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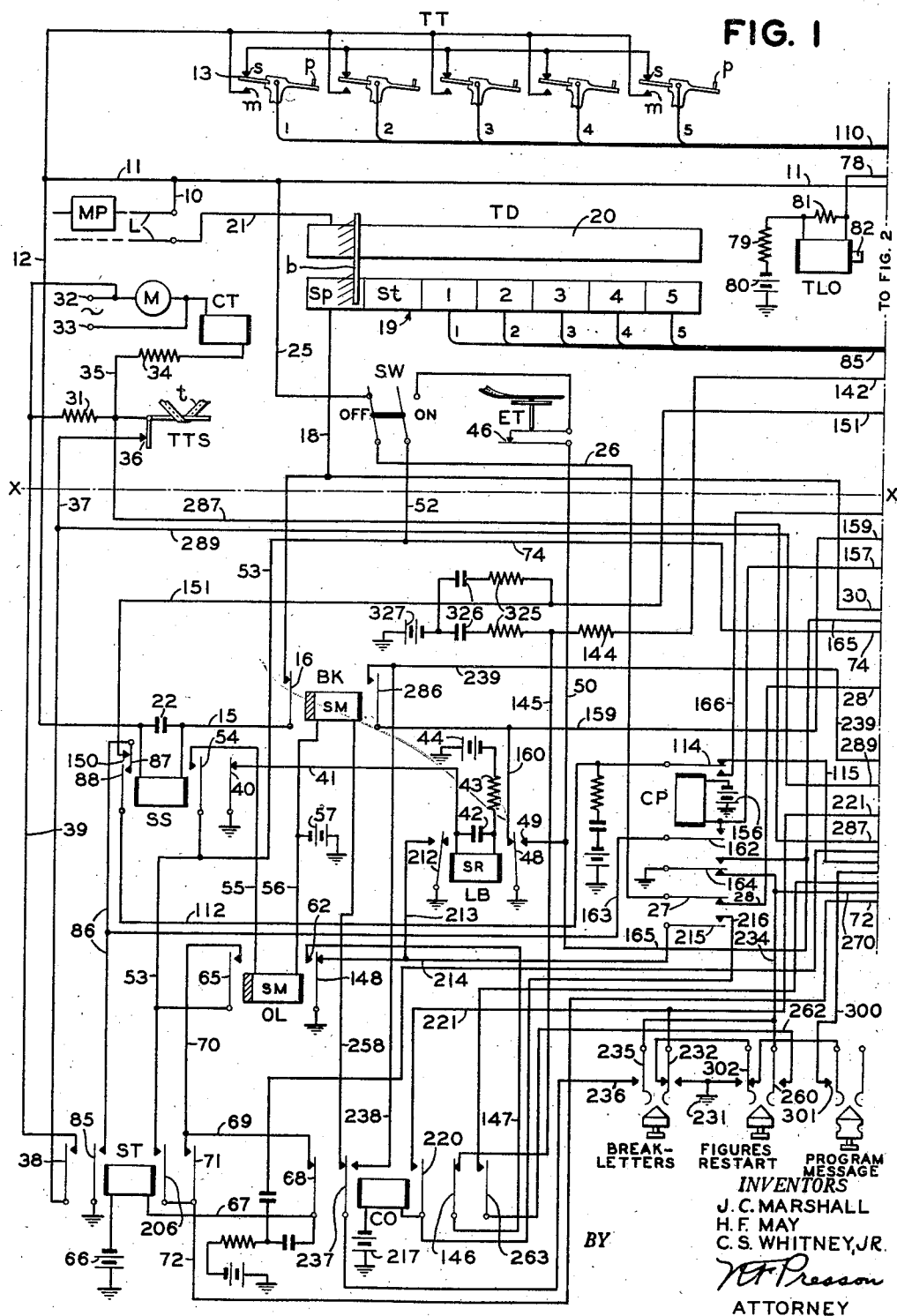
J. C. MARSHALL ET AL

2,419,581

PRINTING TELEGRAPH STATION IDENTIFICATION TRANSMITTER SYSTEM

Filed Dec. 18, 1943

3 Sheets-Sheet 1



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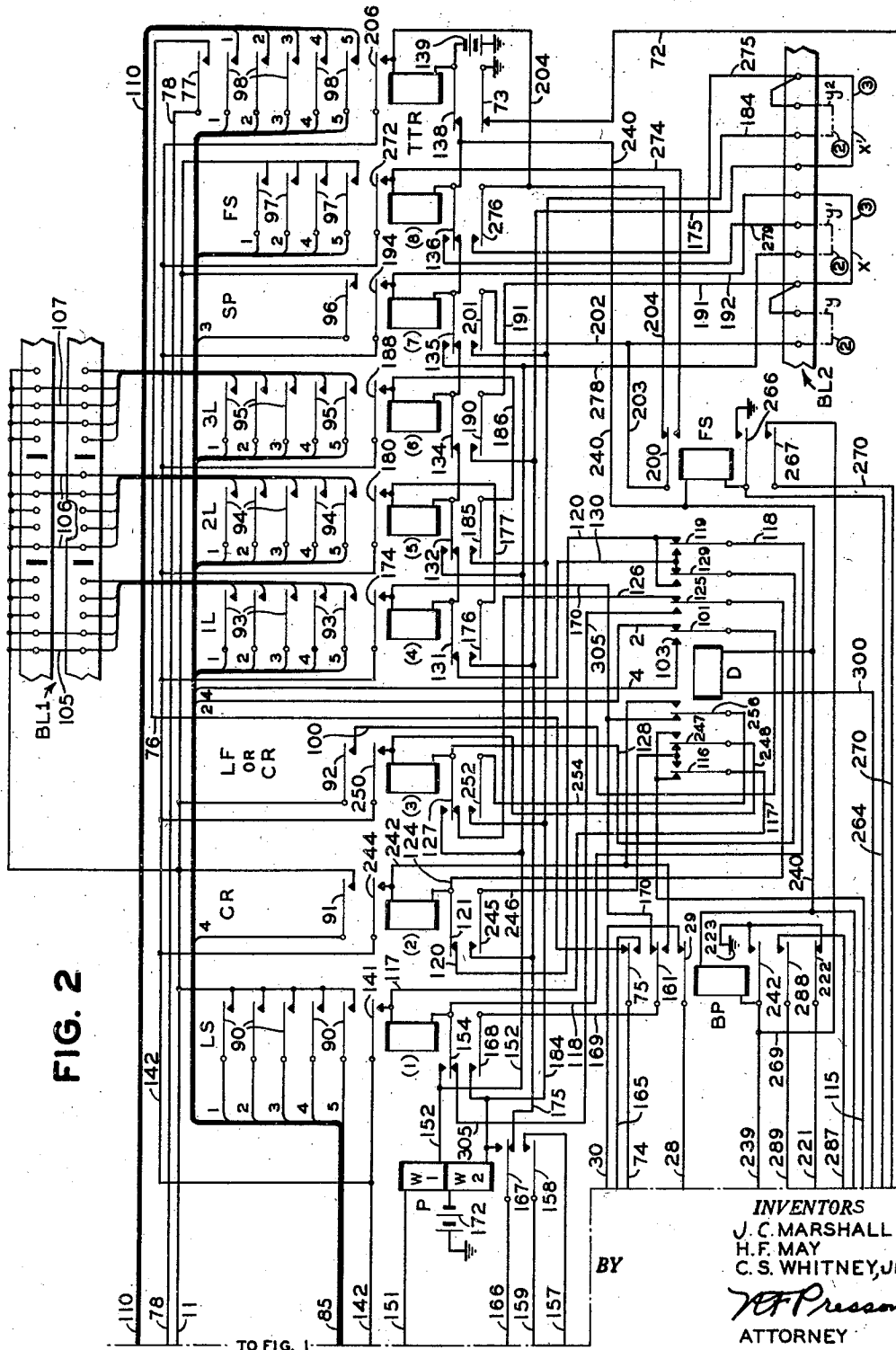
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UNITED STATES PATENT OFFICE

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PRINTING TELEGRAPH STATION IDENTIFICATION TRANSMITTER SYSTEM

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This invention relates generally to telegraphic transmitting apparatus and more particularly to an automatic telegraph station identification system and apparatus in which messages in permutation code stored in a tape or other control form may be transmitted over a telegraph line or loop by automatic transmitters, such as tape transmitters, located at one or more sending stations on the line, each of the sending stations having other apparatus for automatically inserting additional signals, such as station identification characters, at the beginning of transmission of a message from the control form or upon resumption of transmission of an interrupted message, whereby each message or portion thereof as received at a receiving or relay station invariably will bear the identification or address of the sending station. More specifically, in the system disclosed, various predetermined functional signals, in addition to the identification and message signals, are automatically inserted and transmitted for operating a printer, reperforator or similar recorder at the receiving or relay station.

In various printing telegraph systems it is desirable to have a number of sending stations connected in a telegraph office or line for the transmission of messages, for example, meteorological and other data or information, to a receiving or relay station where the information from the various transmitting stations may be received and recorded on a telegraph reperforator or printer common to the sending stations, and it is desirable that the received messages invariably include the sending station identification letters or other characters whereby all of the messages received and recorded, stored or relayed at the receiving station may readily be identified with the particular stations respectively from which they were sent.

It is also desirable that certain functional signals, for example, letters shift, normally be caused to precede the station identification characters, and that certain functional signals, for example, a space signal, normally follow the station identification, and that under certain abnormal or special operating conditions, as when transmission of a message has been interrupted, the remainder of the message also will be accompanied by certain functional and identification signals, for example, letters shift, carriage return and line feed, station identification characters, spacing, and in certain instances, figures shift, whereby the remaining portion of the message will be set apart from the preceding printed or recorded portion of the message received. Also,

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it is desirable that certain functional or selection signals, for example, carriage return signals and letters shift, precede the station identification letters when "program messages" are transmitted, whereby at the receiving station the functional signals may be employed to effect recordation of the received messages on a particular reperforator or other apparatus for retransmission thereof to other stations.

An object of the invention is a telegraph system in which predetermined additional characters, such as station identification characters, are inserted automatically at the beginning of a message transmitted under the control of a perforated tape or other control form at a sending station, so that at the receiving station the message printed or otherwise recorded invariably will bear the identification of, or other information in regard to, the sending station.

Another object is a system of the foregoing character in which under normal operation certain functional signals also will be inserted and transmitted immediately preceding and following the station identification or other additional information.

