

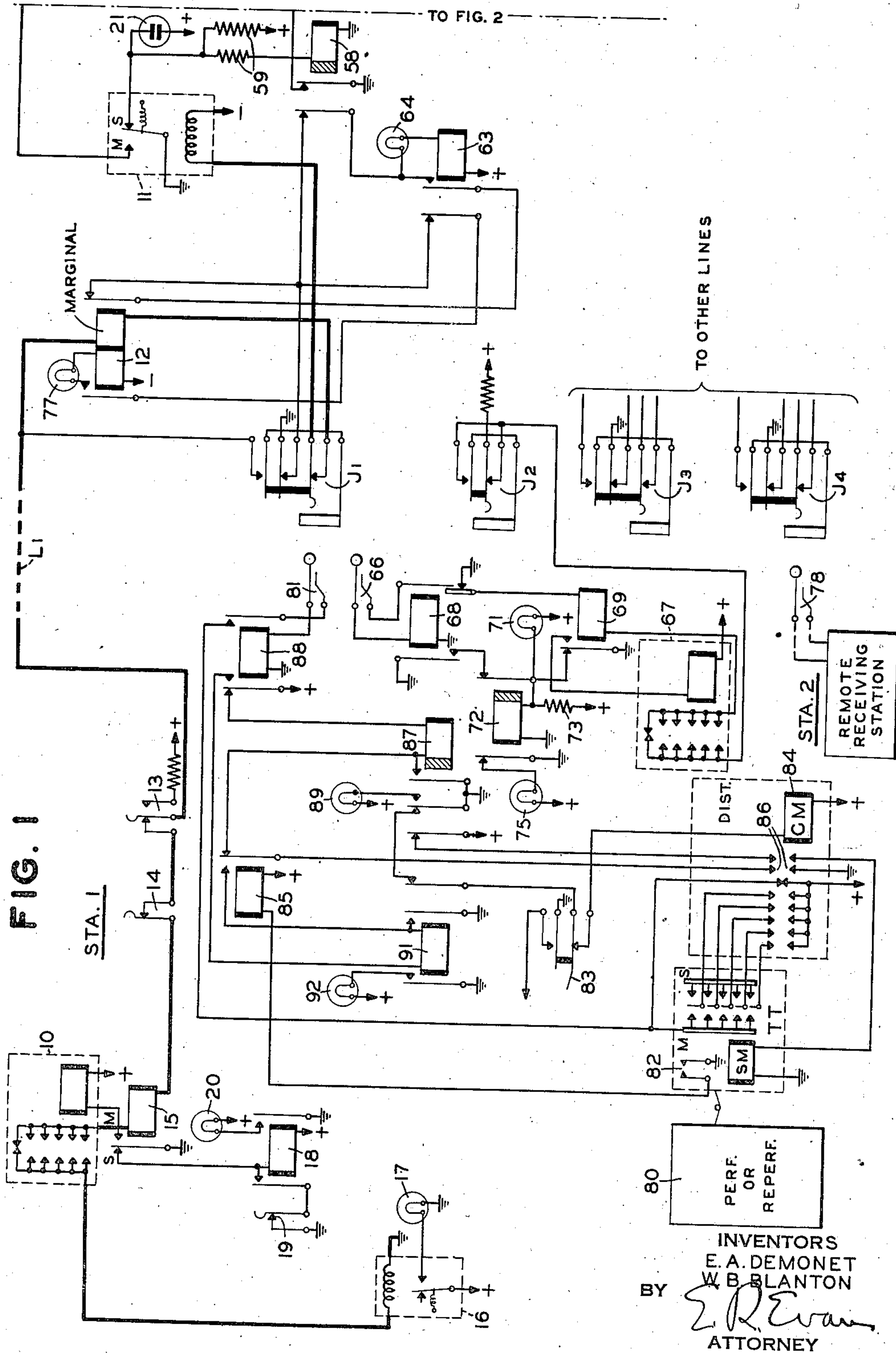
Oct. 23, 1945.

