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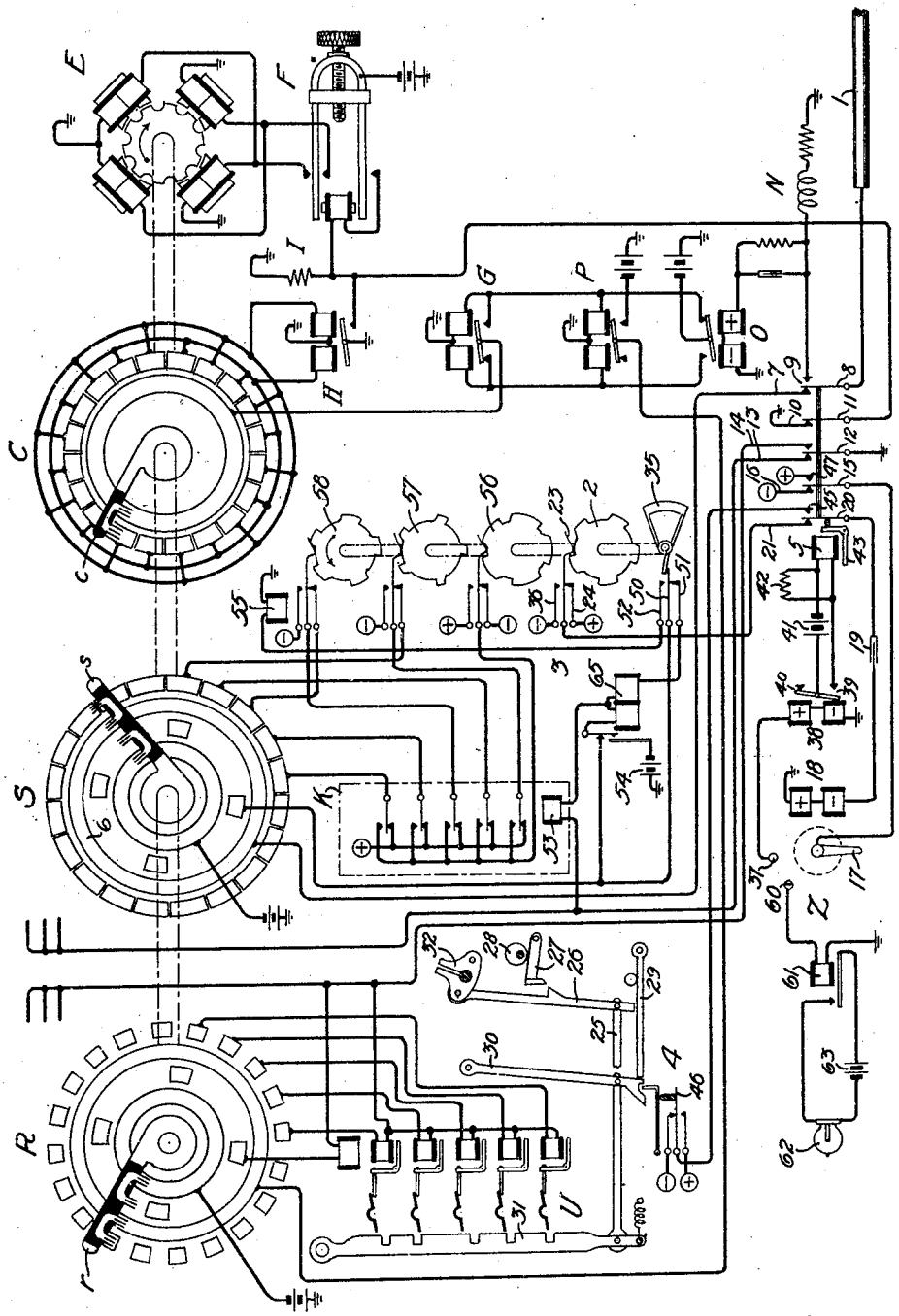

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TELEGRAPH SYSTEM.

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This invention relates in general to synchronous telegraph systems and more particularly to an auxiliary signaling arrangement for controlling the direction of transmission in such systems.

The principal object of the invention is to provide a method and manually controlled means for changing the direction of transmission over a telegraph line or cable arranged for the transmission of messages in one direction only at one time.