Still another object of the invention is a telegraph system in which under certain abnormal or special operating conditions, as upon interruption in the transmission of a message, the identification of the sending station will automatically be inserted and transmitted prior to resumption of transmission of the stored message from such station.

A further object is a system in which upon interruption of the message being transmitted, certain additional functional signals will accompany the identification to set the remainder of the interrupted message apart from the preceding portion of the message recorded at the receiving station.

A still further object is a system in which predetermined functional or selection signals will accompany the identification signals of certain messages to cause the messages to be reperforated or recorded on particular apparatus at the receiving station in such manner as to cause or enable retransmission from the receiving station to other stations or apparatus to which the message is to be relayed or retransmitted.

An additional object is the provision of suitable means for automatically preventing the transmission of a message upon the presence or occurrence of certain line and operating conditions.

Other objects and advantages of the system and apparatus, and subcombinations thereof, will

be apparent from the following detailed description of an illustrative embodiment of the invention, taken in connection with the accompanying drawings, in which:

Figs. 1 and 2 show the circuit arrangement and apparatus of a sending station embodying the principles of the instant invention;

Fig. 3 is a perspective view of a combined tape transmitter and distributor which may be used in the system of Figs. 1 and 2;

Fig. 4 is a fragmentary view taken along the line 4—4 of Fig. 3, showing certain details of the operating mechanism for the contact lever bail of the transmitter-distributor;

Fig. 5 is a fragmentary view in elevation of the operating mechanism and contact lever bail of a transmitter-distributor with tape transmitter lock-out mechanism associated therewith; and

Fig. 6 illustrates diagrammatically a telegraph loop comprising a receiving or relay station and a plurality of sending stations in accordance with the instant invention.

General description of the system and apparatus

The automatic station identification system disclosed is intended primarily for use on telegraph printer circuits, although not limited thereto, and may be employed in connection with conventional telegraph page printers or reperforators for receiving the transmitted messages, and with conventional transmitter-distributors as modified in accordance with the invention, for the transmission of messages. The system performs a number of functions, among which are the following:

- (a) At the beginning of each regular message transmission, the system identifies the sending station by transmitting the station identification letters.
- (b) Following an interruption of message transmission for any one of a number of causes hereinafter enumerated, the system transmits the station identification letters and in addition certain functional characters, before resuming the interrupted transmission.
- (c) Prevents starting transmission under various abnormal or special conditions or at a time when the telegraph circuit is in use by another station, or is disabled or otherwise unavailable.
- (d) Provides means for "breaking" the transmission of another station on the circuit, and thereafter sends the identification letters of the "breaking" station.
- (e) Provides means for automatically transmitting certain characters ahead of "program transmission" messages.

Figs. 1 and 2 of the drawings illustrate a sending station in accordance with one embodiment of the invention in which a combination tape transmitter TT and rotary stop-start transmitting distributor TD, shown above the dot-and-dash line X—X in Fig. 1, are employed for translating the code combinations perforated in a tape into permutation code impulses and transmitting these impulses to the receiving station. The distributor TD, in connection with the circuits and apparatus shown in Figs. 1 and 2, also automatically inserts and transmits to the receiving station permutation code signals comprising the identifying characters of the sending station and certain functional signals, immediately prior to the transmission or resumption of transmission of a message from the perforated

tape in the transmitter TT. As shown in the upper left hand portion of Fig. 1, the station is connected to a telegraph loop or line L which, as indicated in Fig. 6, may include other stations S like the station of Figs. 1 and 2, in addition to a receiving or relay station R. All of the stations S and R preferably are adapted to both send and receive messages over the line. At the receiving or relay station R the permutation code signals may be received and recorded by suitable stop-start telegraph equipment. For example, the signals may be received and printed on various known types of printers, such as the sending and receiving page printers disclosed in the Noxon et al. Patents 2,231,215, 2,315,009 and 2,252,232. If it is desired to reperforate or otherwise store the received messages at the receiving station, thereby to enable the same to be retransmitted to other telegraph apparatus or stations, any suitable storage means may be employed, for example, reperforators such as disclosed in the patent to Hoover 2,252,852, or a printer-reperforator such as disclosed in the Dirkes et al. Patent 2,193,809 may be employed.

The sending station circuit has two push-button keys of the non-locking or self-restoring type, designated in the lower right hand portion of Fig. 1 as "Break-letters" and "Figures restart," and a locking type push-button key designated "Program message." The non-locking keys, hereinafter generally referred to as "restart keys," are for the purpose of restarting transmission in either the "letters" or "figures" case following an interruption of transmission due to any of the causes enumerated hereinafter. An electromagnetic solenoid TLO, shown diagrammatically in the upper right hand portion of Fig. 1, controls the stepping of the tape in the transmitter in a manner hereinafter described in detail. When the solenoid is energized, stepping of the tape may proceed through the tape transmitter, and when the solenoid is deenergized, this prevents stepping of the tape, thereby to insure that the station identification letters and associated functional signals which are transmitted by the special apparatus disclosed herein, and the message signals stored in the tape which are transmitted by the tape transmitter, will be transmitted respectively in proper order and proper time relationship.

Under various conditions, as described hereinafter, the apparatus transmits to the circuit L with which it is associated either a short address, a long address, or a program message address. The short address comprises, in the illustrative embodiment disclosed, the following characters, which are transmitted in the order given: (1) letters shift, (2) station identification consisting of two or three letters, and (3) space. The long address comprises, in the embodiment illustrated, the following characters, which are transmitted in the order given: (1) letters shift, (2) carriage return, (3) line feed, (4) station identification consisting of two or three letters, (5) space, and (6) figures shift when the following text of the message requires such a signal. The program message address comprises, in the illustrative embodiment shown, the following characters, which are transmitted in the order given: (1) carriage return, (2) carriage return, (3) letters shift, (4) station identification consisting of two or three letters, and (5) space.

Normal operation.—For normal message transmission the operator inserts the prepared message tape in the tape transmitter TT, closes the tape

gate in known manner, and operates a starting switch, such as SW in Fig. 1, to its "on" position. Provided the line L is idle, the apparatus transmits the short address to the line, after which transmission from the message tape proceeds in the usual manner. At the conclusion of the message, transmission is stopped by the opening of an end-of-tape switch ET associated with the tape transmitter, or by the operator who throws the switch SW to its "off" position. When a program message is to be transmitted, the locking push-button, designated "Program message" at the lower right hand corner of Fig. 1, is pushed in, and thereafter the operation is as described immediately above. The program message address is transmitted to the line, followed by transmission from the perforated tape or control form.

Operation under abnormal or special conditions.—If the tight tape switch arm TTS associated with the tape transmitter is lifted due to a tight tape condition in tape *t* occurring while transmission is in progress, the distributor TD will be stopped automatically and transmission will cease. The operator then releases the tape loop and restores the tight tape switch arm to its normal or lowered position shown in Fig. 1. Transmission cannot be resumed, however, until one of the restart keys is depressed and released. The operator inspects either a monitor printer MP, shown in the upper left hand corner of Fig. 1, or the already transmitted portion of the tape to determine whether transmission was in progress in "letters" or "figures" case at the time of interruption, and then depresses the corresponding restart key. Upon release of the key, the apparatus transmits to the line the long address, sending as the final character thereof "figures shift" if the figures restart key is depressed, and omitting it if the break-letter key is used. Immediately thereafter transmission from the message tape is resumed.

Transmission interrupted by open line.—If the line circuit L to which transmission is taking place goes open and remains so for approximately the transmission time of one character, transmission will stop. After the line circuit has been reestablished, transmission may be resumed by depressing and releasing one of the restart keys, thereby sending the long address.

Transmission interrupted by power failure.—If the A. C. power supply to the distributor driving motor M and associated clutch trip magnet CT fails while transmission is in progress, the distributor will stop and transmission will cease. After the power supply has been reestablished, transmission may be resumed by depressing and releasing one of the restart keys, thereby sending the long address. If the D. C. power supply to the relays of the system fails while transmission is in progress, the distributor will stop and transmission will cease. After the power supply is reestablished, transmission may be resumed as in the normal start of transmission, and the short address will be sent, followed by transmission from the tape.

Interference with brush arm.—If the rotation of the brush arm *b* of the start-stop distributor is mechanically impeded while transmission is in progress, the clutch trip magnet CT will be released and transmission will cease. Transmission may be resumed by depressing and releasing one of the restart keys.

Attempt to start on open line.—If the trans-

mitter is associated with a line circuit which is not closed so that line current may flow, the apparatus prevents transmission from starting, and neither the identification nor tape transmission may take place until the line circuit is closed.

Attempt to start when line is in use.—If the transmitter is associated with a line which is in use and transmitting signals are originating at another station, transmission will not be initiated by throwing the start and stop switch SW to its "on" position. However, if the transmitter is left connected to the line with the switch thrown to its "on" position, transmission will start with the sending of the short address as soon as the line is released by the stopping of transmission from the other station. In the case of "sequence collection" transmissions by the various stations on the line, the start-stop switch at any station is not turned to its "on" position until the station immediately ahead in the sequence is actually transmitting; otherwise this station may start its transmission out of its proper sequence.

Breaking transmission from another station.—The operator may break the transmission of another station by depressing the "Break-letters" key. As long as the key is held depressed, the line circuit will be held open. When the key is released, the long address will be transmitted, provided the other station has released the line and left it in a steady "marking" condition. When the start-stop switch is "on," transmission from the tape will proceed immediately following the transmission of the long address.

Attempting to stop transmission of address.—Under normal operating conditions, when transmission is once started as in regular operation, it will be allowed to proceed, beginning with the transmission of the address, followed by transmission from the tape. If, however, the switch should be restored to its "off" position while transmission of the address is in progress, the complete short address will be transmitted, after which transmission will cease. If the switch is returned to its "on" position, the short address will again be sent, followed by transmission from the tape. If the tight tape arm is lifted during transmission of the address, transmission will cease with the transmission of the character then in progress. Transmission may then be resumed only by depressing and releasing one of the restart keys, thereby transmitting the long address, followed by transmission from the tape.