E. A. DEMONET ET AL
TELEGRAPH EXCHANGE SYSTEM

2,387,246

Filed Sept. 23, 1941

2 Sheets-Sheet 1



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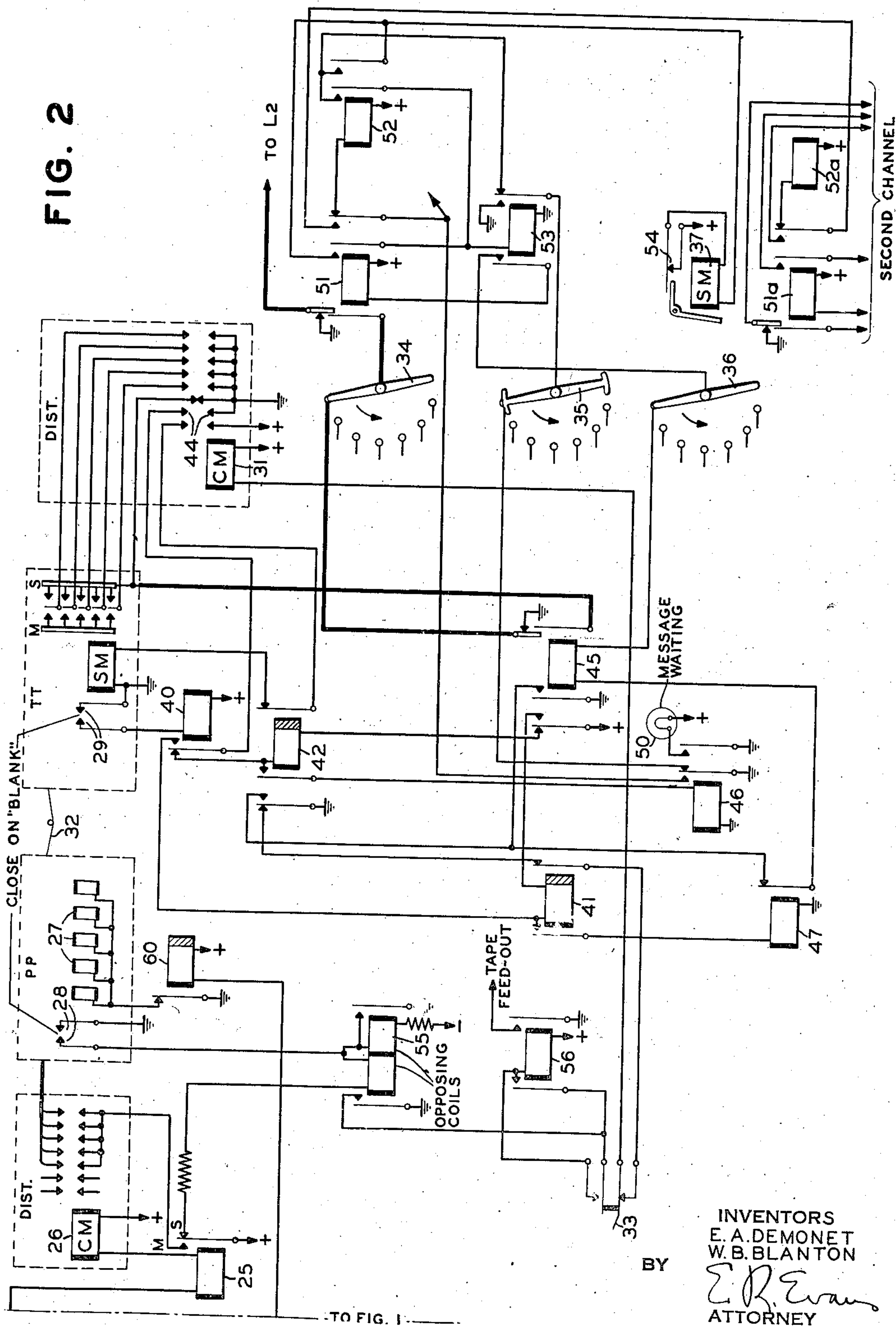
2,387,246

TELEGRAPH EXCHANGE SYSTEM

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2 Sheets-Sheet 2

FIG. 2



UNITED STATES PATENT OFFICE

2,387,246

TELEGRAPH EXCHANGE SYSTEM

Eugene A. Demonet, Short Hills, N. J., and
William B. Blanton, Merrick, N. Y., assignors to
The Western Union Telegraph Company, New
York, N. Y., a corporation of New York

Application September 23, 1941, Serial No. 411,948

9 Claims. (Cl. 178—4)

This invention relates to telegraph exchange systems and more particularly to systems involving a main office and a plurality of branch offices or teleprinter stations, each connected with the main office.

One object of the invention is to simplify the handling of messages to be sent from branch offices over a trunk circuit terminating at a local main office.

Another object of the invention is to provide an improved switching system arranged to interconnect a teleprinter at a main office to selected line circuits and also to interconnect printing telegraph equipment at a plurality of branch offices adjacent said main office to outgoing trunks terminating in said main office.

A still further object of the invention is to provide an improved arrangement for operating calling and supervisory signals in a system of the character described over the line circuit utilized for telegraphic communication.

