March 22, 1938. C. R. WALKER 2,111,685

TELEGRAPH BROADCASTING SYSTEM

Filed May 23, 1936 2 Sheets-Sheet 1

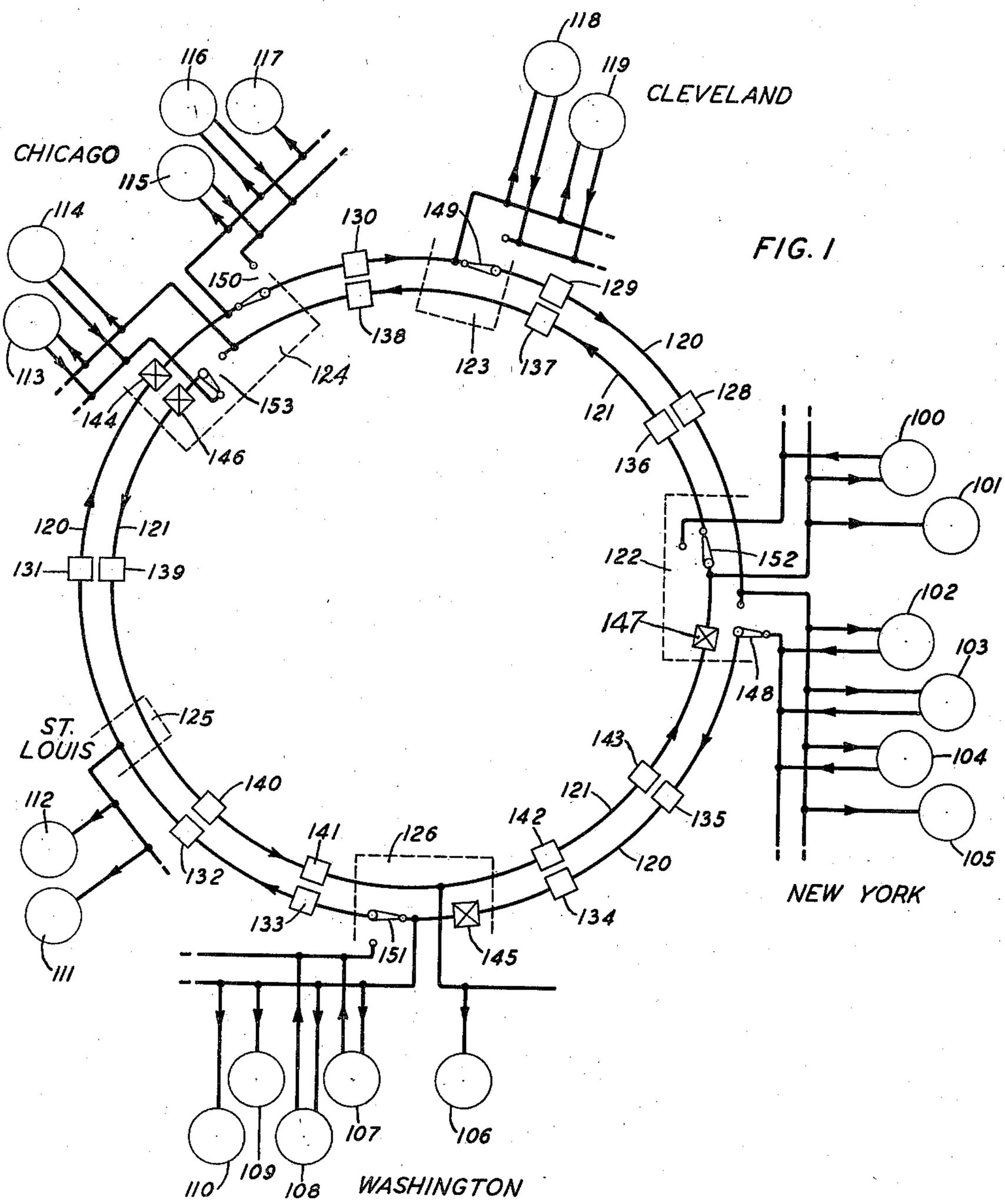