General circuit description

For convenience in Figs. 1 and 2 of the drawings, various of the devices and elements shown are identified by reference letters which generally designate their functions in the circuits. Such devices as seen in Fig. 1, several of which have been referred to above, comprise the telegraph line L, monitor printer MP, tape transmitter TT with fixed marking and spacing contacts *m* and *s* for selective engagement by resilient spring contact tongues 13, the operative positions of which are determined by tape feeler pins *p*. Associated therewith is the rotary transmitting distributor TD with stop and start segments *Sp* and *St*, respectively, and five code segments 1 to 5, driving motor M for the transmitting distributor, clutch trip magnet CT for stopping and releasing the rotatable brush arm *b* of the distributor, switch SW for initiating and terminating transmission from the station, end-of-

tape switch ET which operates to stop transmission when the perforated message tape in TT is depleted, tight-tape switch TTS which functions as an autostop when the tape *t* in the loop feeding into the tape transmitter becomes too tight, and tape lockout solenoid TLO which when energized permits the message tape to step through the transmitter and when deenergized prevents the tape from stepping even though the clutch trip magnet CT may be energized and the transmitter brush arm *b* is in rotation. Various of the relays in Fig. 1 are the relay SS connected to the stop segment Sp, break relay BK, line busy relay LB, common pulse relay CP, open line relay OL, start relay ST, and cutoff relay CO. The push buttons at the lower right hand corner of Fig. 1 have legends which designate their functions.

In Fig. 2 is shown a counting chain of eight sequence relays (1) to (8) which are operable in variable sequence to control under varying conditions the transmission of the station identification letters and functional signals to the line. Following the counting relays is a relay TTR which controls tape transmission such that when the relay is energized, it establishes circuit paths from the tape transmitter contacts to corresponding segments 1 to 5 of the transmitting distributor TD and also closes a circuit path to the tape lockout solenoid TLO. Other control relays in Fig. 2 are prime relay P which directs pulses to the counting chain, by-pass relay BP for bypassing certain of the counting chain relays, diverter relay D used for program message transmission, and figures shift relay FS. Also, at the top of Fig. 2 there is shown a cross-connecting block arrangement BL1 which is used for cross-connecting the letter abbreviations comprising the station identification, these connections being made in accordance with the standard five-unit telegraph printer code. Provision is made for a maximum of three station identification letters, transmission of these letters to the line being under control of the sequence relays (4) (5) and (6) of the counting chain. At the lower right hand portion of the figure there is shown a cross-connecting block arrangement BL2 to facilitate different connections which determine whether two or three station identification letters are to be transmitted.

Referring again to Fig. 1, the sending station is connected to the incoming side of the telegraph loop L by means of conductors 10, 11 and 12. The monitor printer MP, which preferably is a sending and receiving printer such as hereinbefore referred to, is connected in series with one side of the line. The conductor 12 extends upwardly from conductor 11 to each of the marking contacts *m* of the tape transmitter TT, and extends downwardly from conductor 11 to the operating winding of the stop-segment relay SS. The operating circuit of the latter relay continues by means of a conductor 15, left hand armature and break contact 16 of the slow release break relay BK, and conductor 18 to the stop segment Sp of the segmented ring 19 of the rotary start-stop transmitting distributor TD. From the stop segment the circuit is continued through the rotary distributor brush *b* to the solid distributor ring 20, and thence by way of conductor 21 to the outgoing side of the telegraph loop L. A condenser 22 is bridged across the winding of the relay SS for line correction purposes.

With the start switch SW in its "off" position, operating winding of relay SS is short-circuited

by a shunt path comprising a conductor 25, left hand blade of switch SW, conductor 26, armature and break contact 27 of the common pulse relay CP, conductor 28 to the upper inner armature and break contact 29 of the by-pass relay BP, Fig. 2, conductors 30 and 18 to the stop segment Sp of the distributor TD, Fig. 1. When the switch SW is thrown to its "on" position, however, the foregoing shunt circuit is removed from the stop-segment relay SS. When the station is transmitting, relay SS is connected in series with the stop segment Sp and operates and releases once during each time the brush *b* contacts the stop segment during operation of the rotary distributor TD, for controlling the operation of the counting chain of sequence relays (1) to (8) and the tape transmission relay TTR in a manner hereinafter described.

The start-stop distributor, when operating, is driven by the motor M through the medium of well known friction clutch mechanism (not shown in Fig. 1) at a constant fixed speed, the driving motor being energized from a suitable source of current, such as the alternating current source 32, 33, it being understood that a control switch may be employed in known manner to start and stop the driving motor at the beginning and end of the periods when the station is in use. The motor may be either a constant speed synchronous motor or a governor controlled motor. One side 33 of the alternating current source is also connected to the clutch trip magnet CT associated with the rotary brush *b* of the transmitting distributor TD, the circuit continuing from the magnet through a current limiting resistance 34 and conductor 35, the tight-tape switch contacts 36, and conductor 37 to the outer left hand armature 38 and make contact of the start relay ST, when operated, and thence by conductor 39 to the other side 32 of the alternating current supply source. The relay ST, when energized as hereinafter described, operates to energize the clutch trip magnet and trip the distributor clutch for releasing brush *b* for rotation and initiating transmission by the distributor TD. A resistance 31 is connected between the conductors 35 and 39 so as to bridge the armature and contact 38 of relay ST for spark prevention purposes, the value of resistance 31 being sufficiently high, for example, 2000 ohms, to prevent operation of ST through the resistance.

Operation

With the station in normal unoperated condition, as shown in Figs. 1 and 2, and the power supply turned on, all relays are deenergized except the line busy relay LB which is operated from ground at the outer right hand armature 40 and break contact of relay SS, conductor 41, winding of the relay LB, which is a slow release relay by reason of a condenser 42 bridged across its winding, and through a resistance 43 to grounded battery 44. The external line circuit is held closed over the SS relay shunt circuit hereinbefore described, viz., conductors 10, 11 and 25, left hand blade of the switch SW, conductor 26, armature 27 and break contact of the relay CP, conductor 28, upper inner armature and break contact 29 of relay BP, Fig. 2, conductors 30 and 18 to the stop segment Sp of the distributor, and through brush *b*, solid ring 20, and conductor 21 to the outgoing side of the telegraph loop L.

If a message tape is inserted in the tape transmitter TT and the tape cover gate closed, the contacts 46 of the end-of-tape switch ET will be closed. When the operator desires to transmit to

the line, the switch SW is thrown to its "on" position, and this opens the SS relay shunt circuit previously described and places the winding of the relay SS in series with the transmitting line. If the line is externally closed through to a source of telegraph battery, the line current will pass through the winding of relay SS and cause it to operate.

The operation of relay SS opens, at its outer right hand grounded armature and break contact 40, the circuit of the line busy relay LB and causes LB momentarily to release. Ground through the right hand armature 48 and contact 49 of the now unoperated relay LB is supplied to conductor 50, through the closed contacts 45 of the end-of-tape switch ET and the right hand blade of the switch SW which is in its "on" position, and through conductor 52 to various other points and initiates several operations as follows. It causes open line relay OL to operate through conductor 53, inner right hand armature and make contact 54 of operated relay SS, conductor 55, operating winding of the slow release relay OL, and conductor 56 to grounded battery 57. The operation of relay OL, at its left hand armature and make contact 65, completes an operating circuit for the start relay ST, this circuit comprising grounded battery 66, operating winding of relay ST, conductor 67, left hand outer armature and break contact 68 of cutoff relay CO, conductors 69 and 70, left hand armature and make contact 65 of the operated relay OL, and thence through conductors 53 and 52 to the right hand blade of the switch SW and the closed contacts 46 of switch ET, and conductor 50 and the right hand contact 49 and armature 48 of relay LB, to ground. Relay ST operates and locks up from battery on conductor 69, through its outer right hand armature and make contact 71, conductor 72, and the lower outer armature and break contact 73 of relay TTR, Fig. 2, and thence to ground.

The operation of relay SS has also caused a path to be prepared from conductor 52, Fig. 1, through a conductor 74, upper outer armature 75 and break contact of by-pass relay BP, Fig. 2, and conductor 76, to the make contact associated with the upper outer armature 77 of the tape transmission relay TTR. When this latter relay is operated, as hereinafter described, the foregoing circuit is continued through a conductor 78 to the operating winding of the tape lockout magnet TLO, Fig. 1, and through a limiting resistance 79 to grounded battery 80. A resistance 81 is bridged across the winding of TLO for spark prevention at the tape transmission relay armature and contact 77. Energization of the tape lockout magnet at the proper time causes retraction of its core 82 thereby to enable the message tape to be stepped through the transmitter TT, described in detail hereinafter with reference to Figs. 3, 4 and 5.

The code segments 1 to 5 of the segmented ring 19 of the rotary transmitting distributor TD are connected by conductors 1 to 5 which are multiplied, by means of a cable 85, to nine upper groups of armatures and make contacts of the counting chain of sequence relays (1) and (8) and the tape transmission relay TTR. The groups of armatures and contacts of the counting relays (1) to (8) are designated in Fig. 2 by the reference letters LS, CR, LF or CR, 1L, 2L, 3L, SP, and FS, respectively, appearing above the groups. The subsequent operations of the stop-segment relay SS, together with the auxil-

iliary relays P and CP, cause the sequential operation of predetermined ones of the counting relays (1) to (8), depending upon the nature of the functional signals and address signals to be transmitted, as determined generally by the operated or unoperated condition of relays BP, D and FS. If a short address is to be sent, relays (1), (4), (5), (6) and (7) are successively operated in the order named to transmit a letters shift signal, three station identification characters, and a space signal, immediately prior to operation of the tape transmission relay TTR. If a long address is to be sent prior to resumption in the transmission of an interrupted message, relays (1) to (7) are successively operated to transmit letters shift, carriage return, line feed, three station identification letters, and a space signal. If the following text of the interrupted message requires a figures shift signal, relay (8) also is operated immediately after relay (7), after which relay TTR is operated.

If a program message address is to be transmitted, the sequence of operation of the first three relays (1) to (3) is reversed in order to send predetermined selection or switching signals which at the receiving or relay station may be employed to switch the incoming circuit to desired outgoing circuits or to a selected tape re-perforator for preparing a control form for subsequent retransmission of the received messages to other lines or stations. These selection signals, in the particular embodiment illustrated, comprise carriage return, carriage return, and letters shift which are transmitted by relays (3), (2) and (1) operating in the order named, after which relays (4) to (6) transmit three station identification letters, and relay (7) transmits a space signal, followed by the operation of relay TTR.

