circuit of the above-identified application may be expanded to transmit any number of different start signals. It is not limited to the transmission of only three or four different transmitter start code combinations but may be expanded to include any suitable number such as nine as required in the present case. For a description of the manner in which these signals are caused to be transmitted by an operator or automatically, reference is made to the above-identified copending patent application of Bacon et al.

In the foregoing description it was assumed that the blank signal employed for conditioning the circuits at the secondary switching centers for starting or controlling the transmitters was transmitted during the transmission of a message over the receiving channel. It has been pointed out that the blank signal and the following transmitter start signals are not added to the recorded copy of the message then in progress of transmission and also that they do not cause any of the message signals to be mutilated or lost.

The blank signal may also be transmitted at other times without interfering with any of the switching signals employed to control the receiving apparatus at the stations served by the party line and without affecting the switching circuits

employed to control these receiving instruments. For example, if the blank signal followed by the other transmitter signals are transmitted first, i. e., when the circuits are in the condition shown in the drawings, they will cause the operation of the circuits as described above. Namely, relay 547 at the more remote switching station will be operated in response to the blank signal. Approximately a half a second to a second later, relay 577 will operate and cause relay 580 to operate. Relay 580 then completes circuits for the operation of relays 681 and 682. Relay 681 in turn completes a circuit for the operation of relay 604 and interrupts the circuits between the selector 601 and the switching relays for controlling the receiving apparatus. The R signal then causes relay 542 to operate which relay in turn completes a circuit for the operation of relay 505. Relay 505 establishes circuits between the contacts of the selector 601 and the switching relay controlling the transmitters shown in Fig. 10. Thereafter the next signal when selected will start one of the transmitters connected to the party line. At the end of the second and a half time interval relay 571 will operate and cause relay 579 to operate which restores the circuit at this secondary switching center to its previous condition except in the case when one of the transmitters controlled by this station is started in which case one of the respective relays 540, 531 or 541 will remain operated and the associated transmitter will be operative and transmitted over the transmitting channel of the party line.

The equipment at the other secondary switching centers operates in substantially the same manner and controls the transmitters at these stations under these conditions. It should be noted that when the blank signal is received first, it will be impossible to receive any of the switching signals for controlling the receiving apparatus until all of the signals for controlling the transmitters have been received. Consequently, transmission of these transmitter start signals will in no way be added to any message nor will they cause any of the message signals of the message to be mutilated or lost.

The only remaining time during which a blank signal may be transmitted is between the figures signal and the H signal at the end of a message being recorded by one of the receiving instruments. In this case the blank signal followed by the transmitter control signals as described above will be transmitted from a central station in the same manner as described above. Namely, after the figures signal has been transmitted, transmission over the receiving channel will be interrupted for a short interval of time after which the blank signal will be transmitted. After another short interval of time the R signal will be transmitted and then the selecting code combinations which will selectively start one of the transmitters at one of the stations served by the party line. Thereafter, the H signal will be transmitted by the transmitting equipment at the central switching station. Under these circumstances, the figures and H signals at the end of the message would be effective to control the switching circuits at each of the secondary switching centers in the same manner as if the transmitter stored signals had not been interposed between these two signals.

As pointed out above, under usual conditions it is necessary that an H signal immediately follow a figures signal. If any other signal immediately follows the figures signal, the effect of the figures signal will be cancelled. However, in case a blank signal follows the figures signal, the figures signal will not be cancelled but will remain stored in the switching equipment until the end of the transmission of the transmitter start signals after which the control of the circuit is returned to the message transmitting apparatus at the central station. If the next signal then is an H signal, the circuits will operate as if no signals had been interposed between the figures signal and the H signal. If the next signal is not an H signal, then the effect of the figures signal will be cancelled.

The manner in which the circuits function under these circumstances may be readily understood by reference to the secondary switching center shown in Figs. 5 and 6. As will be readily understood by those skilled in the art, the circuits at each of the switching centers operate in substantially the same manner.

As described above, upon the reception of the figures signal by the selector magnet 601, contacts 625 of the selector 601 will momentarily close and complete a circuit for the operation of the relay 645. Relay 645 in operating completes a circuit for maintaining itself operated from battery through its left-hand winding and the left-hand outer break contacts of relay 637, right-hand and left-hand outer make contacts of relay 645 to ground through the right-hand contact and armature of relay 546. Relay 645 in operating also extends a circuit from the upper winding of relay 546 to the universal contacts 627 as described above.