In the duplex method of signaling commonly used for signaling over long telegraph lines or cables an artificial line or network is employed to balance the line so that the receiving mechanisms are unaffected by outgoing signals. Recent developments in the design of submarine cables have made it possible to provide a cable having electrical characteristics which permit a speed of operation far in excess of any used heretofore, but at such high operating speeds it is difficult to construct an artificial line which will simulate the real cable with sufficient accuracy to permit of duplex operation, and the simplex method of operation may therefore in some cases be resorted to with periodical reversals of the direction of transmission.

In my copending application, Serial No. 592,216, filed October 4, 1922, there is disclosed a simplex telegraph system provided with means for automatically reversing the direction of transmission depending upon the traffic conditions at the respective stations. In many cases the traffic conditions are continually changing so that while at certain periods of the day there may be a much greater demand for the transmission of messages in one direction, at other periods, traffic conditions may change so that there is a greater demand for transmission in the opposite direction. To satisfactorily meet such changing traffic conditions the present invention contemplates a signaling system provided with manually controlled means for reversing at will the direction of transmission over the line or cable.

This invention may be more clearly understood by reference to the accompanying drawing in which the single figure shows the arrangement of apparatus at one of the stations.

At each station there is provided a rotary distributor comprising a sending face S, a receiving face R, and a correcting face C, the brushes s, r, c, associated therewith being driven by an impulse motor E controlled by an electrically operated tuning fork F. The rotary distributors at the respective stations are maintained in synchronism by means of the electrical method of speed correction well known in the art and comprising a leak relay G, a correcting relay H, and a resistance I which is in series with the driving magnet of the fork F. Signals are transmitted in the usual manner by means of a perforated tape controlled transmitter K, operating in conjunction with the sending face S and brush s of the distributor. When the apparatus is in the receiving position the line impulses are received through the distortion correction network N by the line relay O or any suitable type of relay or amplifying device and are repeated into the printing relay P which operates in conjunction with the receiving face R and brush r to distribute the received impulses to the proper selecting magnets of the receiving mechanism or printer U in a manner which is readily understood by those skilled in the art.

One or more of the channels is equipped with an auxiliary signal arrangement the construction and operation of which is fully described in Patent No. 1,275,559, of August 13, 1918 to W. A. Houghtaling. This auxiliary transmitter which is commonly termed the "auto-control transmitter" is provided with an auxiliary contact closing cam 2 which operates a battery reversing contact group 3, each time a certain code combination is transmitted over the line by the operation of that transmitter. This code combination is preferably that used for bell signaling and consists of the figure shift —J— letter shift. The usual bell controlling contacts in the printer which form a part of the auxiliary signaling system are in the present invention replaced by a battery reversing contact group 4, which is arranged to be operated once and then restored to its normal position each time the printing mechanism is operated in accordance with the code combination for figure shift —J— letter shift.

When the impulses representing "figure shift" in the code is received at the printer

U a selecting bar (not shown in the drawings) pivotally connected to bar 25 is operated causing the member 26 to move to the right, so that the shouldered portion is in alignment with the arm 27. The cam 28 in its rotation engages arm 27 moving it downward and moves the stop arm 29 out of engagement with member 30. Upon the following rotation of the brush r selecting bar 31 is selected by the impulses representing letter J and is moved to the right causing the switch member 4 to be operated by the cam surface of member 30. Upon the receipt, at the printer, of the current impulses for "letter shift" the rocker arm, 32 which rocks the platen is returned to its original position, the operation of the selecting bar and lever arm not being shown in the drawing. It will thus be noted that the switch member 4 is operated once for each time the combination of figure shift —J— letter shift is received at the printer.

A direction control relay 5 equipped with a plurality of contact groups is provided for the purpose of transferring the line and local circuit connections from the transmitting to the receiving position and vice versa. When this relay is in its deenergized or sending position the common sending ring 6 is connected through contact 7 and tongue 8 to the cable 1, and the line circuit to the correction network N and line relay O is open at contact 9. The action of corrector relay H and corrector resistance I is prevented from influencing the driving fork F by the grounded contact 10 which engages with tongue 11 thereby short-circuiting resistance I. The transmitter local circuits are made operative by the grounded tongue 12 engaging the contact 13 while the local circuits of the receiving mechanism or printer are made inoperative by having this ground connection removed from contact 14. Tongue 15 engages with contact 16 causing negative battery to be applied to the rotating contact member 17 of a selector Z which is of the type ordinarily employed in train dispatching circuits. One terminal of the magnet 18 of this selector is grounded and the other terminal is connected through condenser 19 with tongue 20 of controlling relay 5. Tongue 20 engages contact 21 which in turn is connected to tongue 23 of contact group 3 and thence through contact 24 to positive battery. The control relay at the distant or receiving station will occupy the energized position and the line and local circuit connections will therefore be in the proper condition to permit of the reception of incoming line signals.