When sequence relay (1) is operated, the five segments 1 to 5 of the transmitting distributor ring 19 are connected, through the armatures 90 and make contacts of the relay to conductor 11 which in turn is connected to the incoming side of the telegraph line L, and battery from the telegraph line will cause marking impulses to be applied to each of the five code segments of the distributor ring 19, thereby transmitting a letters shift signal. When sequence relay (2) is operated, its upper armature 91 and make contact will cause marking battery from line L to be applied to segment 4 of ring 19, the remaining segments representing spacing impulses, thereby transmitting a carriage return signal to the line. The function of sequence relay (3) varies dependent upon whether the diverter relay D is operated or unoperated. If D is unoperated, the operation of relay (3), through its armature 92 and make contact, will cause marking battery from the line L to be applied through conductor 100 to the right hand inner armature 101 and break contact of relay D and then through conductor 2 of cable 85 to segment 2 of distributor ring 19, causing the transmission of a line feed signal to the line. If relay D is operated, as when program messages are to be sent, marking battery will be applied through its aforesaid armature 101 and a make contact 103 to conductor 4 of cable 85 to apply marking battery to segment 4 of ring 19, thereby causing the transmission of a carriage return signal.

The particular identification character code signals transmitted by relays (4), (5) and (6), when operated successively, will be dependent upon which of their marking armatures and make

contacts 93, 94 and 95 are connected to conductor 11 by means of the cross connections 105, 106 and 107 on cross-connecting block BL1.

Relay (7), when operated, causes marking battery to be applied, through its armature 96 and make contact to segment 3 of the segmented ring 19, thereby transmitting a space signal to the line. The operation of relay (8) depends upon the operation of the figures shift relay FS, and when operated the four armatures and make contacts 97 apply marking battery to segments 1, 2, 4 and 5 of ring 19, thus transmitting a figures shift signal. Relay TTR, when operated, through five of its armatures and make contacts 98 and a cable 110, connects the five code contacts 13 of the tape transmitter TT to the corresponding five code segments of ring 19, so that during successive revolutions of the distributor brush *b* the permutation signals in the perforated tape which is being stepped through the tape transmitter and comprising the body of the message are transmitted to the line.

Transmission of a short address

The operation of the system will now be described with reference to the transmission of a short address, it being recalled that stop segment relay SS operates and releases once during each rotation of the released brush *b* of the rotary distributor TD.

Operation of relay (1).—The first operation of the relay SS completes a circuit from ground at armature 85 of the operated start relay ST, conductor 86, make-before-break contact 87 and armature 88 of relay SS, conductor 112, upper armature 114 and break contact of common pulse relay CP, conductor 115, left hand outer break contact and armature 116 of unoperated relay D, conductor 117, winding of relay (1) of the counting chain, conductor 118, outer right hand armature 119 and break contact of relay D, conductor 120, and lower inner armature 121 and break contact of relay (2). From the armature 121 a chain circuit extends through conductor 124, right hand armature 125 and break contact of relay D and conductor 126 to the break contact of the lower inner armature 127 of relay (3). From armature 127 the chain circuit continues through conductor 128 to right hand armature 129 and break contact of relay D, and conductor 130 to the break contact of the lower inner armature 131 of relay (4). Armature 131 is connected directly to the break contact and lower inner armature 132 of relay (5); similarly, armature 132 is connected to the break contact and lower inner armature 134 of relay (6), and thence to break contact and armature 135 of relay (7), break contact and armature 136 of relay (8) and break contact and armature 138 of relay TTR to grounded battery 139.

Relay (1) operates and at its armatures 90 and make contacts applies marking battery to each of the segments 1 to 5 of distributor ring 19, thereby marking the letters shift code on the transmitting segments of the distributor. Relay (1) locks up through a holding circuit comprising its upper inner armature 141 and make contact, conductor 142, current limiting resistance 144, Fig. 1, conductor 145, break contact and right hand middle armature 146 of relay CO, conductor 147 and right hand inner contact 62 and grounded armature 148 of the operated slow release relay OL. It will be recalled that the operation of relay ST has, through its armature 38 and make contact, operated the clutch trip magnet CT and released the distributor brush for rotation. The

locking armature 141 of relay (1) is a "preliminary make" armature, i. e., it engages its associated contact to close its locking circuit before the remaining armatures of the relay are effective to perform their circuit-controlling operations, and this is likewise true of the upper inner locking armatures of the relays (2) to TTR.

When the distributor brush leaves the *Sp* segment, the relay SS is released, and the ground from armature 85 of relay ST which caused the operation of counting relay (1) is removed at the armature 88 of relay SS, but relay (1) remains operated over its locking circuit above described. Due to the release of relay SS, the following operations also ensue: Prime relay P operates by reason of the reclosure of contacts 37 and 150 of relay SS which completed a circuit from ground at armature 85 of relay ST, to conductor 151, the operating winding *w1* of relay P, conductor 152, lower inner make contact and armature 154 of operated relay (1), conductor 118, and thence through the chain circuit above described which includes the lower inner armatures and break contacts of relays (2) to TTR, to grounded battery 139. The operation of relay P closes an operating circuit for relay CP, this circuit comprising grounded battery 156 at relay CP, operating winding of CP, conductor 157, lower outer make contact and armature 158 of relay P, conductors 159 and 160 and the right hand inner make contact and grounded armature 48 of relay LB which has operated by reason of the closure of its operating circuit at the armature 40 of deenergized relay SS. Relay LB now remains operated, because of its slow release characteristics, during succeeding revolutions of the distributor brush. Relay OL also remains operated because of its slow release characteristics, notwithstanding that the energizing circuit through its winding was opened at armature 54 of relay SS.

Relay CP, upon operating, provides a locking circuit for itself from grounded battery 156 through its lower inner make contact and armature 162, conductor 163, conductor 86, and left hand inner make contact and armature 85 of relay ST to ground. With relay CP operated it provides ground through its lower make contact and armature 164, replacing the former ground through armature 48 and break contact 49 of relay LB, for energizing relay OL when relay SS reoperates, the circuit comprising armature 164 and make contact of relay CP, conductor 165, conductor 50, end-of-tape switch contacts 46, right hand blade of switch SW, conductors 52 and 53, right hand inner armature 54 and make contact of relay SS, conductor 55, operating winding of relay OL and conductor 56 to grounded battery 57.

Operation of relay (4).—Since relay ST remains operated by reason of its locking circuit through grounded armature 73 of relay TTR, the clutch trip magnet CT remains energized and the brush arm *b* will not stop after completing one revolution. When the brush again reaches the stop segment *Sp*, relay SS again operates, causing the operation of sequence relay (4), the relays (2) and (3) being by-passed by the upper middle armature 161 and break contact of unoperated relay BP, as described below.

The second operation of relay SS completes a circuit from ground at armature 85 and make contact of operated relay ST, through conductor 86, make-before-break contact 87 and armature 88 of SS, conductor 112, armature 114, and make contact of operated relay CP, conductor 116, lower inner armature 167 and make contact of

operated relay P, lower outer make contact and armature 168 of operated relay (1), conductor 169, upper middle armature 161 and break contact of unoperated relay BP, conductor 170, winding of relay (4), and thence through armatures and break contacts 132, 134, 135, 136 and 138 of relays (5) to TTR, to grounded battery 139. Relay (4) operates and locks up through its preliminary make armature 174 and contact to the grounded conductor 142. At its five upper armatures 93 and their make contacts the relay applies marking battery to certain of the segments of the distributor ring 19 in accordance with the cross connections 105 of block BL1, thereby marking the transmitting segments with the code for the first character of the station identification, for example, the letter A. The same ground supplied by the closed contacts 87, 88 of relay SS temporarily establishes a locking circuit through winding w2 of relay P to grounded battery 172. The operation of relay (4) causes the battery supply to the winding of relay (1) and winding w1 to be opened at armature 131 and break contact of relay (4), causing relay (1) to release. Relay P remains operated because of the locking circuit through its winding w2 just described. When relay SS releases, this locking circuit is opened and relay P releases.

Operation of relay (5).—The third operation of relay SS causes the operation of relay (5) through a circuit which includes the contact 87 and armature 88 of SS, armature 114 and make contact of relay CP, armature 167 and break contact of unoperated relay P, conductor 175, lower outer make contact and armature 176 of operated relay (4), conductor 177, winding of relay (5), and thence through armatures 134, 135, 136, 138 of relays (5) to TTR, to grounded battery 139. The operation of relay (5) opens, at its armature 132 and break contact, the holding circuit for the winding of relay (4) which releases, relay (5) having previously locked up through its preliminary make armature 180 and contact to ground on the conductor 142. When relay SS releases, relay P operates from ground on conductor 151 through its upper winding w1, conductor 152, and make contact and armature 132 of relay (5) to battery at 139. Relay (5) at its five upper armatures 94 and their make contacts, marks the transmitting segments of distributor ring 19 in accordance with the cross connections 106 of block BL1, thereby marking the transmitting segments with the code for the second character of the station identification, for example, letter B.

Operation of relay (6).—The fourth operation of relay SS operates relay (6), it being understood that the terminals of the connecting block BL2 are wired as shown by the connecting wires x and x' in the lower right hand corner of Fig. 2. The ground applied to conductor 166 by relay SS is extended through armature 167 and make contact of operated relay P, conductor 184, lower outer armature and make contact 135 of relay (5), conductor 186, winding of relay (6), and thence through armatures and break contacts 135, 136 and 138 of relays (7) to TTR, to the grounded battery 139. Relay (6) operates and at its five upper armatures 95 and their make contacts applies marking battery to certain of the segments of distributor ring 19 in accordance with the cross connections 107 of block BL1, thereby marking the transmitting segments with the code for the third letter of the station identification, for example, letter C. The same ground applied by relay SS again temporarily

establishes a locking circuit through the winding w2 of relay P to grounded battery 172. Relay (6) locks up through its preliminary make armature 188 and contact to ground on conductor 142. The operation of the relay opens, at its lower inner armature 134 and break contact, the holding circuit for relay (5) which releases, and the circuit through winding w1 of relay P which, however, remains operated because of the locking circuit through its winding w2. When relay SS releases, the locking circuit for relay P is opened and relay P releases.

Operation of relay (7).—The fifth operation of relay SS operates relay (7), operating ground being applied to conductor 175 in the manner heretofore described with respect to relay (5). From conductor 175 the circuit extends through lower outer make contact and armature 190 of operated relay (6), conductor 191 to terminal block BL2, connection x, conductor 192, winding of relay (7) and thence through armatures 135 and 138 of relays (8) and TTR to the grounded battery 139. Relay (7) operates and locks up through its preliminary make armature 194 and contact to the grounded conductor 142, and opens at its armature 135 and break contact, the holding circuit for relay (6) which releases. When relay SS releases, relay P operates from ground on conductor 151 through its upper winding w1, conductor 152 and make contact and armature 135 of relay (7) to grounded battery 139. Relay (7) at its upper outer armature 96 and make contact applies marking battery to segment 3 of the transmitting ring 19, marking the transmitting segments with the code for a "space" signal, thereby separating the identification letters one space from the body of the message which is to follow.