FIG. 1

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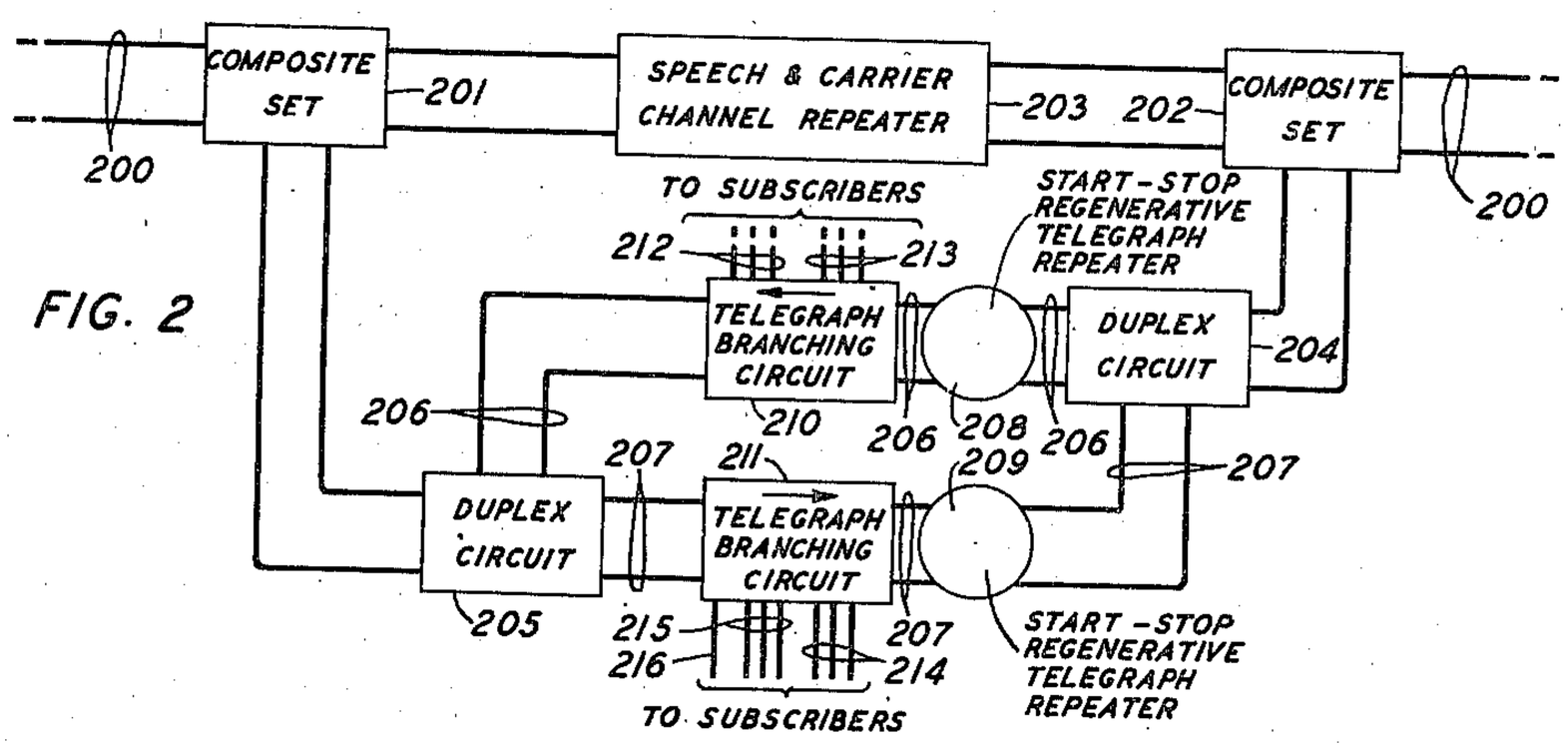
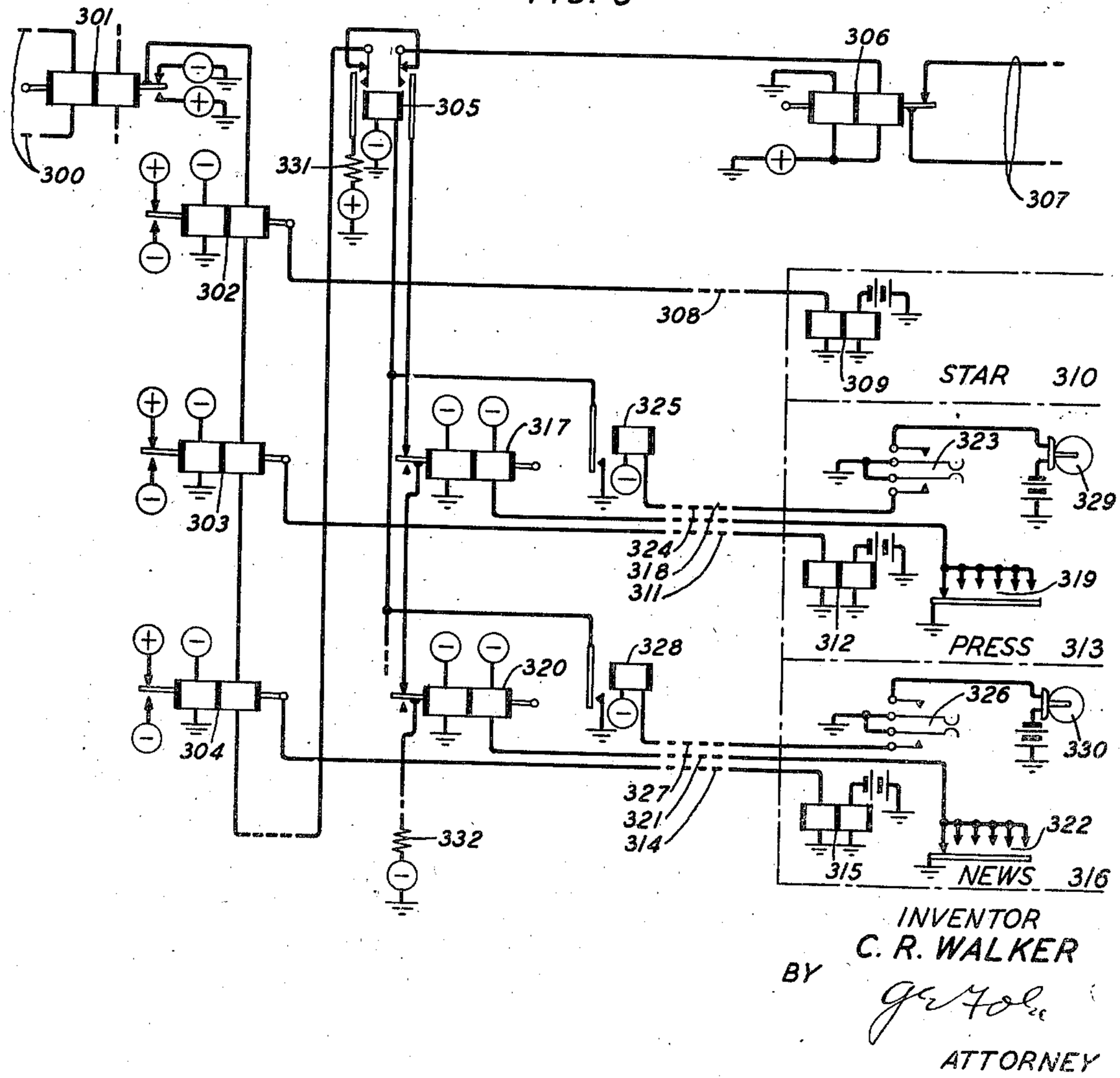