If the next signal following the figures signal is a blank signal, a circuit will be completed from ground through the momentarily operated contacts 627, which contacts are momentarily operated in response to the reception of the blank signal, the winding of relay 547 and the lower winding of relay 546 to battery. A short interval of time later contacts 626 will close and complete a circuit through the upper winding of relay 546. However, since the circuit is completed through the lower winding of relay 546 first and will remain completed for a slightly longer interval than the circuit through the upper winding of relay 546, as described above, the armature of relay 546 will be maintained in the position shown in the drawings where it will maintain the locking circuit of relay 645. Consequently, the reception of the blank signal will not cause relay 546 to release and thus will not cancel the effect of the previous figures signal.

At the end of the ensuing pause in transmission, relay 577 will operate and cause the operation of relay 580, 681 and 682. Following this pause the R signal will be transmitted over the receiving channel which when received by the selector magnet 601 will cause contacts 622 of the selector 601 momentarily to close and complete a circuit through the winding of relay 542 and lower winding of relay 546. A short interval of time later the universal contacts 626 will close and complete a circuit through the upper winding of relay 546. However, since a circuit is also completed through the lower wind of this relay at this time, this armature will remain in the position shown in the drawings and maintain the locking circuit of relay 645. Consequently, the effects of the figures signal is not cancelled.

Relay 542 in operating due to current flowing through its winding in the above circuit completes a circuit for the operation of relay 505 as described above. Relay 505 in operating com-

pletes a second circuit for maintaining relay **645** operated from battery through the left winding of relay **645**, the left-hand outer break contacts of relay **637**, the left-hand and right-hand outer make contacts of relay **645** to ground through the center right-hand armature and operated contact of relay **505**. Following the R signal the selecting code combination will be transmitted for selectively starting one of the transmitters. When this signal is received it will cause the respective relay to operate and also cause contacts **626** to be momentarily closed. Closure of contacts **626** at this time completes a circuit through the upper winding of relay **546** which relay will thereupon be operated to its left-hand position because a circuit will not be completed to its lower winding at this time. However, the operation of relay **546** at this time is ineffective because relay **505** interrupts the circuit through the left-hand contact of relay **546** and connects ground to the holding circuit of relay **645**. Consequently, the effect of the figures signal is not cancelled and at the same time the proper transmitter has been started. A short interval of time later relay **571** will operate and restore the transmitter control circuits at each of the stations to its normal or inactive condition. It should be noted, however, one of the transmitter control relays will be locked operated and the associated transmitter will be transmitting over the transmitting channel.

In restoring the transmitter control circuits to their inactive condition relay **505** will be released; however, relay **546** was previously released so that the locking circuit of relay **645** is maintained. If the next signal transmitted from the central switching station by the message transmitting apparatus is the H signal, relay **637** will be operated as described above and cause the previously connected receiving device to be disconnected from the receiving channel.

If the first signal transmitted from the central switching station by the message transmitting apparatus after the final transmitter start signal is not an H signal, relay **637** will not be operated. Instead relay **546** will operate to its left-hand position and interrupt the locking circuit of relay **645** and thus cancel the effect of the figures signal as described above.

Keys **576**, **776** and **876** are provided at the respective secondary switching stations to enable the operator or attendant to stop any transmitter and disassociate it from the transmitting channel and also to disassociate any receiving apparatus at any of the stations served by the respective secondary switching centers from the receiving channel of the party line. The operation of key **576**, for example, interrupts any of the locking circuits of relay **540**, **531** or **541** which may be completed at the time key **576** is operated. Interruption of any of these locking circuits will cause the respective relay to release and also interrupt the control circuit at the respective stations which will cause the transmitter at that station to stop transmission. The release of the respective relay **540**, **531** or **541** will interrupt the transmission path between the previous operating transmitter and the transmitting channel of the party line.

In addition, the operation of key **576** interrupts the locking circuit of relay **578** so that relay **578** will release as soon as relay **547** releases, when, and if, these relays are operated in response to the transmission of transmitter start signals from the central station. Consequently, with key **576** operated, it is impossible to start any of the transmitters at the stations controlled by the respective secondary switching centers in response to transmitter start signals transmitted from the central switching station.

The operation of key **576** also completes a circuit for the operation of relay **637** from ground through right-hand operated contacts of key **576**, winding of relay **637** to battery, through the lower winding of relay **546**. The operation of relay **637** interrupts the locking circuit of any of the relays **629**, **630**, **631** or **632** which may have been operated prior to the operation of relay **637**. The release of these relays disassociates any of the receiving instruments at any of the stations shown in Fig. 10 with the receiving channel of the party line. The operation of relay **637** also maintains an operating or locking circuit for relay **604**. Consequently, relay **604** will be operated if it were previously released upon the operation of key **576**. The operating or locking circuit for relay **604** at this time may be traced from battery through winding of relay **604**, the left and inner operated contacts of relay **637** to ground through the right-hand operated contacts of key **576**.