Operation of relay TTR.—The sixth operation of relay SS operates the tape transmission relay TTR, the operation of relay (8) being by-passed at the upper armature 209 and break contact of unoperated figures shift relay FS. Relay SS again applies operating ground to armature 167 and make contact of operated relay P, the circuit continuing through conductor 184, lower outer make contact and armature 201 of operated relay (7), conductors 202, 203, upper armature 200 and break contact of relay FS, conductor 204, and winding of relay TTR to grounded battery 139. Relay TTR operates and locks to ground through its preliminary make contact and armature 206 to conductor 142, and at five of its upper armatures 98 connects, through cables 110 and 85, the five tape pin contacts 13 of the tape transmitter TT to the five transmitting segments 1 to 5 of distributor ring 19, permitting transmission from the perforated tape.

Relay TTR also operates the tape lockout solenoid TLO in the transmitter, the circuit comprising the grounded armature 164 and make contact of operated relay CP, conductors 165 and 50, switch contacts of ET and SW, conductors 52, 74 to armature 75 and break contact of unoperated relay BP, conductor 76, upper outer armature and make contact 77 of relay TTR, conductor 78, operating winding of magnet TLO and resistance 79 to grounded battery 80. The same ground at armature 164 of relay CP also serves to lock the start relay ST, through conductor 53, right hand inner armature and make contact 206 of relay ST, armature 71 and make contact of the same relay, conductor 69, left hand outer armature and break contact 68 of re-

lay CO, conductor 67 and winding of relay ST to the grounded battery 66, the former locking circuit for relay ST through conductor 72 having been opened by the operation of relay TTR, at its lower outer armature and break contact 73. Relay CP remains locked to ground at armature 85 and make contact of relay ST. Relay (7) is released at operated armature 138 of relay TTR.

So long as untransmitted perforated tape is available for feeding through the transmitter, all equipment remains in the condition just described, and transmission to the line L from the perforated tape continues. The following relays remain operated: ST, CP, OL, LB and TTR; also magnets CT and TLO of the transmitter-distributor. Relay SS operates and releases as the brush *b* passes the stop segment *Sp* on each revolution during transmission from the tape.

Upon completion of transmission of a message, transmission will normally be stopped by the operator who restores the switch SW to its "off" position. This opens the locking circuit for relay ST which releases. The release of ST releases relay CP and deenergizes the clutch trip magnet CT. Upon completion of the revolution of the distributor then in progress, the brush arm *b* comes to rest on the stop segment. Relay SS will not operate at this time since it is short-circuited by the shunt path through the left hand blade of switch SW, as hereinbefore described, and therefore relay OL releases, causing the release of relay TTR. Relay LB remains operated and all portions of the equipment have been restored to their original condition.

Another means of stopping transmission which may be considered normal is for the end of the message tape to pass completely through the transmitter, causing the contacts 46 of the end of tape switch ET to open. The resulting operations are similar to those of the preceding paragraph, except that since the switch SW is still in its "on" position, relay SS will operate from the line current after the brush arm *B* has come to rest with its brushes on the stop segment *Sp*. Relay OL will release, however, since its holding circuit is opened at the switch ET. Relay LB will release, after relay SS has been operated for approximately 0.3 second.

Two letter station identification.—When the station identification is to comprise only two letters or other characters, the cross connections 107 on block BL1 are changed, as by omitting all the cross connections 107 except the middle one, so that a "space" code signal will be applied to the transmitting segments of distributor ring 19 when relay (6) is energized, and in this case the connections indicated in dotted lines *y*, *y'* and *y*² at block BL2 are employed, instead of the connections *x* and *x'* which are omitted. Since relay (6) will transmit a space signal, the operation of relay (7) may therefore be omitted so as to eliminate the transmission of a second space signal, the skipping or by-passing of the normal operation of relay (7) being accomplished by the cross connections *y*, *y'* and *y*² referred to above. The operation of the relay SS, following its operation which causes relay (6) to operate, will operate relay TTR, omitting the operation of relay (7). This circuit for operating TTR may be traced from grounded battery 139, winding of relay TTR, conductor 204, upper break contact and armature 200 of unoperated relay FS, conductors 203 and 202 to terminal block BL2, cross connection *y*,

conductor 191, and operated armature 190 and make contact of relay (6), to ground which has been applied to conductor 175 by the relays SS and P. Otherwise, the remainder of the operation is the same as that above described with reference to three station identification letters.

Stopping transmission due to tight tape.—If, during transmission from the perforated tape, the tight tape arm of switch TTS is lifted, opening the contacts 36, the circuit to the trip magnet CT is opened and the magnet releases. At the end of the revolution in progress, the brush arm *b* comes to rest on the stop segment *Sp* and relay SS operates. Relay ST remains operated, holding relay CP locked. Relay LB releases in approximately 0.3 second after the operation of SS, and operates the relay CO over a circuit comprising left hand grounded armature 212 and break contact of relay LB, conductors 213 and 214 to lower outer armature 215 and make contact of relay CP, conductor 216, and winding of relay CO to grounded battery 217. The opening of armature 146 of relay CO releases relay TTR. Relay CO locks through its right hand inner armature 220 and make contact, and conductor 221, lower outer armature 222 and break contact of relay BP, to ground at 223. The opening of armature 68 of relay CO releases relay ST, thereby releasing relay CP. If the tight tape arm is now restored, reclosing its contacts 36, transmission will not be resumed automatically because the circuit to the clutch trip magnet has been opened at armature 38 of relay ST.

Operation of the restart keys

When the transmission has been stopped in the manner described in the preceding paragraph, it can be resumed only after the "long address" has been transmitted, and this operation can only be initiated by the use of one or the other of the two restart keys designated by the legends "Break-letters" and "Figures restart" in Fig. 1. The operator inspects the monitor printer MP to observe whether transmission was in progress in "letters" or "figures" case at the time of interruption, and then depresses and releases the corresponding restart key so that transmission may be resumed in the proper case following transmission of the long address.

Assume that the Letters restart key is depressed. This establishes a circuit from ground at 231 through the right hand make contact and spring 232 of the key, conductor 221, armature 220 and make contact of operated relay CO and through its winding to grounded battery 217, holding relay CO locked. An operating circuit for the by-pass relay BP is also completed from ground at armature 164 and break contact of relay CP, conductor 234, to the left hand spring 235 and make contact of the depressed key, conductor 236, left hand inner armature 237 and make contact of operated relay CO, conductors 238 and 239, winding of relay BP, conductor 240 and armature 138 and break contact of relay TTR to grounded battery 139. Relay BP operates and locks through its lower inner armature 242 and make contact to ground 223, and removes the ground which was applied at its lower outer break contact and armature 222 and formerly held relay CO operated. If the key is now released, this removes the remaining ground 231 from conductor 221 and relay CO releases. Re-transmission of the station identification in long address form now begins.

Operation of relay (2).—Since relay BP is now

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operated, relays (2) and (3) will not be bypassed as in the previously described transmission of the short address, and the second operation of relay SS will cause relay (2) to operate following the operation of relay (1) which transmitted a letters shift signal. Relay (2) operates from ground applied by relay SS to the conductor 166, armature 167 and make contact of operated relay P, armature 168 and make contact of operated relay (1), conductor 169, the upper middle armature 161 and make contact of BP, conductor 242, winding of relay (2), conductor 124, armature 125 and break contact of relay D, conductor 126, break contact and armature 127 of relay (3) conductor 128, armature 129 and break contact of D, conductor 130, armatures 131—138 of relays (4) to TTR, and grounded battery 139. Relay (2) operates and locks up through its preliminary make armature 244 and contact to conductor 142, and at its actuated armature 121 causes the release of relay (1). At its upper armature 91 and make contact relay (2) marks segment 4 of distributor ring 19, thereby causing the distributor to transmit a carriage return signal to the line L. Relay P functions in the manner hereinbefore described in the operation of relay (4), and upon the release of SS, relay P releases. At the lower armature 245 of relay (2) a path is prepared for the subsequent operation of relay (3).

Operation of relay (3).—The third operation of relay SS will cause relay (3) to operate over a circuit from grounded conductor 166, armature 167 and break contact of unoperated relay P, conductor 175, make contact and armature 245 of operated relay (2), conductor 246, winding of relay (3), conductor 128, right hand armature 129 and break contact of D, conductor 130, armatures 131—138 of relays (4) to TTR, to grounded battery 139. Relay (3) operates and locks through its preliminary make armature 250 to the conductor 142, and at its lower inner armature 127 and break contact releases relay (2). At the armature 127 and its make contact, an operating circuit from battery 139 is supplied, through the unoperated contacts of relay D, for the winding *w1* of relay P which locks up. At its lower armature and make contact 252, relay (3) prepares a path from conductor 184 for the subsequent operation of relay (4) through conductor 254, left hand inner armature 256 and break contact of relay D, conductor 170, winding of relay (4) and armatures 132—138 of relays (5) to TTR, to battery 139.

The operation of relay (3) at its upper armature 92 and make contact applies marking current through conductor 190, right hand inner armature 191 and break contact of D, and conductor 2 to segment 2 of the distributor ring 19, and a line feed signal is transmitted to line L following the carriage return signal previously transmitted by relay (2), thereby to set the remainder of the interrupted message, when printed, apart from that portion of the message which was transmitted prior to the interruption.

When relay TTR operates, following the transmission of the long address, the relay opens, at its armature 139, the operating circuit of relay BP which releases. Transmission from the tape is now resumed, assuming that switches SW, ET and TTS have remained closed; if they are not all closed, transmission will cease after completion of the address, as follows: (a) If SW is "off," the winding of relay SS will be short-circuited when relay BP releases following the

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operation of relay TTR. (b) If SW is "on," but ET is opened, the release of relay BP opens the holding circuit for relay ST at armature 75 and break contact of BP. (c) If the contacts 36 of the tight tape switch TTS are open, the clutch trip magnet CT will be deenergized when relay BP releases, the brush arm will come to rest with brush *b* on the stop segment *Sp*, relay SS operates and relay OL releases, releasing relays ST and TTR. Under the condition just described, the armature 75 and break contact of relay BP serve as a precautionary measure in opening the circuit to the tape lockout magnet TLO to prevent a premature stepping of the tape when relay TTR operates.