FIG. 2

FIG. 3



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UNITED STATES PATENT OFFICE

2,111,685

TELEGRAPH BROADCASTING SYSTEM

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16 Claims. (Cl. 178—2)

This invention relates to telegraph broadcasting systems and particularly to systems of this type which include a number of geographically remote transmitting stations all of which are adapted to transmit, one at a time, to a plurality of receiving stations.

Among the objects of the invention are to provide a system of this type with simple switching operations for cutting stations in and out, which will operate without interference caused by feedback, and which efficiently utilizes the necessary wire facilities; and, more specifically, which may efficiently utilize available channels in the telephone plant.

For certain purposes, as for the emanation of press news, it is desirable to be able to interconnect a great number of receiving telegraph stations widely distributed over the country by a common broadcasting system into which messages may be sent, for example, from a number of news centers, also widely separated geographically. For such a system it is, of course, desirable to use as far as possible available channels in the telephone plant and to confine the system to a single channel.

In accordance with the invention a single channel system is provided for successive transmission by a plurality of geographically remote transmitting stations, one at a time, to a plurality of receiving stations, such as teletypewriter stations, and switching means are provided for cutting in and out of the individual transmitting stations.

In accordance with the invention, a one-way channel with its normally associated repeater equipment is used for all messages, the channel being carried over wires preferably but not necessarily, run along a circuitous path and closed upon itself at each station to form a complete loop. In this manner a closed loop may be laid out to pass through a number of widely scattered news centers over wire facilities already available.

In accordance with the invention, branching stations are provided at a plurality of such centers with equipment for associating with the channel passing through each station one or more local lines permanently connected to the channel, for distribution of messages to local or outlying subscribers provided with teletypewriter or other receiving equipment. Where necessary the branching station is also equipped with switching means for associating with the channel one or more broadcasting stations located at or near the branching station, the switching means at a branching station being under remote control by each of the broadcasting stations associated therewith.

The channel used for broadcasting may utilize different facilities, depending upon what equipment is available over the various distances, and the circuit may be set up as a two-conductor system and carried through carrier repeaters or composite sets in the regular manner of extending calls at exchange stations. For large systems with fairly continuous service it may, however, be preferable to permanently assign certain facilities for this purpose.

Since the usual transmission channels are arranged in pairs for communication in both directions, the setting up of a broadcasting loop or "round robin" circuit for one-way transmission may often tie up both channels of such a pair. In that case one channel may conveniently act as reserve for the other, the branching stations being provided with obvious switching equipment for this purpose. However, the two channels may be used independently to give increased service over the same territory, possibly with different assignments of transmitting and receiving stations, and possibly with different schedules of hours of broadcasting.

In case the channel for its full length or at least for a long distance is based upon the telegraph frequency and thus for a long distance by-passes the carrier repeaters by means of composite sets, it may be found that the relay repeaters at the various branching stations are insufficient to reduce distortion of the signal to within permissible limits and must be supplemented by one or more regenerative telegraph repeaters preferably located at branching stations.

It will thus be apparent that in accordance with the invention a telegraph broadcasting system is provided which may be extended over territories of continental expanse; which is repeatered to provide receiving levels at various points along its looped path and which at any of these points may be placed at transmission level for broadcasting simultaneously to all receiving points.

With the telegraph channel closed back upon itself and including a plurality of repeating stages, all pointing in the same direction about the loop, there would be enough energy available to set up a serious oscillating condition any time a current impulse, accidentally or otherwise, were impressed upon the system. To avoid this contingency all branching stations associated with broadcasting stations are provided with switching

means normally cutting the channel through, and a broadcasting station may operate the switching means at the associated branching station to open the telegraph channel and connect the broadcasting station as well as any other broadcasting stations located near the same branching station, to the sending end of the channel. All receiving stations located near the branching station remain connected to the receiving end of the cut channel.