Other objects and advantages of the invention will become apparent from the following description of the preferred embodiment thereof shown on the accompanying drawings, wherein:

Figs. 1 and 2 taken together form a complete diagram of a telegraph exchange system including a main office, nearby branch offices or teleprinter stations, and a plurality of inter-city trunks or channels to which both the main office and the branch office printing telegraph equipment may be connected.

In accordance with the invention, a plurality of branch telegraph offices are normally connected to signal storage equipment at the main office associated with one or more outgoing telegraph lines or channels, usually inter-city trunks. Ordinary messages transmitted from the branch offices are stored in the storage equipment and repeated over an associated line or channel without manual handling or switching of the line circuit. If, however, one of the branch offices desires to communicate with the main office or another local station, a signal is operated over the branch office line circuit to indicate that a connection is desired with the main office or said local station, and the attendant at the main office answers the call or switches it to the desired station. The switchboard or equivalent switching equipment at the main office is arranged to extend any call, regardless of origin, to the desired branch office line. Calling and supervisory signals are controlled over the branch office line circuits to initiate a call, to indicate the setting up of the

connection at the switchboard, and to prevent interference between different calls.

Referring to the drawings, the printer 10 at station No. 1 represents one of a plurality of branch offices or teleprinter stations each connected by an individual line circuit similar to the line L1 to the main office shown in Figs. 1 and 2. It is to be understood that the system may comprise a considerable number of branch offices but since each may be similar to station No. 1, only one station is shown in detail, and the connections to other similar stations indicated in the drawings. For example, the system may be used for interconnecting a plurality of branch retail stores in one city with the main or principal store in that city and through intercity trunks to headquarters or general offices in a remote city.

In the embodiment shown, the line L1 terminates at the main office or store in a jack J1 and a receiving line relay 11. The jack J1 is provided for the purpose of effecting a connection to station No. 1 for a message from the main office or an incoming circuit, and similar jacks J3, J4 et cetera, at the same switchboard are provided for connecting to other stations. The relay 11, which may be a polar relay, responds to certain message signals received from station No. 1 and is arranged to control a printer-perforator PP, Fig. 2, to store the received message signals in the form of perforated tape for transmission to the remote office. The associated tape transmitter TT controlled by the tape 32 from the perforator is arranged after connection has been made to an idle line or channel, such as the line L2, to repeat the stored signals to a receiving printer or reperforator (not shown) in the general offices.

The circuit of relay 11 can be traced from negative battery through the winding of said relay, normally closed contacts associated with the tip conductor of jack J1, the right hand winding of marginal relay 12 which is adjusted so that it does not operate on normal line current, the line L1, the normally closed contacts of the calling keys 13 and 14, the line relay 15, the keyboard contacts of the printer 10, and the winding of polar relay 16 to ground. The winding of relay 16 is poled to operate its armature to the left as shown when the line circuit is connected to negative battery at the main office, thereby maintaining the circuit of the supervisory lamp 17 open until connection is made to positive battery, as will be described below.

At station No. 1 the contacts of the line relay 15 are arranged to control the printer magnet of the printer 10 as shown, and also arranged to ener-

gize relay 18 whenever the contacts of the line relay are released in response to spacing signals. When relay 18 becomes energized during transmission or reception of a message, it becomes locked up through its left hand armature and front contact and the contacts of a non-locking key 19 so that the associated supervisory lamp 20 remains lighted until the key 19 is actuated.

As explained above, the system embodying the invention may be used where a number of stores or factories are to be provided with facilities for communicating with each other and with a remote headquarters or general office, and is of particular advantage where the majority of calls from a group of branch stores or stations are directed to the general office. One of the trunk channels from the group of branch stations to the remote station or headquarters is indicated at L2, Fig. 2. In order to facilitate the transmission of messages over these trunk channels which form the greater part of the traffic from the branch offices, the system embodying the invention is arranged to pick up an idle trunk channel for each call and repeat the message to the remote station without any necessity for manual supervision or switching of the calls at the local main office where the trunk circuits or channels such as L2 terminate. The automatic repeating of messages at a local trunk terminal office without supervision may, however, be effected over a local circuit or any desired preselected channel, the designation of the channel L2 as given above being merely illustrative.