When transmission is restarted by means of the Figures restart key, the resulting series of operations is similar to that just described for the Letters restart, with the exception that relay FS operates over a circuit from grounded armature 164 and break contact of relay CP, conductor 234, right hand spring 260 and make contact of the latter key, conductor 262, armature 263 and make contact of relay CO, conductor 264, winding of figures shift relay FS, conductor 240 and break contact and armature 138 of relay TTR to grounded battery 139. Relay FS operates and locks through its lower inner armature 266 and make contact to ground, and through its lower outer armature 267 and make contact operates relay BP over a circuit from battery 139 on conductor 240, winding of BP, conductor 269, armature 267 and make contact of FS, conductor 270 to grounded armature 164 of relay CP. Both FS and BP remain locked under the control of relay TTR. With BP operated, this insures the transmission of the long address in the manner stated above, and with FS operated causes relay (8) to operate for the transmission of a figures shift signal after the space signal has been transmitted and before TTR operates. For this purpose relay (8) at its four upper armatures 97 and make contacts applies marking current to segments 1, 2, 4 and 5 of distributor ring 19.

Following the operation of the space relay (7), and assuming three station identification characters are employed, the operation of relay SS causes ground to be applied to conductor 184 as in the manner heretofore explained with reference to the operation of relays (4) and (6), the circuit extending through make contact and armature 201 of relay (7), conductors 202, 203, armature 200 and make contact of operated relay FS, conductor 274, winding of relay (8) and break contact and armature 138 of relay TTR to the grounded battery 139. The operation of relay (8) prepares a circuit from conductor 175 through connection *x'* of block BL2, conductor 275, lower outer make contact and armature 276 of relay (8), conductor 204 and winding of relay TTR to battery 139. Relay (8) locks up through its preliminary make armature 272 and contact, and at its lower inner armature 136 and break contact releases relay (7). Following the transmission of the figures shift signal, relay TTR operates through the circuit above noted, and relays BP and FS release due to the operation of armature 138 of TTR.

If only two station identification letters or other characters are employed, relay (6) transmits the space signal and relay (7) is by-passed, the circuit to relay (8) extending from ground on conductor 175, make contact and armature 190 of (6), conductor 191 to block BL2, connection *y*, conductors 202, 203, armature 200 and

make contact of FS, conductor 274, winding of relay (8) and armature and break contact 139 of relay TTR to battery. Relay (8) connects a circuit for the winding w1 of relay P through conductors 152, 278 to block BL2, connection y', conductor 279, lower inner make contact and armature 136 of relay (8) and armature 138 and break contact of TTR to battery 139. At its lower outer armature 276 and make contact, relay (8) prepares an operating circuit for TTR by connecting conductor 184, connection y2 on block BL2 and conductor 275 to conductor 294 and winding of relay TTR to battery, and the latter relay operates following the transmission of the figures shift signal.

Various known spark protection means may be employed throughout the circuit, wherever desirable or necessary. For example, resistances 325, Fig. 1, which are connected from conductors 151 and 145, through condensers 326 to negative grounded battery 327, protect certain contacts of relays SS, CO and OL. The condensers are charged up by the battery 327 when these relays are operated and their contacts are connected to ground, and when the ground is removed the condensers discharge through the relay counting chain circuit and absorb the surges. Also, current limiting resistances may be employed throughout the circuit to regulate or control the current flowing in the various portions thereof.

Description of tape transmitter

Figs. 3 to 5 illustrate one form of a tape transmitter and distributor, and tape stepping control means therefor, which may be employed with the system shown in Figs. 1 and 2, although it is to be understood that any other known transmitter and distributor suitable for the purpose, and having tape stepping mechanism controllable generally as disclosed herein, may be employed. The general structural details and manner of operation of the transmitter-distributor illustrated are well known in the art and are substantially in accordance with the unit described in the U. S. Patent to Potts No. 2,057,111, issued October 13, 1936, except as the unit is modified for the purposes of the instant invention. Referring particularly to Fig. 3, the brush arm b, when released by the clutch trip magnet CT, travels over the circular segmented distributor ring 19 and the circular solid ring 20, the solid ring being concentrically disposed within the segmented ring. A mounting base structure 350 supports the transmitter-distributor apparatus, the apparatus including its driving motor being protected by a removable cover or housing structure 351. Secured to the base 350 is a frame 352 which supports the rotary distributor, its shaft 353 and other operating parts. Shaft 353 which carries the brush arm b is driven, in known manner, by the driving motor M and gearing (not seen in Fig. 3) within the housing 351, the power being supplied through a gear wheel 354 and a friction clutch 355. The shaft 353 is restrained in stop-start manner by a stop cam 356 and stop arm 357 controlled by the clutch trip magnet CT, the arm 357 operating to release shaft 353 when magnet CT is energized.

The lower end of shaft 353, which is supported by bearing structure 358, carries a cam 360 rigidly secured to the shaft by a collar 361 and plate 362 to which the cam is adjustably secured, as by screws 364 which are received within arcuate slots in the plate 312, as seen in Fig. 4. The

cam 360, which rotates with the shaft 353 in the direction of the curved arrow shown in Fig. 3, controls a tape sensing mechanism comprising, in the instant embodiment, five feeler arms 368. The feeler arms are all cyclically withdrawn, during advancement of the tape, by a pivotally mounted lever bail 369 having an arm or lever 370 which is operated by a lever 372 that is pivotally mounted at 374 to a depending bracket member 375 of the frame structure, and is controlled by the cam 360 when the lever 372 is not locked by the solenoid plunger 82 of the tape lock-out magnet TLO. When the relay TTR of Fig. 2 is energized, each of the five code segments 1 to 5 of the segmented ring 19 is electrically connected, as heretofore described, to a corresponding one of the set of electrical contacts 13 on the feeler levers 368 which carry the feeler pins p. These feeler pins are arranged in transverse alignment across the path traveled by the perforated tape or control form t. The resilient spring contacts 13 move between the pair of oppositely presented marking and spacing contacts m and s.

When the tape transmitter is operating, perforated tape is fed, in the direction of the straight arrow in Fig. 3, by a pawl and ratchet actuated feed wheel 378 in a step-by-step manner. The several feeler levers 368 are periodically reciprocated by the bail 369 in cooperation with individual springs (not shown), alternately presenting and withdrawing their pins p from engagement with the tape t. Bail 378 rotates about the point 380 and describes a periodical reciprocal movement, and in so doing actuates in well known manner, and as shown in Fig. 4 of the aforesaid Potts patent, the feed pawl 381 and ratchet 382 for advancing the tape.

The perforations in the tape t occur in regular transverse rows, having various numbers of code perforations which are variously distributed in each row. When a transverse row of perforations is presented opposite the alignment of pins p, the absence of a perforation prevents its associated lever 368 from rotating beyond that point at which it engages the tape, but when a perforation is presented opposite any pin p, the pin is permitted to enter such perforation and the associated lever 368 continues to rotate to a limited degree until its spring contact 13 encounters its associated contact m. The presence of a perforation is generally referred to as a marking condition and the absence of a perforation as a spacing condition. In this sense then, those feeler levers 368 which encounter a marking condition continue to rotate until their spring contacts 13 touch the lower contact points m, while those which encounter a spacing condition fail to travel this distance and remain with their contact springs 13 engaged with the upper contact points s.

The cam 360, which has a high point 360a, engages a cam follower 365 on the lever 372, seen more clearly in Fig. 4, and as the cam rotates during rotation of the shaft 353, it periodically actuates the lever 372 and thus imparts a periodic reciprocal movement to the bail 369 and feeler levers 368. The end of the lever 372, which actuates the arm 370 of the bail, carries a screw 387 and adjustable nut 388 whereby the extent of movement of the bail 369 may accurately be adjusted. Since the stepping of the tape and operation of the tape transmitter is initiated by and depends upon the operation of the bail 369, stopping the movement of the bail will prevent the transmitter from stepping, and this is effected

by reason of the fact that the retractile plunger or core 82 of the tape lockout magnet, when the latter is deenergized, drops down into a position such that it engages the edge of the lever 372 and holds or blocks the lever in the position shown in Figs. 3 to 5, notwithstanding that the cam 360 may continue to rotate as during rotation of the distributor when transmitting the functional and address characters hereinbefore referred to. The tape lockout magnet structure is rigidly secured, as by a U-shaped plate 390 which is fastened by studs 391 to a bracket 392 secured to a portion 350a of the frame structure 350. The operation of relay TTR at its upper armature 77 and make contact energizes the magnet TLO, which causes the core 82 to be drawn upwardly to a position such as to release and clear the lever 372, whereby the cam 360 again is operative to actuate lever 372 and bail 369 and thus effect transmission from the tape t.

Stopping transmission due to various abnormal conditions

Interference with brush arm.—If during transmission from the tape the brush arm b is mechanically impeded so as to stop its rotation with the brushes on any segment except the stop segment Sp, relay SS will remain unoperated for an interval longer than during transmission of a character and relay OL will release. Ground through the armature 148 and break contact of relay OL, conductor 214, armature 215 and make contact of operated relay CP, conductor 216, and winding of relay CO to battery 217 will cause the latter relay to operate. The operation of CO, at its armature 68 and break contact, releases relay ST, thereby deenergizing the clutch trip magnet CT. If the brush arm is now released, it will come to rest with the brushes on the stop segment, and relay SS will reoperate, but transmission can be resumed only by the use of one of the restart keys.

If the mechanical interference with the brush arm takes place while the brushes are on the stop segment, relay SS will remain operated for longer than the normal interval and relay LB will release, applying ground from its released armature 212 and break contact to conductors 213, 214, armature 215 and make contact of relay CP, conductor 216 and winding of relay CO, to grounded battery 217, operating CO and stopping transmission, as described heretofore. Transmission can be resumed only by the use of one of the restart keys.

Stop due to open line.—If the line L to which transmission is being made goes open, relay SS will not operate as the distributor brushes pass the stop segment. Relay OL will then release, operating relay CO and stopping transmission, as described with respect to stopping of transmission due to interference with the brush arm when on other than the Sp segment. When the line circuit is reestablished, relay SS will operate, but transmission can be resumed only by the use of one of the restart keys. If the station is provided with plugs and jacks or other connecting or switching apparatus for connecting or switching the station, the removal of the connecting plug associated with the apparatus from a sending-line jack or the opening of other connecting devices will open the line and stop transmission in a similar manner.