In order to avoid freezing up the telegraph repeaters in spacing position by temporarily placing the channel in singing condition, provision must be made to ensure that at the termination of a broadcast over one branching station, the channel at that station shall not be cut through until it has been opened at another branching station. This may be arranged in each instance by conversation between the stations, but is preferably provided for by a prearranged schedule of hours of broadcasting for all stations.

In case of emergencies of any nature, an idle broadcasting station may break in on a broadcast by opening the channel at its branching station and connecting its equipment thereto for sending of some prearranged signal. This signal will be received by the home recording printer at the station scheduled to broadcast and may act in any desired manner to cause the latter station to disconnect from the channel and cut the channel through. Reception of the special break signal on the home recorder at the station breaking in will serve to indicate to that station that the channel has been cut through.

The system and its operation arranged in accordance with the invention will now be described more in detail in conjunction with the accompanying drawings in which:

Figure 1 illustrates schematically a round-robin start-stop telegraph broadcasting system embodying the features of this invention;

Fig. 2 illustrates schematically the facilities provided for dropping off one or more stations at any point of the system; and

Fig. 3 shows such details of a telegraph branching circuit employed at a drop-off point in the system, together with certain portions of several start-stop type telegraph subscribers' stations, as are required for a clear understanding of the functioning of the invention.

Referring now to Fig. 1, there is disclosed therein schematically a telegraph broadcasting system consisting of a plurality of start-stop telegraph stations **100** to **119**, inclusive, variously located, and interconnected by two transmission channels, **120** and **121**, in such a manner that each channel forms a complete ring extending through all of the geographical points of the system. As indicated by arrows, channels **120** and **121** each provides for one-way transmission and operate in opposite directions. Each of these channels is a fully repeatered two-conductor circuit for general transmission purposes and is composited for separation of the telegraph channel at least at each point where one or more stations are dropped off, such as at the points **122** to **126**, inclusive. At each of these drop-off points the segregated telegraph channels are equipped with the usual duplex telegraph relay repeaters and branching circuits are provided for connecting from these repeaters to the subscribers' stations.

Since each of the channels **120** and **121** are arranged for general transmission purposes, they are provided with the regular speech or speech and carrier repeaters such as indicated by the blocks **128** to **135**, inclusive, in channel **120**, and blocks **136** to **143**, inclusive, in channel **121**. Where required, due to the length of the channel and to other causes of distortion, start-stop regenerative telegraph repeaters may also be provided. These regenerative repeaters are preferably located at the drop-off points and are indicated by blocks **144** and **145** in channel **120** and by blocks **146** and **147** in channel **121**.

As indicated by the arrows in the circuits extending from the drop-off points to the individual stations, certain of these stations are provided with transmitting facilities and are, therefore, arranged to broadcast messages over the channel as well as to receive messages broadcast by some other station connected to the ring circuit. Stations **100**, **102**, **103**, **104**, **107**, **108**, **113**, **114**, **115**, **116**, **118**, and **119** are shown as having transmitting as well as receiving facilities. Other stations, such as stations **101**, **105**, **106**, **109**, **110**, **111**, **112**, and **117**, have no transmitting facilities and are arranged to receive messages only.

In a round-robin system, since the telegraph channel extends in a complete ring serially interconnecting the stations located at various points, a signal originating at any station provided with transmitting facilities would return after a finite length of time to the originating point and would normally start out again from that point and, due to the action of the repeaters, would continue around the ring indefinitely, thereby interfering with subsequent signals from the transmitting station. In addition, a completely closed channel would also result in the setting up of a singing condition in the speech and carrier repeater equipment of the channel.

In order to eliminate these aforementioned conditions, it is therefore necessary to keep each complete transmission loop or ring open at some point at all times. This is accomplished by means of a cutting arrangement located at each drop-off point in the system to which stations provided with transmission facilities are connected. This cutting arrangement splits the loop at the point of transmission so that there is an actual termination for the transmitting and receiving ends of the telegraph channel, with respect to the transmitting station, although both ends of the channel are located at the same geographical point. Drop-off points to which stations arranged for receiving only are connected, such as drop-off point **125**, are not provided with cutting arrangements since no transmission takes place from these points. Cutting arrangements **148**, **149**, **150**, and **151** are indicated schematically in channel **120** at drop-off points **122**, **123**, **124**, and **126**, respectively. Channel **121** is provided with cutting arrangements **152** and **153** at drop-off points **122** and **124**, respectively. As will later be described, the cutting arrangements are incorporated in the telegraph branching circuits and are controlled at each drop-off point by the station or stations provided with transmitting facilities which are connected to that drop-off point.