Thus, upon the operation of key **576**, all of the transmitters or receivers controlled by this station will disassociate with the respective transmission channels and the switching circuits all rendered non-responsive to further message or switching signals transmitted over the party line.

It is to be noted that relay **542** when operated in response to transmitter start signals as described above, will remain operated until all of the relays **540**, **531** and **541** have released and relay **505** has operated, thus insuring that the switching circuits will be in condition to properly respond to the next signal transmitted over the receiving channel to selectively start the desired transmitter and associate it with transmitting channel of the party line.

In a similar manner, relay **637** upon operation completes circuits for maintaining itself operated under control of relays **630**, **631**, **632**, **629** and **648**. Consequently, relay **637** will not release after it has once operated until all of these relays have released. This arrangement insures that switching relay **630**, **631**, **632**, **629** and **648** will all be released and in condition to properly respond to switching signals transmitted over the receiving channel of the party line, preceding the next message. The corresponding keys, relays, and circuits at the other secondary switching operate in substantially the same manner as described above.

What is claimed is:

1. In a telegraph system, a selector controlled by permutation code combinations, a first group of switching devices, a second group of said devices, apparatus responsive to a predetermined group of code combinations received in a consecutive order for operatively associating said first group of switching devices with said selector for control by succeeding code combinations, other apparatus for operatively associating said second group of switching devices with said selector for control by succeeding code combinations which are of the same character as said first-mentioned succeeding code combination.

2. In a telegraph system, a plurality of telegraph stations, a telegraph transmission path extending to all said stations, telegraph transmitting apparatus located at a plurality of said stations, telegraph receiving apparatus located at

a plurality of said stations, switching equipment for selectively controlling said transmitting apparatus in accordance with telegraph signals transmitted over said line when said telegraph signals are preceded by predetermined signals, other switching apparatus for selectively controlling said receiving apparatus in response to the same telegraph signals when preceded by other predetermined telegraph signals.

3. In a telegraph system, a plurality of telegraph stations, a telegraph transmission system extending to all said stations, telegraph transmitting apparatus located at a plurality of said stations each of which is designated by a telegraph code, telegraph receiving apparatus located at a plurality of said stations each of which is designated by a telegraph code, said code designations for designating said receiving apparatus and said transmission apparatus including the same combinations, switching apparatus for controlling said transmitting apparatus and said receiving apparatus upon reception of the respective code combinations designating the respective apparatus and means responsive to predetermined signals preceding said designating combinations for distinguishing between code combinations for controlling said transmitting apparatus and the same combinations for controlling said receiving apparatus.

4. In a telegraph system, a plurality of telegraph stations, telegraph transmission paths extending between said stations, telegraph transmitting apparatus located at a plurality of said stations each of which is designated by a predetermined telegraph signal, telegraph receiving apparatus located at a plurality of said stations each of which is designated by a predetermined telegraph signal, a first group of switching devices for controlling said transmitting apparatus, a second group of switching apparatus for controlling said receiving apparatus upon the reception of respective signals designating the respective apparatus and means responsive to predetermined signals preceding said designating signals for distinguishing between code combinations for controlling said transmitting apparatus and the same signals for controlling said receiving apparatus and other switching apparatus responsive to other telegraph signals for extending the transmission system to a plurality of said receiving devices when said first mentioned switching apparatus fails to extend said channel to any of said receiving apparatus in response to transmission of signals preceded by signals designating receiving apparatus.

5. In a telegraph system, a plurality of telegraph stations, telegraph transmission paths extending between said stations, telegraph receiving devices located at each of a plurality of said stations each of which is designated by preassigned permutation code signals, switching apparatus for selectively extending said transmission path to each of said receiving devices, control equipment responsive to the signals designating said stations and controlling said switching apparatus and extending said path to the respective receiving devices, other switching apparatus for extending said path to at least one of said receiving devices when said first switching apparatus does not extend said path to any of said receiving devices.

6. The method of operating a system in which intelligence is transmitted by permutation code combinations and selective control of a transmitter to transmit and selective conditioning of a receiver to receive incidental to the transmission of the intelligence are accomplished by remote control by a chosen sequence of code combinations, which comprises, transmitting one and the same code combination for selectively controlling a transmitter to transmit and conditioning a receiver to receive dependent upon the transmission precedent to said code combination of different activating signaling conditions.