Failure of A. C. power supply.—If the alternating current power supply 32, 33 fails during transmission, the direct current power remain-

ing uninterrupted, the clutch trip magnet CT will release and the driving motor M will begin to coast to a stop. When the brushes on arm b reach the stop segment, the brush arm comes to rest. Operation thereafter is similar to that described hereinbefore with reference to stopping of transmission due to tight tape, and transmission can be resumed only by the use of one of the restart keys.

Failure of D. C. power supply.—If the direct current power, illustrated by battery symbols in Figs. 1 and 2, fails during transmission, all operated relays will release except relay SS which operates on line current. The release of relay ST will deenergize the clutch trip magnet, and the brush arm will come to rest with the brushes on the stop segment. When the direct current power supply is reestablished, all relays are enabled to function as in the normal starting operation hereinbefore described, and the short address is transmitted followed by resumption of transmission from the tape.

Attempt to start on open line.—If an attempt is made to start transmission when the external line circuit is not closed, relay SS will not operate and relay OL remains unoperated which prevents relay ST from operating. No further action can take place until the line circuit again is closed.

Attempt to start transmission when line is in use

If an attempt is made to start transmission at a time when signals are being sent over the line L from some other station, the relay SS will pulse following the line signals as soon as the left hand contact of switch SW is opened when the switch is operated to its "on" position, removing the short circuit from the winding of relay SS. Under this condition relay SS will not remain operated for a sufficient length of time to permit relay LB to release. Hence, relay ST cannot operate, since it is awaiting closure to ground at armature 48 and contact 49 of relay LB. When transmission from the distant station ceases and steady marking current flows to hold relay SS operated for a sufficient length of time to permit LB to release, transmission of the address will proceed in the normal manner hereinbefore explained.

Breaking transmission from another station

If the operator desires to break the transmission of some other station on the line, this may be done by depressing the Break-letters key. This causes operation of the break relay BK over a circuit from ground at armature 164 and break contact of relay CP, conductor 234, spring 235 and make contact of the Break-letters key, conductor 236, armature 237 and break contact of relay CO, conductor 258, winding of relay BK and conductor 56 to grounded battery 57. BK operates and opens the line circuit at its left hand armature 16 and break contact. If the distant station is transmitting from a station similar to the one disclosed herein, the transmission of the distant station will be stopped as described above with reference to stopping of transmission when the line goes open. The opening of the line circuit by relay BK releases relay SS, operating relay LB and causing relay BP to operate through grounded armature 48 and make contact of LB, conductors 160, 159, armature 286 and make contact of BK, conductor 239, winding of BP, conductor 240 and break contact and armature 138 of TTR, to grounded battery 139.

When the operator releases the Break-letters key, relay BK releases, reclosing the line circuit.

The station will now send the long address so as to indicate to other stations on the line the identity of the station making the break. If at this time switch SW is "on" and ET and TTS switches are closed, the transmission will be the same as described hereinbefore with reference to the operation of the restart keys. However, if switch SW is in the "off" position, relay SS will be permitted to operate on the line current, since the short circuit path which is normally closed across the winding of SS when SW is "off" is now open at armature 29 and break contact of relay BP. If the TTS switch contacts are open, the clutch trip magnet will be energized through conductor 287, lower middle armature 288 and make contact of operated relay BP and conductor 289.

Following transmission of the long address described in the previous paragraph, transmission from the tape will take place, provided the switches SW, ET and TTS are all closed; otherwise, transmission will cease upon completion of the address.

Attempt to stop transmission of address

If during transmission of the address and before relay TTR has operated switch SW is moved to "off" or switch ET is opened, transmission of the address will proceed in the normal manner, but upon its completion no further operation will take place. Once transmission of the address has started the relay CP is operated in a manner already described with reference to the normal operation of the system, the relay operating through armature 158, and make contact of P, armature 48 and make contact of LB and locks through armature 162 and make contact of CP and armature 85 and make contact of ST. If switch SW is restored during transmission of the address, it will not short-circuit the winding of SS because the shunt path is open at armature 27 and break contact of CP. Hence, relay SS will continue to pulse as the brush arm rotates. The ground through switch SW to armature 54 of relay SS is removed, but this armature still remains grounded over a circuit from ground at armature 73 of TTR, conductor 72, armature 71 and make contact of ST, conductor 70 and armature 65 and make contact of relay OL and conductor 53. This ground from relay TTR, therefore, holds relays OL and ST locked and permits rotation of the brush arm to continue, and as SS operates each time the brushes pass the stop segment, the counting or sequence relays function and the address is transmitted. When relay TTR operates, the operation of its armature 73 releases relays ST and OL. The release of ST releases relay CP and deenergizes the clutch trip magnet.

If switch ET is open during transmission of the address, the operation is similar to that just described; the ground from armature 164 is removed from armature 54 of relay SS but is replaced by ground from armature 73 of TTR. If the tight tape switch contacts 36 are opened during transmission of the address, relay CT will be deenergized and the brush arm will come to rest at the end of the rotation then in progress. Relay SS then operates, releasing relay LB. Since relay CP is operated, a path is provided for operating relay CO from armature 212 of LB. The operation of CO releases ST and all operated counting chain relays. With relay ST released,

this releases CP. Transmission can be resumed only by use of one of the restart keys, causing transmission of the long address.

Program message transmission

As set forth above, certain messages designated program messages are to be preceded by the transmission of selection or switching signals comprising, in the embodiment disclosed herein, two carriage return signals transmitted successively, followed by a letters shift signal, as an indication to automatic message diversion equipment at the receiving station that the message is to be switched to other circuits for repeating. Before preparing to transmit a program message, the Program message key, which is of the locking type, is depressed and left in its depressed position; the message tape is placed in the transmitter and transmission initiated as described herein with reference to starting the equipment when in its normal condition. The operated Program message key closes a circuit from grounded battery 139, armature 138 and break contact of relay TTR, conductor 240, winding of diverter relay D, conductor 300, spring 301 and make contact of the key, and thence through break contact and spring 302 of the Figures restart key and break contact and spring 232 of the Break-letters key, conductor 221, armature 222 and break contact of relay BP to ground 223.

With relay D operated, the first operation of relay SS will operate sequence relay (3) instead of relay (1) as heretofore. Relay SS, upon operating, completes a circuit from ground at armature 85 of the operated start relay ST, conductor 86, make-before-break contact 87 and armature 88 of SS, conductor 112, upper armature 114 and break contact of CP, conductor 115, make contact and armature 247 of operated relay D, conductor 248, winding of relay (3), conductor 128, armature 129 and make contact of relay D, conductor 120, break contact and armature 121 of relay (2), conductor 124, armature 125 and make contact of relay D, conductor 305, break contact and armature 154 of relay (1), conductor 118, armature 119 and make contact of relay D, conductor 130, break contact and armature 131 of relay (4) and thence through the remainder of the chain circuit comprising armatures 132—138 of relays (5) to TTR, to grounded battery at 139.

Relay (3) operates and locks, from battery on conductor 128, through its upper inner armature 250 and make contact to conductor 142, and at its lower armature 252 and make contact prepares a circuit for the subsequent operation of relay (2). At its upper outer armature 92 and make contact, relay (3) applies marking battery from the line L to segment 4 of distributor ring 19, over a circuit comprising conductor 100, right hand inner armature 101 and make contact 103 of relay D, and conductor 4 in cable 25, thereby marking the distributor ring with the code for a carriage return signal. The operation of relay ST, following the operation of SS, has operated the clutch trip magnet CT and released the distributor brush for rotation.

When the distributor brush leaves the stop segment, the ground at armature 85 of relay ST which caused the operation of relay (3) is removed at the released armature 88 of relay SS, but relay (3) remains operated over the locking circuit through its preliminary make armature 250. Due to the release of SS, prime relay P operates by reason of the reclosure of the contacts 87 and 150 of SS which completes a circuit from

ground at armature 85 of relay ST, to conductor 151, the upper winding w1 of relay P, conductor 152, lower inner make contact and armature 127 of operated relay (3) and conductor 128 through the chain circuit described above for energizing the winding of relay (3), to grounded battery 139 at relay TTR. The operation of relay P closes an operating circuit for relay CP, this circuit comprising grounded battery 156 at CP, winding of CP, conductor 157, lower outer make contact and armature 158 of operated relay P, and conductors 159 and 160 to the grounded armature 48 of operated relay LB which operated by reason of the closure of its operating circuit at the armature 40 of deenergized relay SS. As stated before in connection with the operation of relay (1), slow release relays LB and OL remain operated, and relay CP locks up, through its inner armature 162, to armature 85 of relay ST to ground. Relay CP operated provides a ground through its make contact and armature 164, replacing the former ground through armature 48 and break contact 49 of relay LB, for energizing relay OL when relay SS reoperates.

As heretofore described, the second operation of relay SS applies ground to the lower inner armature 167 and make contact of operated relay P, the circuit continuing through conductor 184, make contact and armature 252 of relay (3), conductor 254, armature 256 and make contact of relay D, conductor 242, winding of relay (2), conductor 124, armature 125, and make contact of relay D, conductor 335, break contact and armature 154 of relay (1), conductor 118, armature 119 and make contact of relay D, conductor 130, break contact and armature 131 of relay (4), and thence through the chain circuit comprising armatures 132—138 of relays (5) to TTR, to grounded battery 139. Relay (2) operates and locks up through its preliminary make armature 244 and contact, and at its operated armature 121 releases relay (3) and opens the circuit through winding w1 of relay P. At its armature 91 and make contact relay (2) applies marking battery to segment 4 of distributor ring 19, thereby marking the distributor ring with the code for a second carriage return signal. At its lower armature 245 and make contact the relay prepares a circuit for the subsequent operation of relay (1). Relay P remains operated because of the locking circuit through its winding w2 until the relay SS releases, whereupon this locking circuit is opened and relay P releases.

The third operation of relay SS applies ground to the armature 167 and break contact of the now unoperated relay P and causes the operation of relay (1), the circuit extending through conductor 175, make contact and armature 245 of relay (2), conductor 246, make contact and armature 116 of relay D, conductor 117, winding of relay (1), conductor 118, armature 119 and make contact of relay D, conductor 130, break contact and armature 131 of relay (4), and thence through armatures 132—138 of relays (5) to TTR, to grounded battery 139. Relay (1) operates and locks up through its preliminary make armature 141, and at its armature 154 and break contact releases relay (2). At its five upper armatures 90 and make contacts, relay (1) applies marking battery to each of the segments 1 to 5 of the distributor ring 19, thereby marking the letters shift code on the transmitting segments of the distributor ring 19.