Assume now that station **102** at New York desires to transmit a telegraph broadcast to the stations served by channel **120**. Cutting arrangement **148** is operated under control of station **102**, thereby cutting the loop of channel **120** at drop-off point **122**. Cutting arrangement **148** (operated, as indicated in the figure) associates the transmitting equipment at stations **102**, **103**, and **104** with the left-hand or transmitting end

of channel 120, while the right-hand or receiving end of that channel remains permanently connected to the receiving equipment at these aforementioned stations. The message broadcast from station 102 at New York will be received at stations 107 to 110, inclusive, at Washington, 111 and 112 at St. Louis, 115, 116, and 117 at Chicago, 118 and 119 at Cleveland and finally at stations 102, 103, 104, and 105 at New York, station 102 receiving the message for its home record. Station 102 does not release the cutting arrangement until some transmitting station at another point around the ring of channel 120 causes the cutting arrangement at that point to open the channel. This procedure insures a continuously cut channel at all times and in practice is accomplished by scheduling the stations using the channel to certain hours and instructing the operator at the station to operate the channel cutting arrangement at the drop-off point serving that station a short time before the station is scheduled to transmit and to hold the cutting arrangement operated until a short time after the station is scheduled to conclude its transmission. For example, assume that station 102 at New York is scheduled to transmit from 1:00 to 2:00 P. M. and station 107 at Washington is scheduled to transmit from 2:00 to 3:00 P. M. The operator at station 102 causes the cutting arrangement 148 at drop-off point 122 at New York to operate at some predetermined interval, for example 10 seconds, before 1 P. M., thereby insuring that channel 120 is open before the cutting arrangement at the drop-off point of the previously scheduled transmitting station is again closed at that point. At some predetermined interval after 1 P. M., for example 15 seconds, the operator at station 102 may start transmitting, the loop at the previously scheduled transmitting point having been closed at 10 seconds after 1 P. M. in accordance with the schedule. Transmission from station 102 may continue until approximately 10 seconds before 2 P. M., at which time the loop of channel 120 will be opened by the operation of cutting arrangement 151 under control of station 107 at Washington. The operator at station 102 does not cause the cutting arrangement 148 to restore until approximately 10 seconds after 2 P. M., thereby insuring that the loop of channel 120 is continuously cut at some point in the ring.

The operation of channel 121 is identical with that of channel 120 except that transmission is in the reverse direction and that, with the particular arrangement as shown in this figure, no stations are dropped off at either St. Louis or Cleveland on this channel. In the illustration given, channel 121 is split at Chicago by cutting arrangement 153 operated under control of either station 113 or 114 at that point. The only other cutting arrangement in channel 121 is the arrangement 152 at New York, since station 100 at that point is the only other station having transmitting facilities which is served by that channel. Transmission over channel 121 is controlled by a schedule in the same manner as hereinbefore described in connection with the operation of channel 120.

Referring now to Fig. 2, this figure illustrates schematically the manner in which subscribers' stations are dropped off the channel at a particular point in the round-robin system with respect to the arrangement of the various circuits involved at such a drop-off point. The particular drop-off point illustrated is one similar to the Chicago drop-off point 124 of Fig. 1 in that stations are dropped off both channels and that it is assumed that several of the stations served by each of the two channels are provided with transmitting facilities.

Conductors 200 represent a fully repeatered general transmission channel providing transmission in both directions. At the drop-off point each side of this general transmission channel terminates in a composite set, such as indicated by blocks 201 and 202, which separate the telegraph channel from the telephone channels. The telephone channels in turn connect to speech and carrier channel repeater equipment represented by block 203, while the telegraph channels connect to duplex circuits represented by blocks 204 and 205. From these duplex circuits are derived the two telegraph channels, channel 206 providing for transmission from right to left while channel 207 provides for transmission in the opposite direction. Channel 206 extends from duplex circuit 204 to a start-stop regenerative telegraph repeater 208 and from this repeater to a telegraph branching circuit 210 which contains relay repeater equipment for repeating signals to and from subscribers' stations connected to this branching circuit. In the illustration given it is assumed that two stations are served through branching circuit 210 and that both of these stations are provided with transmitting facilities. Three conductors, the sets 212 and 213, extend from the branching circuit to each of these stations (not shown). Of these three conductors per station one is used for receiving, one for transmitting, and the third for controlling the cutting arrangement, incorporated in the branching circuit, whereby channel 206 may be opened under control of either of the stations when these stations are transmitting. The detailed circuit of the branching circuit and the cutting arrangement as well as the operation thereof will subsequently be set forth in the description of Fig. 3. The outgoing end of branching circuit 210 extends to duplex circuit 205 and thence through composite set 201 to the transmission channel 200 thus completing the transmitting path in the right to left direction.

Telegraph channel 207, which provides for transmission in the direction opposite to that provided by telegraph channel 206, extends from duplex circuit 205 to telegraph branching circuit 211. In the illustration given it is assumed that three stations (not shown) are served through branching circuit 211, two of these stations being provided with transmitting facilities and connected to conductors 214 and 215, and one station being arranged for receiving only and therefore requiring but a single conductor, 216, between it and the branching circuit. A cutting arrangement, incorporated in the branching circuit as will be disclosed hereinafter, provides means for opening channel 207 under control of either of the stations connected to conductors 214 and 215 when either of these stations is transmitting or is scheduled to do so. The outgoing end of branching circuit 211 connects to a start-stop regenerative telegraph repeater 209 the output of which in turn connects to duplex circuit 204 and thence through composite set 202 to the transmission channel 200 thus completing the telegraph transmitting channel in the left to right direction.

It is to be understood that the regenerative telegraph repeaters 208 and 209 are shown merely by way of illustration and that either one or

both may not be required at any particular drop-off point depending upon the total length of the transmission channel and the width of the available frequency band.