7. In a system, in which message code groups are accompanied by address code groups for the purpose of directing message code groups incoming to a channel to selected stations of address upon said channel, the method of operating which comprises, transmitting code combinations assigned to stations upon the channel to cause the direction to such stations of messages addressed thereto and transmitting another code combination for causing the reception at at least one station upon said channel of all message code groups incoming to said channel but not accompanied by code addresses assigned to any station upon said channel.

8. In a telegraph system, a first group of telegraph instruments, a second group of telegraph instruments, a first group of switching devices for controlling said first group of telegraph instruments, a second group of switching devices for controlling said second group of telegraph instruments, signal responsive apparatus, instrumentalities responsive to a predetermined consecutive group of permutation code signals for establishing an operative connection between said signal responsive apparatus and said first group of switching devices, other instrumentalities responsive to a predetermined pattern of signaling conditions for establishing an operative connection between said signal responsive apparatus and said second group of switching devices, apparatus responsive to all signals other than said predetermined group of signals and said pattern of signaling conditions for canceling the effect of the first signals of said first group of predetermined consecutive signals and means responsive to said pattern of signaling conditions for disabling said canceling instrumentalities.

9. In a telegraph system, a signal responsive device and selector mechanism controlled thereby, a first group of switching devices, a second group of switching devices, apparatus responsive to a predetermined and consecutive group of signals for establishing an operative connection between said first group of switching devices and said selector mechanism, apparatus responsive to a predetermined pattern of signaling conditions for establishing an operative connection between said selector mechanism and said second group of switching devices, instrumentalities responsive to all signals and signaling conditions other than said predetermined and consecutive group and said predetermined pattern of signaling conditions for canceling the effect of the first portion of said group of predetermined consecutive signaling conditions and other instrumentalities responsive to said pattern of signaling conditions when received during said predetermined group of consecutive signaling conditions for disabling said canceling instrumentalities.

10. A method of selectively controlling a plurality of groups of telegraph instruments which comprises transmitting a predetermined and consecutive group of signals followed by a selective signal for selectively controlling one group of said instruments, transmitting another group of predetermined signaling conditions followed by

...als for selectively controlling another group of said instruments, causing the effect of the first portion of said first group of signals to be canceled in response to any signals other than said predetermined groups, and preventing the cancellation of any portion of said first group of predetermined consecutive signals when said second group of predetermined signals is transmitted.

11. A telegraph system comprising a central station, a plurality of secondary switching stations, a common telegraph transmission system extending between said secondary switching stations and said central station, a plurality of local stations associated with said secondary switching stations, telegraph receiving apparatus located at a plurality of said local stations, apparatus at said central station for transmitting directing signals followed by message signals over said common transmission system, receiving instruments at said secondary switching stations responsive to said directing signals for selectively directing the message following said directing signals to the proper local stations, apparatus at said secondary switching stations responsive to other signals which are not preceded by directing signals assigned to local stations controlled thereby for directing the message to at least one of said local stations.

12. A telegraph system comprising a central station, a plurality of secondary switching stations, a common telegraph transmission system extending between said secondary switching stations and said central station, a plurality of local stations associated with said secondary switching stations, telegraph receiving apparatus located at a plurality of said local stations, apparatus at said central station for transmitting directing signals followed by message signals over said common transmission system, receiving instruments at said secondary switching stations responsive to said directing signals for selectively directing the message following said directing signals to the proper local stations, apparatus at said secondary switching stations responsive to other signals which are not preceded by directing signals assigned to local stations controlled thereby for directing the message to at least a group of said local stations.

13. A telegraph system comprising a central station, a plurality of secondary switching stations, a common telegraph transmission system extending between said secondary switching stations and said central station, a plurality of local stations associated with said secondary switching stations, telegraph transmitting apparatus located at a plurality of said local stations, telegraph receiving apparatus located at a plurality of said local stations, apparatus at said central station for transmitting directing signals followed by a predetermined and consecutive group of permutation code signals at the end of each message, apparatus at said secondary switching centers responsive to said directing signals for selectively establishing a transmission path from said transmission system to the designated local station, apparatus at said central station for interrupting said first transmission apparatus thereat and transmitting a predetermined pattern of signaling conditions over said transmission system for selectively starting one of the transmission devices located at said local stations, apparatus at said secondary switching centers responsive to said predetermined consecutive group of signals for interrupting a previously established path to the local station and apparatus responsive to all signals except said predetermined and consecutive order of signals and said predetermined and consecutive order canceling the effect of the first portion of said predetermined and consecutive order of signals and apparatus responsive to said predetermined pattern for rendering said canceling patterns ineffective.