The relay 11 is normally responsive to line signals from the printer 10 at the branch office or station No. 1 and a "busy" lamp 21 is connected to the spacing contact thereof to flash during transmission from said station. The marking contact of relay 11 is arranged to operate the line relay 25 and the clutch magnet 26 of the distributor associated with or forming a part of the printer-perforator PP. The clutch magnet 26 of the distributor is normally energized during the "rest" or marking condition of the relay 11 and responds to the first spacing or start signal to release the cam shaft of the distributor, thereby together with the contacts of the line relay 25 controlling the five selector magnets 27 of the printer perforator PP, as well known to those skilled in the art. The printer perforator PP may be of any conventional type, such as that shown, for example, in the patent to Dirkes and Wentworth, No. 2,143,828, granted January 10, 1939, except that it is provided with contacts 28 which close on receipt of a "blank" or all-spacing code combination. The contacts associated with stop members of the perforator disclosed in the Dirkes and Wentworth patent which are closed upon the receipt of a particular code combination could be applied to the stop member of the "blank" selection if the sixth pulse cut-out was omitted, but should preferably be arranged to close only momentarily. Associated with the printer-perforator is a tape transmitter TT which is provided with contacts 29 closed upon the receipt of a "blank" or all-spacing code combination. This tape transmitter may be similar to that disclosed in a patent to Benjamin, No. 1,298,440, granted March 25, 1919. Other types of signal storage and repeating equipment, preferably of the infinite storage type, could be used if desired.

The transmitting contacts of the tape transmitter TT are connected to the contacts of a conventional distributor having a clutch magnet 31 under the joint control of the tape lever 33

and the connected line or channel, such as the line L2, to transmit from the tape transmitter TT whenever a message is stored in the tape 32 and a line has been connected to said transmitter in response to the call. A finder switch individual to the line L2 is provided for picking up calls and connecting the same to said line or channel whenever it is idle. This finder switch comprises the wipers 34, 35 and 36 and a stepping magnet 37, a similar switch being provided for each of the lines or channels to the remote station or headquarters.

Assuming that a message is to be transmitted from station No. 1 to the remote station or headquarters over one of the intercity trunks, such as L2, in response to the operation of the keyboard of the printer 10 the receiving relay 11 of the local main office controls the printer-perforator PP to record the message and perforate tape in accordance with the message signals from the printer 10. Each of the successive messages is spaced by one or more "blanks" in the tape 32 in a manner that will be explained below. The "blanks" in the tape at the transmitter will cause the closure of the contacts 29, thereby energizing relay 40 so long as "blanks" are fed through the tape transmitter. The circuit for operating the clutch magnet 31 of the transmitting distributor may be traced from battery through the winding of said clutch magnet 31, the lower break contacts of the tape lever 33, the right hand armature and back contact of slow-release relay 41, and the left hand armature and back contact of slow-release relay 42 to ground. The operation of the distributor closes the circuit of the stepping magnet of the tape transmitter TT through the right hand armature and back contact of relay 42 and the left hand contacts of the distributor to step the "blanks" in the tape through the transmitter.

As soon as the first character of the message reaches the feeler pins of the tape transmitter TT and the contacts 29 of the tape transmitter are opened, relay 40 becomes deenergized. A circuit is now closed from ground through the second contacts 44 of the distributor (which are timed to close at the end of the first pulse and open at the end of the fifth pulse), the circuit further including the armature and back contact of relay 40, the winding of relay 42 and the left hand outer armature and back contact of relay 45, whereupon relay 42 becomes energized, opens the circuit of the stepping magnet of the tape transmitter to prevent the first character of the message from being stepped through the transmitter before a line is connected thereto and prepares another circuit for relay 42 through the inner left hand armature and front contact thereof and the winding of relay 46. The operation of relay 42 also opens the circuit of the clutch magnet 31 of the distributor at the left hand outer armature and back contact thereof to stop the distributor until the line circuit has been connected.

If the line L2 is idle, the finder switch will be operated to connect the tape transmitter TT and associated distributor individual to branch station No. 1 to said line circuit. When the contacts 44 of the distributor open to remove ground from the above described operating circuit of relay 42, the last-mentioned relay locks up in series with relay 46 and said relay 46 becomes energized. The energization of relay 46 closes the circuit of the supervisory lamp 50 to indicate that a message is waiting from branch station No. 1. The

energization of relay 46 also closes a circuit from ground through its inner armature and front contact, the right hand outer armature and back contact of relay 51 and the winding of relay 52 to battery, whereupon relay 52 becomes energized. It will be understood that a system employing a series of finder switches and control means therefor arranged to connect successive calls to idle lines or channels is not new, and any conventional arrangement of suitable character may be utilized. The control circuit is, therefore, not fully illustrated but is only indicated in sufficient detail to provide a clear understanding of the invention.