In the operation of the device the station illustrated in the drawing will continue to transmit signals over the line, and the distant station at which the control relay is energized will continue to receive these impulses until the positions of the respective direction control relays are reversed. This is accomplished at the will of the transmitting station in the following manner: Sector 35 of the auto-control transmitter is advanced manually to a predetermined position which will cause the code combination figure shift —J— letter shift to be transmitted over the line five times in succession in the manner described in the patent referred to above. Each time this combination is transmitted the tongue member 23 is moved away from the positive contact 24 engaging negative contact 36 and then moved back to again engage positive contact 24. Thus five negative impulses alternating with five positive impulses are applied to contact 21 and tongue 20 of control relay 5, condenser 19 and the winding 18 of selector Z, causing the contact member 17 of the selector to be advanced 10 spaces and to come to rest on the stationary contact 37. Negative battery is thus applied through contact 16 and tongue 15 of relay 5, contact member 17 and contact 37 of selector Z to the winding of a slow-acting polarized relay 38 the armature 40 of which is energized and engages contact 39, thereby completing a circuit from battery 41 through armature 40, contact 39 and the operating winding of control relay 5. A non-inductive resistance 42 is connected in parallel with the winding of relay 5 to make the latter slow in operation.

Upon the energization of relay 5 the armature 43 is attracted causing the contact members or tongues 11, 12, 15 and 20 to be moved to the right, thereby breaking contact with the left hand contact members 10, 13, 16 and 21, respectively and engaging with the right hand contact members. The cable circuit which was connected to the sending face of the distributor by means of contact 7 is thus transferred through the distortion correcting network N to the winding of the receiving line relay O. The corrector relay H and resistance I are made operative by removing ground from tongue 11 and the ground connection of contact 12 is transferred from contact 13, which is connected to the local circuit of the transmitter K, to contact 14 which is connected to the local circuit of the receiving printer U. The selector Z is arranged to have its armature or tongue member 17 restored to its normal unoperated position by the passage of a single current impulse, through its operating magnet after the armature has come to rest at any selected position. Thus when tongue member 20 of the control relay 5 is moved into engagement with contact 45 the control of selector Z is removed from the positively connected tongue 23 of the auto-control transmitter and is transferred to the negatively connected tongue 46 of contact group 4 of

the printer and a short current impulse opposite in polarity to the last operating impulse is applied through condenser 19 to the operating winding 18 of the selector, thereby causing the immediate return of the contact member 17 to its unoperative position. The movement of tongue 15 of relay 5 from contact 16 to contact 47 reverses the polarity of the battery applied to the selector contact member 17 but due to the time lag introduced by the slow action of relays 38 and 5 and the quick return of member 17, relay 38 will not be operated in the opposite direction thereby until the next succeeding operation of the selector.

Upon the operation of the sector 35 the tongue member 50 breaks contact with contact member 51 and engages with contact member 52 thus opening the circuit through the right hand winding of differential relay 65 and for the time being preventing operation of stepping magnet 53 which controls the feeding of tape for transmitter K. At the same time a circuit is completed from grounded battery 54 through the armature and contact members of relay 65, tongue 50, contact 52 and through winding of magnet 55 which controls the movement of the auxiliary control transmitter and to ground. As this transmitter is operated the cam members 56, 57 and 58 cause the operation of their respective contacts resulting in the transmission of current impulses representing the code combination figure shift —J— letter shift through the cable 1 to the receiving face of the distributor at the receiving station, this combination being sent five successive times. The line relay at the receiving station in response to these impulses operates the printing relay which in conjunction with the receiving face of the distributor causes the contact group in the printer to be operated five times in succession. The resulting reversals of polarity due to the operation of the contact group in the printer causes the operation of the selector at the receiving station which in turn results in the operation of the control relay. The operation of this relay completes the operation of reversing the direction of transmission over the circuit and transmission will therefore be commenced and will continue in the opposite direction until changed by the manual operation of the automatic control transmitter at the then transmitting station.

In order to permit the sending of service signals over the line from the transmitting station without interfering with the messages then being transmitted an additional contact 60 is provided on selector Z together with relay 61, lamp or indicating device 62 and local battery 63. When it is desired to signal to the receiving station the sector 35 is moved a distance corresponding for example to the transmission of four successive groups of the figure shift —J— letter shift combination thus causing the contact group 4 at the distant station to be operated four times in the manner described above and the reversals of battery potential to be thus applied to the selector contact member causing it to be advanced a sufficient distance to engage with the contact 60 at the receiving station. The relay corresponding to 61 would thus be operated and causes the lighting of a lamp 62. Any number of such signal lamps may be controlled in this way by providing the required number of contacts on the selector and by suitably cut cams in the automatic control transmitter.