Referring now to Fig. 3, this figure shows in detail the essential circuit elements of a telegraph branching circuit such as, for example, the branching circuit 211 shown schematically in Fig. 2, together with certain portions of three subscribers' stations associated therewith. Telegraph signals broadcast over the transmission loop from some other point in the system are segregated by a composite set, extend through a duplex circuit as previously set forth, and are received over the incoming end 300 of the telegraph channel in which the branching circuit of Fig. 3 is located. The incoming telegraph impulses actuate polar receiving relay 301, the armature of this relay moving to its lower and upper contact in unison with the open and closed impulses received.

Relays 302, 303, and 304 are polar receiving repeater relays, there being one of these relays for each subscribers' station connected to the branching circuit. The left windings of these relays are normally energized in local circuits to provide a biasing flux. A circuit extends from the armature of the receiving relay 301, through the right or operating windings of repeater relays 302, 303, and 304 in series, over the normally closed contacts of cutting relay 305, to positive potential through the right or operating winding of polar transmitting relay 306. The outgoing end 307 of the telegraph channel, which extends through this branching circuit, connects to the contacts of transmitting relay 306. The left winding of relay 306 is normally energized in a local circuit to supply a biasing flux for the relay.

Three subscribers' stations, stations 310, 313, and 316 are shown connected to the branching circuit. Station 310 is arranged for receiving only, whereas stations 313 and 316 both have provisions for transmitting as well as for receiving. The receiving loop for station 310 extends from the armature of repeater relay 302 of the branching circuit, over conductor 308, to the left or operating winding of the receiving relay 309 at that station. Similarly, the receiving loops for stations 313 and 316 extend from the armatures of repeater relays 303 and 304 respectively, over conductors 311 and 314, to the operating windings of receiving relays 312 and 315 at subscribers' stations 313 and 316 respectively.

Signals broadcast over the telegraph channel under discussion are impressed on the incoming end 300 of the channel. Receiving relay 301 follows the incoming signal impulses and its armature causes corresponding current variations in the right windings of the receiving repeater relays 302, 303, and 304 and in the right winding of transmitting relay 306. Relays 302, 303, and 304 repeat the incoming impulses to substation relays 309, 312, and 315 at subscribers' stations 310, 313, and 316, respectively, which form part of the teletypewriter receiving equipment at these stations. Transmitting relay 306 also follows the pulsing of the armature of receiving relay 301 and, since its contacts control the outgoing end 307 of the telegraph channel, causes the incoming signals to be repeated over the outgoing end which extends to the next drop-off point in the system. In this manner signals transmitted from any point on the channel are repeated from point to point around the entire system and are received by all teletypewriter stations normally connected to the channel in the manner just described.

The functioning of the telegraph branching circuit and its incorporated cutting arrangement in connection with the broadcasting signals from some station connected to this branching circuit will now be set forth. The branching circuit is provided with a polar transmitting repeater relay, such as the relays 317 and 320, for each associated subscriber's station having transmitting facilities. These transmitting repeater relays repeat signals impulses from the subscribers' stations to the transmitting relay 306 which directly controls the outgoing end 307 of the telegraph channel. The transmitting loop for station 313 may be traced from the right winding of transmitting repeater relay 317 of the branching circuit, over conductor 318, to the transmitting contacts 319 of the teletypewriter at that station. Similarly, the transmitting loop for station 316 is traceable from the right winding of repeater relay 320, over conductor 321, to the transmitting contacts 322 at station 316. The left windings of relays 317 and 320 as well as the right windings of receiving relays 309, 312, and 315 are normally energized in local circuits to provide biasing flux for these relays.

The branching circuit is provided with a cutting relay 305, which may be of the neutral type, the function of which is to open the telegraph channel and terminate the receiving and transmitting ends of the channel during the transmission of signals from stations located at this drop-off point in the round-robin system. Each station having transmitting facilities, such as stations 313 and 316, is equipped with a cutting key such as keys 323 and 326. A circuit extends from the lower contact of key 323 at station 313, over control conductor 324, to a source of negative potential through the winding of neutral control relay 325 of the branching circuit. Similarly, the lower contact of key 326 at station 316 extends over control conductor 327 to negative potential through the winding of neutral control relay 328 of the branching circuit. The operating circuit for cutting relay 305 may be traced from negative potential through the winding of that relay to the armatures of control relays 325 and 328 the front contacts of these relays connecting to ground.

Assuming now that station 313 is scheduled to broadcast messages over the channel, the locking type cutting key 323 at that station is operated. The operation of key 323 lights a lamp 329 in a local circuit as an indication to the operator that station 313 has control of the channel and closes the operating circuit of control relay 325 at the branching circuit. Relay 325 operates and closes the operating circuit for cutting relay 305. Relay 305 operates and splits the telegraph channel, the left contacts of the relay substituting positive potential through resistance 331 for the positive potential through the right winding of transmitting relay 306 in the circuit extending through the operating windings of the receiving repeater relays 302, 303, and 304 thereby terminating the incoming end of the channel. With relay 305 operated, the circuit for the right or operating winding of transmitting relay 306 now extends over the right front contact and armature of relay 305 and, over the contacts and armatures of transmitting repeater relays 317 and 320 in series, to negative potential through resist-

ance 332, thus terminating the outgoing end of the telegraph channel at this point.