As shown, relay 51 becomes energized when the line circuit is seized by a call and, if the line L2 had already been busy when relay 46 became energized as described above, the initiate circuit would have been extended through the right hand outer armature and front contact of relay 51 to relays 51a and 52a associated with the second channel, as indicated. As many channels as are necessary to handle the traffic may be provided in this manner to connect an idle channel to each successive call. The energization of relay 52 as described closes the stepping circuit of the finder switch which may be traced from battery through the interrupter contacts 54, the winding of the stepping magnet 37 of the finder switch, the outer armature and front contact of relay 52, the right hand armature and back contact of relay 53, and the switch wiper 35 to the grounded bank contacts associated with said wiper and representing the lines which are not calling or which have been previously connected to a trunk channel. In this manner the finder switch is stepped to the terminals of the calling station where the above-described stepping circuit is interrupted at the contacts of relay 46 and the switch wipers 34, 35 and 36 stop as shown on the first contacts representing station No. 1. Relay 53 is now energized through the armatures and front contacts of relay 52 in series with the low-resistance stepping magnet 37, but the current in said circuit is insufficient to operate the stepping magnet. The energization of relay 53 grounds the multiplied bank contacts of the other finder switches through the wiper 35 so that the terminals of station No. 1 test busy to the other finder switches. The energization of relay 53 also closes the circuit of relays 51 and 45 through the switch wiper 36 to connect the line circuit from the transmitter contacts through the make-before-break contacts of said relays to the line L2.

The energization of relay 51 as described transfers the initiate circuit to the next channel so that the next call will be picked up by the second channel. Relay 53 is maintained energized when relay 52 becomes deenergized through a circuit including the inner right hand armature and front contact of relay 51, the last mentioned contact being adjusted to close before the circuit of relay 52 is interrupted at the outer right hand armature and back contact of relay 51. The energization of relay 45 opens the above described circuit of relays 42 and 46, but relay 45 locks up through its inner left hand armature and front contact before slow-release relay 42 releases its armatures.

Upon the deenergization of relay 42 the above described circuit of the clutch magnet 31 of the distributor is reclosed at the outer left hand armature and back contact of relay 42. The cyclic operation of the distributor steps the tape transmitter TT to transmit the message char-

acters perforated in the tape 32 to the line L2, the transmitter remaining connected to the line until the end of the message. At the end of the message the operator at station No. 1 sends an end-of-message signal consisting of a "blank" or all-spacing code combination. The reception of the blank end-of-message signal by the printer perforator PP operates relay 55 through the closure of the blank-reading contacts 28. If no further transmission ensues immediately from the printer 10 at station No. 1, relay 25 remains energized and holds open the left hand winding of relay 55 which is wound in opposition to the right hand winding. Under these conditions relay 55 remains locked up through its right hand armature and front contact, and closes a circuit through its left hand armature and front contact to the make contacts of the tape lever 33. If the tape transmitter TT is able to transmit before another message is started, enough of the previous message so that the tape loop between the perforator and tape transmitter becomes taut, the raising of the tape lever 33 closes the circuit of relay 56 to cause feed-out of blank tape sufficient to enable the last message character perforated by the printer-perforator to reach the feeler pins of the tape transmitter, for example, as disclosed in the patent to Hoover, No. 2,252,852, granted August 19, 1941, in which case the clutch magnet 186 of the aforesaid Dirkes et al. Patent 2,143,828 would be controlled in the manner of the punch magnet 36 of the Hoover patent. Thus, the tape feed-out which is controlled jointly by the tape lever 33 and relay 56 will not occur until the end-of-message signal has been received by the printer perforator. Furthermore, if another message is started before the tape becomes taut, the release of relay 25 in response to the spacing signals of the code combinations representing the message characters causes current to flow through the left hand winding of relay 55, and said relay releases its armatures to prevent the perforation of blank feed-out combinations before the end of the succeeding message, even though the tape again becomes taut between the perforator and the tape transmitter. Thus the perforation of "blanks" to space separate messages occurs automatically but only after the reception of a "blank" end-of-message signal.

Transmission continues from the tape transmitter TT over the line L2 until the "blank" end-of-message signal reaches the feeler pins of the tape transmitter to cause the closure of the contacts 29 and reenergize relay 40. Upon the subsequent closure of the contacts 44 of the distributor while the contacts 29 remain closed, a circuit is closed through said contacts, the armature and front contact of relay 40, the winding of slow-release relay 41, and the left hand outer armature and front contact of relay 45, whereupon relay 41 becomes energized and closes a locking circuit for itself through its left hand armature and front contact and winding of relay 47 to ground. The energization of relay 41 opens the above described circuit of the clutch magnet 31 of the distributor to stop transmission after the "blank" end-of-message signal has been sent and stepped out of the tape transmitter. When the contacts 44 of the distributor open, relay 47 becomes energized and opens at its armature and back contact the above described circuit of relays 45 and 51, thereby restoring the control circuits to their normal or initial condition. Upon the release of the armatures of slow-release relay 41, the circuit of the clutch magnet 31 of the distributor is reclosed