14. A system for selectively conditioning apparatus associated with a channel of telegraphic transmission by telegraphic codes received to condition the apparatus, which includes, means for receiving a signal pattern including an early portion and a later portion, an element of said apparatus being conditioned by said early portion, an element operated incident to reception of a particular part of the pattern to initiate measurement of a predetermined time interval shorter than the normal time of said complete pattern, and canceling means operative upon termination of said time interval prior to reception by said means of a definite later portion of the pattern to cancel the condition produced by said early portion of said pattern.

15. A system for selectively conditioning apparatus associated with a channel of telegraphic transmission by a received signal pattern including telegraphic codes to condition the apparatus, which includes, instrumentalities responsive to the respective elements of said pattern including apparatus responsive to one predetermined element of said pattern, a timer operated incident to reception of an early part of the pattern to start measurement of a time interval terminating before the normal termination of the pattern, canceling means operative at the end of said interval to cancel the response to the elements of said pattern already received, and apparatus responsive to the reception by said instrumentalities of said predetermined element during said interval for preventing the operation of said canceling means.

16. A system for selectively conditioning apparatus associated with a channel of telegraphic transmission by telegraphic codes received to condition the apparatus, which comprises, means for receiving over the channel a signal pattern including a code combination for unconditioning any conditioned apparatus, and a code combination for thereafter selectively conditioning one apparatus, a timer operated incident to arrival from said channel of an early part of the pattern to start measurement of a time interval terminating before the normal termination of the pattern, canceling means operative at the end of said interval to cancel the conditioning effect of the portion of said pattern already received, and apparatus responsive to the arrival of said unconditioning code combination during said interval for recycling said timer.

17. A system for selectively conditioning, for transmission, apparatus associated with a channel of telegraphic transmission, by telegraphic codes arriving to condition the apparatus, which comprises, means for receiving over the channel a signal pattern including an unvarying code combination and a code combination for selectively conditioning one apparatus, a timer operated incident to arrival of an early part of the pattern to start measurement of a time interval terminating before the normal termination of the pattern, canceling means operative upon termination of said interval prior to arrival of said

unvarying code combination to cancel the conditioning effect of the portion of said pattern already received, apparatus responsive to the arrival of said unvarying code combination during said interval for recycling said timer, and apparatus responsive to the arrival of the complete pattern within the recycled interval for conditioning the selected apparatus for transmission.

18. A system for selectively conditioning a plurality of telegraph devices for operation over a channel of telegraphic transmission by telegraphic codes received to condition one of a group of said devices, which comprises, means for receiving over the channel a signal pattern including a code combination for unconditioning any of the conditioned devices of said group of said devices, a timer operated incident to the arrival of an early part of the pattern to start measurement of a time interval terminating before the normal termination of the pattern, cancelling apparatus operative at the end of said interval to cancel the conditioning effect of the portion of said pattern already received, apparatus responsive to said unconditioning code combination for unconditioning all of said devices in said group, and means operative incident to the operation of said unconditioning apparatus during said time interval for recycling said timer.

19. A system for selectively conditioning a plurality of telegraph devices for operation over a channel of telegraphic transmission by telegraphic codes received to condition one of a group of said devices, which comprises, means for receiving over the channel a signal pattern including a code combination for unconditioning any of the conditioned devices of at least said group of said devices and a code combination for selectively conditioning one of said devices for operation over said channel, a timer operated incident to the arrival of an early part of the pattern to start measurement of a time interval terminating before the normal termination of the pattern, cancelling apparatus operative at the end of said interval to cancel the conditioning effect of the portion of said pattern already received, apparatus responsive to said unconditioning code combination for unconditioning all of said devices in said one group, means operative incident to the operation of said unconditioning apparatus during said time interval for recycling said timer, other apparatus responsive to said code combination for selectively conditioning one of said devices for selectively operatively associating the selected device with said channel, and apparatus operative incident to the operation of said last-mentioned apparatus for preventing the operation of said cancelling means.

20. A telegraph system comprising a central station, a plurality of secondary switching stations, a common telegraph transmission system extending between said secondary switching stations and said central station, a plurality of local stations associated with said secondary switching stations, telegraph receiving apparatus located at a plurality of said local stations each of which is assigned an individual set of directing codes, receiving instruments at said secondary switching stations responsive to a single set of directing signals other than the sets of directing codes individually assigned to said receiving apparatus for selectively directing the messages to the receiving apparatus at a plurality of said local stations.

21. A telegraph system comprising a party line, a plurality of secondary switching centers connected thereto, a plurality of stations of address, a central station at which said party line terminates, switching equipment at said secondary switching centers responsive to address signals preceding each message for selectively directing the message to the respective stations of address and other switching circuits responsive to other address signals for selectively directing a message to a selected plurality of said stations.

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