During transmission of the messages by station 313 the transmitting repeater relay 317 of the branching circuit follows the impulses from the transmitting contacts 319 at that station and opens and closes the circuit through the right or operating winding of transmitting relay 306. Relay 306 follows the pulsing of repeater relay 317 and transmits the signals over the outgoing end 307 of the channel. After the signals have traversed the entire system and caused the branching circuits at the intermediate drop-off points to function as previously described in connection with the reception of signals, they are finally received over the incoming end 300 of the channel at this drop-off point and actuate receiving relay 301. The receiving repeater relays 302, 303, and 304 repeat these incoming signals to the receiving equipment at stations 310, 313, and 316 in the manner hereinbefore set forth, the transmitting station 313 receiving the message for record purposes.

The manner in which messages are transmitted from station 316 is identical with that described for station 313. In this instance cutting key 326 is operated, lighting indicating lamp 330 and operating control relay 328 at the branching circuit. The operation of relay 328 operates cutting relay 305 which splits the channel as hereinbefore described. Transmitting repeater relay 320 repeats the signal impulses from transmitting contacts 322 at station 316 to transmitting relay 306 which in turn controls the outgoing end of the channel.

At the conclusion of the scheduled transmission period for station 313 or 316 the cutting key at that station is released. This extinguishes the associated lamp 329 or 330 to indicate that the station no longer has control of the channel. Control relay 325 or 328, as the case may be, also releases in turn releasing cutting relay 305. The release of relay 305 again closes the channel at this point by disconnecting the operating winding of transmitting relay 306 from the circuit extending over the contacts of transmitting repeater relays 317 and 320 and again closing the circuit from that winding to the winding of the receiving repeater relay 304. This branching circuit is now in condition to function, in connection with signals broadcast from some other point in the system, in the manner hereinbefore set forth.

The expression "one-way" used throughout this specification and in the appended claims as a qualifying term in combination with expressions such as "transmission channel" or "telegraph channel" is intended and should be construed to have the generally accepted meaning, according to which the channel is capable of transmitting messages only in one direction, and is incapable of transmitting messages in the opposite direction. The channel is, of course, composed of two-conductor circuits in which the currents flow simultaneously in opposite directions in the two conductors at any point during one-way transmission of a message.

Thus the one-way telegraph channel 120 shown in Fig. 1 may be established throughout its length by equipment, such as the branching circuit 211 shown diagrammatically in Fig. 2 and more in detail in Fig. 3. The line current operating relay 301, Fig. 3, of course flows in opposite directions in the two conductors of the circuit 300, but this circuit is part of the one-way channel since relay 301 can transmit only in one direction. The ground return circuits between relay 301 and relay 306 are other examples of two-conductor one-way circuits or channels.

The other one-way telegraph channel 121 shown in Fig. 1 may similarly be established throughout its length by equipment, such as the branching circuit 210 shown diagrammatically in Fig. 2.

As is well known, such two one-way telegraph channels may be superimposed on circuit facilities carrying other channels in the two directions, respectively, or they may be combined as shown in Fig. 2 by duplex equipment, such as the duplex circuits 204 and 205, to be carried by two-way facilities, such as the composite sets 201 and 202 and the long line circuits 200. Thus, though the line circuit 200 may include a large number of channels, and may in itself be a two-way channel for many messages, it should be noted that the two one-way telegraph channels 120 and 121 actually extend throughout the circuitous path to all the associated stations without mutual reaction or interference, and are separately present at any point of the path. Each channel merely emerges in one-way equipment at points where it is used for sending or receiving messages, or at special telegraph repeating points, and irrespective of the other channel.

What is claimed is:

1. A plurality of telegraph switching stations each including a start-stop transmitting circuit and a start-stop receiving circuit, a two-conductor one-way repeatered transmission channel formed into a double loop serially interconnecting all of said stations and closed upon itself at each of said stations for through transmission, switching means at each of said stations for opening said channel and operatively associating said transmitting circuit at the station with the outgoing side of said channel for transmission to another of said stations in the transmission direction of the channel, said receiving circuit being normally included in said channel.

2. A plurality of telegraph switching stations each including a transmitting circuit and a receiving circuit, a transmission channel formed into a continuous double loop serially interconnecting all of said stations and normally closed upon itself at each of said stations for through transmission, switching means at each of said stations for opening said channel and connecting said transmitting circuit at the station with one opened end of said channel for transmission to all others of said stations, said receiving circuit at the station being connected to the other end of said channel for reception of signals from another of said stations during transmission by its associated transmitting circuit.

3. A plurality of at least three telegraph branching stations, a two-conductor one-way repeatered transmission channel forming a double loop serially interconnecting all of said stations and closed upon itself at each of said stations, each of said stations including a receiving circuit serially included in said loop, and at least two of said stations each including a transmitting circuit and switching means for opening said loop and operatively associating the transmitting circuit at said station with the outgoing side of said loop for transmission to another of said stations in said one direction.

4. A plurality of telegraph switching stations, a one-way repeatered transmission channel forming a loop serially interconnecting all of said sta-

tions and closed upon itself at each of said stations, each of said switching stations including a local circuit for normally interconnecting the incoming end of the channel with the outgoing end of the channel at the station, said local circuit including receiving relay means responsive to signals from said incoming end, transmitting relay means for impressing impulses upon said outgoing end, start-stop signal recording means responsive to operations of said receiving relay means, local start-stop transmitting contact means and switching means for in one position connecting said transmitting relay means to be responsive to operation by said receiving relay means and for in another position disassociating said transmitting relay means from said receiving relay means and connecting said transmitting relay means to be responsive to said transmitting contact means.