if there is a loop of tape between the perforator and the tape transmitter to permit the closure of the lower contacts of the tape lever 33, thereby stepping the blank tape through the tape transmitter TT. Each successive message will normally be transmitted in this manner from the printer 10 over the trunk circuit L2 or over one of the other trunk circuits if this circuit is busy. Similarly, the finder switches associated with the trunk circuits will pick up the calls from other stations similar to station No. 1, each of said other stations being equipped with storage and repeating equipment similar to that shown and connected to other bank contacts of the finder switches individual to the respective trunk circuits.

If, on the other hand, branch station No. 1 desires to transmit a message to the local office or main store at which the trunk circuits terminate, the operator momentarily opens the key 14 in the line circuit before transmitting the message. When the key 14 is actuated, the armature of the relay 11 moves into engagement with its right hand or spacing contact, thereby short-circuiting the winding of slow-release relay 58 which is normally continuously energized through the series resistors 59 to battery. The slow-release relay 58 does not respond to the short spacing signals of the code combinations representing message characters during transmission over the trunk channel L2 as described above. However, it responds to the long circuit interruption produced by the opening of the key 14, energizes the slow-release relay 60 to render the printer perforator inoperative and closes the circuit of relay 63 and of the call lamp 64. The latter circuit may be traced from battery through the winding of relay 63, the call lamp 64, the outer armature and back contact of relay 58 and the middle contacts of the jack J1 to ground. Upon the energization of relay 63, a locking circuit for said relay that is independent of the contacts of relay 58 is closed through the inner armature and front contact thereof, and the call lamp 64 remains lighted after the key 14 has been reclosed. In response to the lighting of the call lamp 64 the attendant at the main store or office inserts the plug 66 into the jack J1 to connect the local printer 67 to the calling line L1. The insertion of the plug 66 into the jack J1 opens the above described locking circuit of relay 63 to extinguish the call lamp 64 and also opens at the lower contacts of the jack J1 the circuit to the relay 11, so that the trunk repeater equipment will not respond to the message signals from station No. 1.

When the plug 66 is inserted in the jack J1, a circuit is also closed from ground through the winding of relay 68, the tip contacts of the plug 66 and of the jack J1 and the winding of relay 11 to negative battery, whereupon relay 68 becomes energized and armature of relay 11 is held on the marking contact. The energization of relay 68 closes the line circuit including the sleeve contacts of the jack J1 and plug 66 through the right hand armature and make-before-break contacts of relay 68, winding of the line relay 69, keyboard contacts of the printer 67 and the normally closed contacts of the jack J2 to battery. Thus the printer 67 is conditioned for two-way communication with the printer 10 at station No. 1.

When the printer 67 is plugged into the jack J1 in response to the call from branch station No. 1 as described, the connection of the line L1 to negative battery at the relay 11 is changed to the connection to positive battery at the jack J2

associated with the printer 67. The reversal of polarity of the battery on the line L1 causes the polar relay 16 at station No. 1 to actuate its armature into engagement with the right hand contact thereof, thereby closing a circuit through supervisory lamp 17 to indicate at station No. 1 that a connection has been made to the main office printer 67 and transmission may be commenced.

As long as transmission continues from station No. 1, the busy lamp 71 flashes since the circuit of said lamp is intermittently closed through the armature and back or spacing contact of the line relay 69 which responds to the received code signals. A slow-release relay 72 is also provided which is maintained normally energized through the circuit including a resistor 73. At the end of the message, the attendant at station No. 1 opens the key 14 and the consequent deenergization of relay 69 short-circuits the resistor 73 to deenergize relay 72. The "disconnect" lamp 75 is thus lighted to indicate to the operator at the main office that the connection should be pulled down.

If station No. 1 desires to transmit a message to station No. 2, which may be a warehouse provided with a printer without a keyboard for receiving messages from any of the local stores or branch stations, the key 13 is actuated to connect line L1 to a source of positive battery and thereby increase the line current sufficiently to operate the marginal relay 12. Upon the energization of relay 12 a locking circuit is closed through the left hand locking winding thereof, the call lamp 77, the left hand armature and front contact of relay 12 and the outer armature and back contact of relay 63 to ground at the contacts of the jack J1. The lighting of the call lamp 77 indicates to the attendant at the main office or store that the branch station No. 1 desires a connection to the warehouse or station No. 2. Thereupon the attendant plugs in the circuit to station No. 2 by inserting the plug 78 in the jack J1, the control equipment associated with the plug 78 being similar to that associated with the plug 66. Thus the insertion of the plug 78 in the jack J1 reverses the polarity of the line L1 to light a supervisory lamp 17 at station No. 1 and indicate that the connection has been set up.