The operation of relay (1) also prepares a path at its lower outer armature 168 and make con-

tact for the subsequent operation of relay (4). When the distributor brush again leaves the stop segment, relay SS is released and relay P operates through its winding w1, conductor 152, lower inner make contact and armature 154 of relay (1), and thence through conductor 118 and the chain circuit above described which includes the armatures 131 to 138 of relays (4) to TTR, to grounded battery 139.

The fourth operation of relay SS operates relay (4). Ground applied to conductor 166 by relay SS is extended through armature 167 and make contact of operated relay P, make contact and armature 168 of relay (1), conductor 169, armature 161 and break contact of relay BP, conductor 170, winding of relay (4), and thence through armatures 132—138 of relays (5) to TTR, to grounded battery 139. Relay (4) operates and locks up through its preliminary make armature 174, and at its armature 131 and break contact releases relay (1); at its lower armature 176 and make contact it prepares an operating path for relay (5). Relay (4) at its upper armature 93 and make contacts marks the transmitting segments of ring 19 with the code for the first character of the station identification. The succeeding operations of the remaining relays (5) to TTR are the same as that heretofore set forth. When relay TTR operates to permit transmission from the message tape, relay D is released at the operated armature 138 of TTR.

If transmission is interrupted by a "normal stop," hereinbefore described, relay D will reoperate upon the release of relay TTR, provided the Program message key remains in the operated position, and the following message will also be preceded by the Program message address. If transmission is interrupted by any of the causes requiring use of the restart keys, operation will be the same as that which has been described with reference thereto, since the depression of either of the restart keys will release at its contact member 232 or 302 the energizing circuit for relay D, permitting transmission of the long address. The energization of relay BP during the transmission of the long address prevents the reoperation of relay D, since ground is removed at operated armature 222 of BP.

It is to be understood that the particular kind and number of the functional signals, selecting signals and station identification signals may be changed as desired, depending upon the purpose of the transmitting station and the nature of the information to be transmitted therefrom. This may be accomplished either by the omission or addition of various of the relays such as (1) to (8), and by supplying such relays with the necessary number of armatures properly wired for marking the distributor ring 19 with any code characters or signals desired. Also, the sequence of operation of the counting relays may readily be changed by changing the connections controlled by the by-pass relay BP and diverter relay D.

While a five-unit permutation code is employed in the system illustrated, any other suitable number of code units may be used, for example, a six unit code, by providing a corresponding number of transmitting contact elements for the transmitter, transmitting distributor and relays (1) to TTR. Also, instead of absence of current to provide the spacing impulses or units of the code, battery of opposite polarity to the marking battery may be employed for this purpose and applied to the spacing contacts of the tape trans-

mitter and to make contacts associated with armatures of the sequence relays for applying such spacing impulses to the proper segments of the transmitting distributor ring 19.

The invention is particularly applicable to a telegraph circuit in which a number of transmitting and/or receiving stations are connected to the same line, but various advantages of the invention will also be present when one such station is connected by an individual line to another station.

The foregoing description of a specific embodiment of the invention is for the purpose of illustration only, and the invention is not intended to be limited except as indicated by the scope of the appended claims.

We claim:

1. In a telegraph communication system, a transmitter for automatically transmitting printer signals comprising a message stored in a control form, and other apparatus operatively associated with said transmitter for automatically and invariably transmitting additional predetermined printer signals pertaining to the message immediately prior to the transmission of the message, said other apparatus including means operative after an interruption in the transmission of said message for automatically and invariably transmitting said additional printer signals and printer line feed signals prior to resumption of transmission of the message by said automatic transmitter, for setting the remainder of the message, when printed, apart from the preceding printed portion thereof.

2. In a telegraph communication system, a transmitter for automatically transmitting printer signals comprising a message stored in a control form, and other apparatus operatively associated with said transmitter for automatically and invariably transmitting predetermined printer functional and printing signals pertaining to the message immediately prior to the transmission of the message, said other apparatus including means operative after an interruption in the transmission of said message for automatically and invariably transmitting said functional and printing signals and printer carriage return signals prior to resumption of transmission of the message by said automatic transmitter, for spacing the remainder of the message, when printed, from the preceding printed portion thereof.

3. An automatic station identification system comprising a telegraph line, a station connected to said line, said station having an automatic transmitter for transmitting telegraph printer message signals stored in a control form, and other apparatus including a plurality of relays operable in predetermined sequence for automatically and invariably transmitting printer signals comprising the sending station identification characters prior to the transmission of said message by the automatic transmitter, said apparatus including means operative after an interruption in the transmission of said message for automatically and invariably retransmitting said station identification characters prior to resumption of transmission of the message by the automatic transmitter.

4. An automatic station identification system comprising a telegraph line, a station connected to said line, said station having a tape transmitter and a distributor associated therewith for transmitting telegraph printer message signals stored in a perforated tape, and other apparatus including a plurality of relays operable in pre-

determined sequence for automatically and invariably causing said distributor to transmit printer signals comprising the sending station identification characters immediately prior to the transmission by the distributor of said message from the tape transmitter, and means including said relays operative after an interruption in the transmission of said message for causing the distributor invariably to transmit said station identification characters prior to resumption of transmission of the message from the tape transmitter.

5. An automatic station identification system comprising a telegraph line, a station connected to said line, said station having a tape transmitter and a distributor associated therewith for transmitting telegraph printer message signals stored in a perforated tape, other apparatus including a plurality of relays operable in predetermined variable sequence for automatically and invariably causing said distributor to transmit printer signals comprising the sending station identification characters immediately prior to the transmission by the distributor of said message from the tape transmitter, and restart means operative after an interruption in the transmission of said message for changing the sequence of operation of said relays to cause the distributor to transmit said station identification characters and predetermined printer functional signals prior to resumption of transmission of the message from the tape transmitter.

6. An automatic station identification system comprising a telegraph line, a station connected to said line, said station having an automatic transmitter for transmitting telegraph printer message signals stored in a control form, other apparatus including a plurality of start means and a plurality of sequence relays responsive thereto for automatically and invariably transmitting additional predetermined signals relative to the message immediately prior to the transmission of the message by the automatic transmitter, and relay means controlled by said start means for varying the sequence of operation of said sequence relays to cause the transmission of different ones of said additional signals depending upon which of the start means is operated.

7. An automatic station identification system comprising a telegraph line, a station connected to said line, said station having an automatic transmitter for transmitting telegraph printer message signals stored in a control form, other apparatus including a plurality of start means and a plurality of sequence relays responsive thereto for automatically and invariably transmitting additional predetermined signals relative to the message immediately prior to the transmission of the message by the automatic transmitter, and relay means controlled by said start means for bypassing certain of said sequence relays to cause the transmission of different ones of said additional signals depending upon which of the start means is operated.

8. A telegraph system comprising a line and a plurality of telegraph stations common to said line, transmitters at said stations respectively for sending telegraph printer signals over the line, at least one of said stations having a relay responsive to signals transmitted over the line by another station, means normally operative for initiating transmission from said one of the stations, means including said relay for preventing inadvertent initiation of transmission from said one of the stations when the line is in use by

another station, means at said one of the stations for breaking transmission from another station, and means operable in response to said last-named means for automatically transmitting to the line character signals comprising the identification of the breaking station.

9. A telegraph system comprising an outgoing circuit and a telegraph station operatively connected to the circuit, said station having an automatic transmitter for sending printer signals comprising a message over the circuit and other apparatus automatically operative for sending the station identification characters prior to transmission of the message by said automatic transmitter, manually operable switch means for initiating transmission from the station, and means for causing said other apparatus to complete transmission of the station identification characters when transmission has been initiated by said switch means notwithstanding an attempt to stop transmission thereof by operating said switch means.

10. A telegraph system comprising an outgoing circuit, a receiving relay station and a sending telegraph station operatively connected to the circuit, said sending station having an automatic transmitter for transmitting printer signals comprising a message to the receiving relay station, a plurality of different start means for initiating transmission of messages from said automatic transmitter, means comprising a plurality of sequentially operable circuit-controlling devices responsive to said start means for automatically transmitting additional predetermined signals, and means controlled by at least one of said start means for varying the sequence of operation of said circuit-controlling devices to cause the transmission of variant message directing signals immediately prior to transmission of the messages by the automatic transmitter for actuating apparatus at the receiving relay station.

11. A telegraph system comprising an outgoing circuit and a telegraph station connected to the circuit, said station having a tape transmitter and a distributor associated therewith for transmitting printer message signals stored in a perforated tape, other apparatus associated with the distributor for transmitting additional predetermined signals relative to the message immediately prior to the transmission of the message from the tape transmitter, means including a solenoid and a retractile core controlled thereby for engaging and mechanically locking the tape stepping mechanism of the tape transmitter to prevent transmission from the tape during transmission of said additional signals, and means controlled by said other apparatus for operating said solenoid to release the tape stepping mechanism of the transmitter for operation upon completion of transmission of said additional signals.

12. A telegraph system comprising an outgoing

circuit and a telegraph station connected to the circuit, said station having a tape transmitter and a distributor associated therewith for transmitting printer message signals stored in a perforated tape, other apparatus associated with the distributor for transmitting additional predetermined signals relative to the message immediately prior to the transmission of the message from the tape transmitter, means including a solenoid and a retractile core controlled thereby for engaging and mechanically locking the tape stepping mechanism of the tape transmitter when said solenoid is deenergized to prevent transmission from the tape during transmission of said additional signals, and means controlled by said other apparatus for energizing said solenoid to retract said core and release the tape stepping mechanism of the transmitter upon completion of transmission of said additional signals.

13. An automatic station identification system comprising a telegraph line, a station connected to said line, said station having an automatic transmitter for transmitting telegraph printer message signals stored in a control form, start means for initiating transmission of a message from the station, other apparatus controlled by said start means for automatically and invariably transmitting printer signals comprising the sending station identification characters prior to the transmission of said message by the automatic transmitter, other start means operative after an interruption in the transmission of said message for resuming transmission of the interrupted message, said other start means causing said apparatus to automatically and invariably transmit printer carriage return and line feed signals and said station identification characters prior to resumption of transmission of the message by the automatic transmitter for setting the remainder of the message, when printed, apart from the preceding printed portion thereof.

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