What is claimed is:—

1. A telegraph system adapted for continuous transmission in either direction comprising a pair of terminal stations interconnected by a transmission line, a receiving mechanism, a transmitting mechanism and a synchronously driven rotary distributor at each station, and manually operable means for controlling the direction of transmission over said line.

2. A telegraph system comprising a pair of terminal stations interconnected by a transmission line, each of said stations including a receiving mechanism, a transmitting mechanism, and an auxiliary transmitting mechanism operable at the transmitting station and operating through and cooperating with the transmitting mechanism to reverse the direction of transmission over the line.

3. A telegraph system comprising a pair of terminal stations interconnected by a transmission line, each of said stations including a receiving mechanism, a transmitting mechanism, operating through said transmitting mechanism, an auxiliary transmitting mechanism, and means cooperating with the auxiliary transmitting mechanism for controlling the direction of transmission over the line.

4. A telegraph system comprising a pair of terminal stations interconnected by a transmission line, each of said stations including a receiving mechanism, a transmitting mechanism, an auxiliary transmitting mechanism, and a mechanical selector under the control of the auxiliary transmitting mechanism for controlling the direction of transmission over the line.

5. A telegraph system comprising a pair of terminal stations interconnected by a transmission line, each of said stations including a receiving mechanism, a transmitting mechanism, an auxiliary transmitting mechanism, and a selective mechanism under the control of the auxiliary transmitting mechanism for transmitting supervisory signals over the line.

6. A telegraph system comprising a pair of terminal stations interconnected by a transmission line, each of said stations in-

cluding a receiving mechanism, a transmitting mechanism, an auxiliary transmitting mechanism operable only at the transmitting station, and a switching means under the control of the auxiliary transmitting mechanism for selectively connecting the transmitting and receiving mechanisms with the line.

7. A telegraph system comprising a pair of terminal stations interconnected by a transmission line, each of said stations including a receiving mechanism, a transmitting mechanism, an auxiliary transmitting mechanism, and selective mechanisms at both stations under the control of the auxiliary transmitting mechanism at the transmitting station only for controlling the direction of transmission over the line.

8. A telegraph system comprising a pair of terminal stations interconnected by a transmission line, each of said stations including a receiving mechanism, a transmitting mechanism, an auxiliary transmitting mechanism, and a selective mechanism under the control of the auxiliary transmitting mechanism at the transmitting station only for controlling the operation of switching means to selectively connect the transmitter and receiving mechanisms at that station with the line, and additional means operable from the distant station to control the operation of said first switching means.

9. In a simplex telegraph line, the combination of rotary distributors synchronously driven and adapted for continuous transmission in either direction, with manually controlled selective mechanisms cooperating with said distributors to control the direction of transmission over the line.

10. In a simplex telegraph system comprising a pair of terminal stations interconnected by a transmission line, a transmitting and a receiving mechanism at each of said stations and a manually controlled selective mechanism cooperating with said transmitting and receiving mechanisms and under the control of the transmitting station only for reversing the direction of transmission over the line.

11. The combination with a transmission line of signal transmitting means at each terminal, signal receiving means at each terminal, and manually operable control means under the sole control of the transmitting station cooperating with current impulses transmitted over the line for reversing the direction of transmission.

12. Terminal apparatus for a transmission line comprising printing telegraph transmitting and receiving apparatus including distributors, means adapted to connect said transmitting and said receiving apparatus to the line, and a manually operable means cooperating with said distributor and under the sole control of the transmitting station, for controlling the operation of said connecting means.

13. A simplex telegraph system comprising a pair of terminal stations interconnected by a transmission line, a receiving mechanism and a transmitting mechanism at each station, a feeding mechanism for each of said transmitting mechanisms, switching means for selectively connecting the transmitting mechanism and the receiving mechanism to the line, auxiliary means for controlling the operation of the switching means, and a differential relay, cooperating with the auxiliary control mechanism for disabling the feeding mechanism of the transmitting mechanism during the operation of the auxiliary transmitting mechanism.

In witness whereof, I hereunto subscribe my name this 27th day of June A. D., 1923.

ALLISON A. CLOKEY.