Other calls such as those originating at the headquarters or general offices, for example, and received over incoming trunk circuits may also be connected by the attendant at the main store to any desired one of the branch offices or to the local printer through jacks J1 to J4. One such incoming trunk is indicated by the reperforator 80, which represents the terminal of any incoming trunk or channel, and its associated plug 81 for repeating the signals received over said incoming channel to the printers accessible through the jacks J1 to J4.

The reperforator 80 may be similar to the printer-perforator PP, Fig. 2, and provided with the usual tape feed-out mechanism. The associated tape transmitter TT is provided with blank-reading contacts 82 which are closed upon the receipt of the "blank" end-of-message signal.

The operation of the storage and repeating equipment including the perforator 80 and its associated tape transmitter is generally similar to that of the storage and repeating equipment shown in Fig. 2 and described above except that the operation of the tape transmitter is initiated when it is plugged into the jack containing the terminals of the wanted line. Upon the receipt

of the message over the incoming trunk circuit, the lengthening of the tape loop closes a circuit through the lower contacts of the tape lever 83 for energizing the clutch magnet 84 of the distributor. When the first character of the received message reaches the feeler pins of the tape transmitter TT, the contacts 82 open and relay 85 connected to said contacts becomes deenergized. Upon the closure of the timing contacts 86 of the distributor at the end of the last "blank" code combination used for spacing successive messages, a circuit is closed through the armature and back contact of relay 85, the winding of slow-release relay 87 and the left hand armature and back contact of relay 88 to battery, whereupon relay 87 becomes energized. The energization of relay 87 closes a circuit through its middle armature and front contact for lighting the "call" lamp 89 to indicate to the attendant that a call is waiting to be switched by the plug 81. Assuming that the call is for station No. 1, as shown by the address on the tape, the insertion of the plug 81 in the jack J1 closes a circuit from ground through the winding of relay 88, the tip contacts of the plug 81 and jack J1 and the winding of relay 11 to energize relay 88, to open the circuit of relay 87 and thus extinguish the "call" lamp 89. The deenergization of relay 87 recloses circuits through the left hand and middle armatures and back contacts of said relay for energizing the clutch magnet 84 of the distributor and the stepping circuit of the stepping magnet of the tape transmitter TT. The operator is able to determine the idle condition of the wanted station by observing that the busy lamp 21 is not flashing, as would be the case if a message were being transmitted from the station No. 1. At the end of the message, the end-of-message signal energizes relay 85 upon the closure of the blank-reading contacts 82 at the same time that contacts 86 are closed. Thereupon a circuit is closed from ground through the timing contacts 86 of the distributor, the armature and front contact of relay 85, the winding of relay 91 and the left hand armature and front contact of relay 88 to battery, whereupon relay 91 becomes energized. The energization of relay 91 closes through its left hand armature and front contact the circuit of the "disconnect" lamp 92 to indicate to the attendant that the message has been completed; and also opens at its outer right hand armature and back contact the circuit of the clutch magnet of the distributor to stop the tape transmitter. When the plug 81 is withdrawn from the jack, relays 88 and 91 become deenergized, thereby restoring the cord circuit to normal in readiness for another call.

In the event that the call received over the trunk circuit on the perforator 80 is destined for a local or main office printer 67, the plug 81 is inserted in the jack J2, thereby extending the transmitting circuit from the tape transmitter TT through the right hand armature and front contact of relay 88, the sleeve contacts of the plug 81 and jack J2 and the upper make contacts of the jack J2 to the keyboard and line relay 69 of the printer 67 and the message is recorded on said printer in the usual manner.

It will be seen that in accordance with the invention a system is provided for switching messages from a number of branch offices or stations to a local printer or to outgoing trunks or other branch offices and for switching calls from incoming trunk circuits either to a local printer or any desired one of the branch offices or sta-

tions. Furthermore, if the greater part of the traffic comprises messages from the several branch offices for a single outgoing circuit, such as an intercity trunk circuit to a remote headquarters or office, these calls may be made and transmission completed without any manual supervision or switching at the local main office. While specific apparatus is described, such as tape perforating and transmitting mechanism for storing and repeating message signals, it will be obvious that other types of control apparatus and signal storage and repeating mechanism may be employed instead of that illustrated for the purpose of explaining the invention. Various modifications in the specific circuits and control mechanism shown will occur to those skilled in the art and may be made without departing from the scope of the invention as defined in the appended claims.