5. A multistage telegraph repeating system comprising a plurality of one-way regenerative repeating stages, connections between successive stages to form a one-way channel closed through all of said stages in succession and arranged to feed back into itself at each of said stages, switching means included in at least two of said connections for opening the associated connection and placing one opening end of the connection at transmitting level, the other end being normally at receiving level, to provide two-way communication between the points of location on said channel of said switching means.

6. A continuous telegraph communication channel closed upon itself, a plurality of one-way regenerative telegraph repeaters serially included in said channel at spaced intervals, a switching station including receiving means and retransmitting means at the incoming and outgoing end, respectively, of said channel, a plurality of local receiving systems responsive to said receiving means, local transmitting means, and switching means for normally completing the channel between said receiving means and transmitting means, and for alternately opening said channel and associating said local transmitting means with said retransmitting means for sending of signals over said channel to said local receiving systems.

7. A continuous telegraph communication channel closed upon itself, a plurality of one-way repeating stations serially included in said channel, one of said stations including receiving means and retransmitting means at the incoming and outgoing end, respectively, of said channel, a local transmitter for originating signals and switching means for normally completing the channel between said receiving means and said retransmitting means for repeating of signals and for alternately opening the channel between said receiving means and said retransmitting means and associating said local transmitter with said retransmitting means for sending of signals over the entire length of the channel to the receiving means at said station.

8. A telegraph repeating station having an outgoing side and an incoming side, a transmission channel forming a complete loop between said outgoing and incoming sides, a remote repeating station for repeating of signals along said channel, said first station further comprising transmitting means for sending signals over said outgoing side into said channel and receiving means for reception of the signals sent by said transmitting means over the incoming side from said channel.

9. A telegraph broadcasting system comprising a plurality of repeating stations each having receiving equipment for recording of messages and transmitting equipment for originating messages, characterized in this that the system includes a two-conductor one-way repeatered transmission channel interconnecting all of said stations in a continuous double loop for transmission by all of said stations, one at a time and in the same direction over said channel, to all the other stations, said loop being open only at the station which is transmitting at any time.

10. A telegraph broadcasting system comprising a plurality of repeating stations each having receiving equipment for recording of mesages and transmitting equipment for originating messages, characterized in this that the system includes a two-conductor transmission channel interconnecting all of said stations in a continuous double loop for transmission over said loop by all of said stations, one at a time to all the other stations and to the receiving equipment of the station which is transmitting, said loop being open only at the station which is transmitting to separate said receiving equipment from said transmitting equipment.

11. A round-robin telegraph system comprising a telegraph channel interconnecting a plurality of repeating stations for repeating signals from one section of said channel to the next in one direction of the channel, a transmitting circuit at one of said stations connected to said channel for transmission of messages in said direction to another of said stations, a transmitting circuit at said other station connected to said channel for transmission of messages in said direction to the said first station, means including switching means at each of said first and other stations for in one position disassociating the said transmitting circuit at the station from said channel and cutting the channel through to form a continuous double loop open at the other switching station for transmission to all of said plurality of stations.

12. A round-robin telegraph system comprising a one-way repeatered telegraph channel interconnecting a plurality of switching stations including repeating means in said channel, a transmitting circuit at one of said stations connected to said channel for transmission of messages to another of said stations in the transmission direction over said channel, a transmitting circuit at the said other station connected to said channel for transmission of messages to the first said station in the said transmission direction over said channel, switching means at said first and other stations for cutting the channel through and disassociating the said transmitting circuits from said channel at each station except during transmission by the station.

13. A round-robin telegraph system comprising a telegraph circuit formed into a loop and a plurality of telegraph signal repeating stations interconnected by said circuit loop, each of said stations having an incoming side for receiving signals from one section of said loop and an outgoing side for repeating said signals into the next section of said loop, and at least two of said stations each also including transmitting means and switching means for disconnecting said outgoing side from said receiving side to open said circuit loop and connecting said outgoing side to said transmitting means for broadcasting over said outgoing side to all other stations connected in said circuit loop.

14. A plurality of telegraph switching stations each including a start-stop transmitting circuit and a start-stop receiving circuit, a two-conductor line circuit formed into a double loop interconnecting said stations and closed upon itself at all stations included in said loop for transmission through the station between two other stations, switching means at each of said switching stations for opening the said loop during transmission from the station and for closing the loop for transmission from another station.

15. A telegraph transmission system comprising a channel of impulse transmission extending through a plurality of stations in a complete loop, said channel including repeating means effective to transmit intelligence impulses in one direction only around said loop, means whereby any one of a plurality of said stations may send intelligence impulses into said loop, means whereby all of said stations may receive said sent impulses including receiving instrumentalities whereby the station which is sending receives said impulses after complete passage around said loop, and switching means whereby said loop is always opened at the station which is sending to prevent the channel from feeding back upon itself.

16. A telegraph system in accordance with claim 15 in which said channel is established over a two-conductor circuit formed into a complete double loop interconnecting all of said stations.

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