We claim:

1. A telegraph exchange system comprising a main office, telegraph trunks or channels terminating at said office, a branch office from which the majority of the messages are to be sent over a particular one of said trunks or channels, a printer at said branch office, means including signal-repeating equipment and automatic switching apparatus at said main office responsive to predetermined incoming signals from the branch office for normally repeating all message signals transmitted from said printer over said particular one of said trunks or channels to a preselected destination and other switching means at said main office to disable said signal-repeating equipment and enable transmission of a message from said printer over another of said trunks or channels.

2. A telegraph exchange system comprising a main office, telegraph trunks or channels terminating at said office, a branch office, printing telegraph equipment at said branch office, means including automatic switching apparatus at said main office responsive to predetermined incoming signals from the branch office for causing messages from said branch office normally to be transmitted over one of said trunks or channels to a preselected destination and operator-controlled means at said main office to disable the normal transmission from the branch office over said one of said trunks or channels and connect the printing telegraph equipment at said branch office to any desired one of a plurality of other trunks or channels terminating at the main office.

3. A telegraph exchange system comprising a main office, telegraph trunks or channels terminating at said office, a branch office, printing telegraph equipment at said branch office including means for transmitting message printer signals and directing signals, means including automatic switching apparatus at said main office responsive to predetermined directing signals from said branch office for causing messages from the branch office normally to be transmitted over one of said trunks or channels to a predetermined destination without manual supervision or manual switching at the main office, signaling means at the main office responsive to other directing signals from said branch office to indicate that the branch office is to be connected to certain others of said trunks or channels and manually operable switching means at the main office for connecting the branch office to said other trunks or channels.

4. A telegraph exchange system comprising a

main office, telegraph trunks or channels terminating at said office, a branch office, printing telegraph equipment at said branch office, signal-storage and repeating equipment at said main office individual to said branch office and one of said trunks or channels and normally operative to repeat messages from the branch office over said one of said trunks or channels, signaling means at the main office to indicate when the branch office desires to transmit over another of said trunks or channels and means to connect the branch office to the desired other trunk or channel.

5. A telegraph exchange system comprising a main office, telegraph trunks or channels terminating at said office, certain of said trunks or channels comprising a group extending to the same destination, a plurality of branch offices, repeater equipment at said main office for each of said branch offices comprising a tape reperforator and associated tape transmitter individual to said group of trunks or channels, means for seizing an idle channel and connecting it to the repeater equipment of a calling branch office in response to the transmission of a message to the main office from the last-mentioned branch office and means at the main office for connecting the branch offices to others of said trunks or channels, when desired.

6. A telegraph exchange system comprising a main office, telegraph trunks or channels terminating at said office, a plurality of branch offices provided with printing telegraph equipment, signal-storage and repeating equipment at said main office normally connected to the printing telegraph equipment at the respective branch offices and arranged to repeat message signals over certain of said trunks or channels, signals at the main office for designating a desired trunk or channel different from that normally available to the branch office making a call, means for operating said signals from the branch offices and means at the main office to reconnect a calling branch office to a wanted trunk or channel in accordance with said signals.

7. A telegraph exchange system comprising a

main office, telegraph trunks or channels terminating thereat, a plurality of branch offices, printing telegraph equipment at said offices including a local printer at the main office, means including automatic switching apparatus at said main office responsive to predetermined incoming signals from the branch office whereby transmission is effected from the printing telegraph equipment at the branch offices over one of said trunks or channels without manual supervision or switching at the main office, means for signaling the main office when a branch office desires to transmit a message thereto which is not to be sent over any of said trunks or channels and means to connect said local printer at the main office to a calling branch office.

8. In a telegraph exchange system, a main office, a branch office including a telegraph printer, a line circuit connecting said offices, a first key at the branch office for interrupting the line circuit, a second key at the branch office for altering the electrical potential of the line circuit, a plurality of supervisory signal devices at the main office selectively controlled by said keys over the line circuit and respectively indicating different desired connections to be made to the branch office line, means including a slow acting relay operable upon said interruption of the line circuit by said first key for a predetermined length of time for energizing one of said signal devices, and means including a relay responsive to the changed potential established by said second key for energizing another of said signal devices.

9. In a printing telegraph exchange system, a main office, a branch office including a telegraph printer, a telegraph circuit connecting said offices, a plurality of line-designating signal devices at said main office controlled from said branch office over said circuit, said signal devices respectively indicating different desired connections to be made to the branch office line, and "go-ahead" and "busy" signal devices at said branch office also controlled over said circuit.

EUGENE A. DEMONET.
WILLIAM B. BLANTON.