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PRINTING TELEGRAPH RECEIVER.

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1,330,472 Patented Feb. 10, 1920.

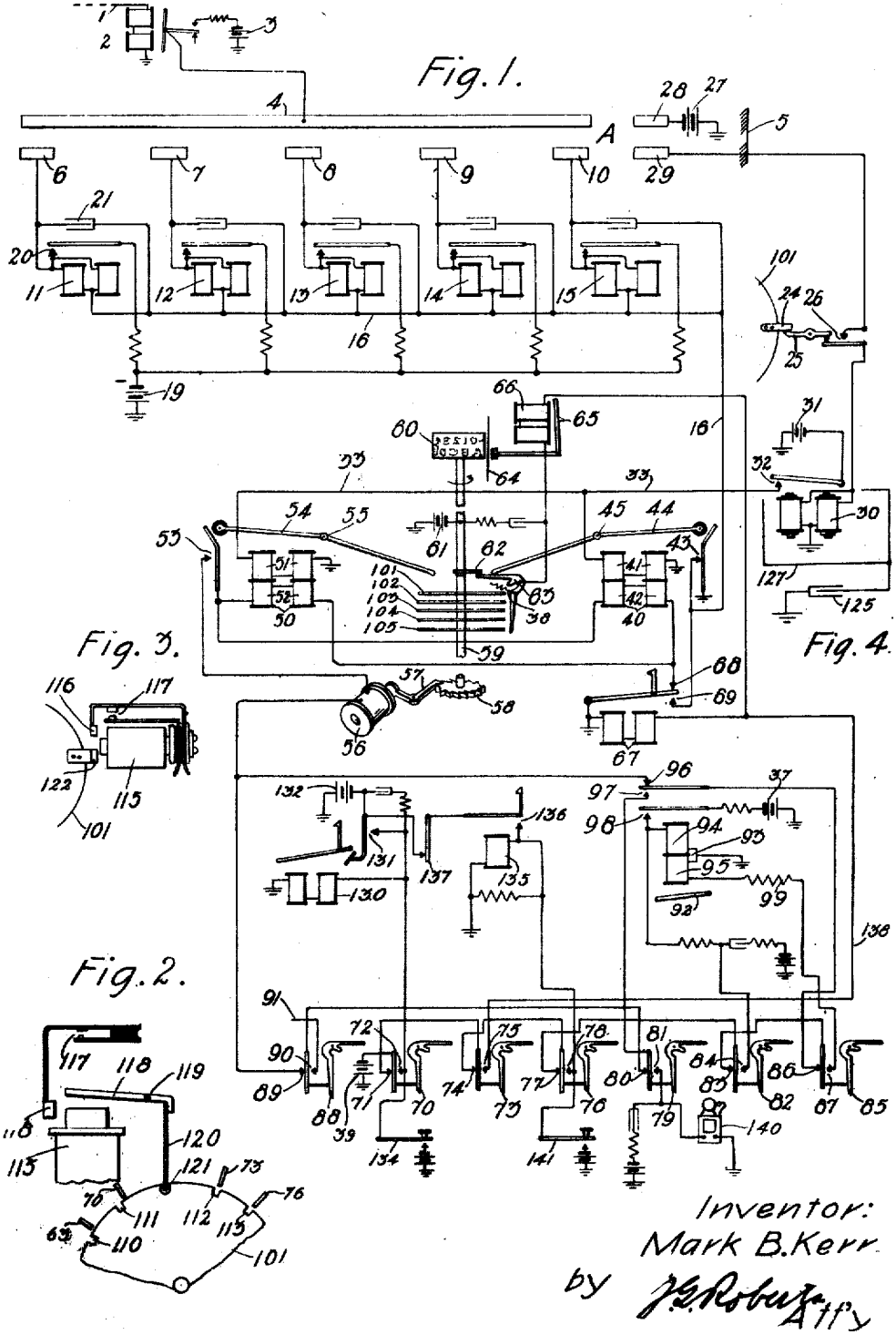

Fig. 1.

Fig. 3.

Fig. 4.

Fig. 2.

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PRINTING-TELEGRAPH RECEIVER.

1,330,472. Specification of Letters Patent. Patented Feb. 10, 1920.

Application filed April 20, 1918. Serial No. 229,765.

To all whom it may concern:

Be it known that I, MARK B. KERR, a citizen of the United States, residing at New York, in the county of New York, State of New York, have invented certain new and useful Improvements in Printing-Telegraph Receivers, of which the following is a full, clear, concise, and exact description.

This invention relates to printing telegraphs and more particularly to a telegraph receiving system wherein the characters of a message may be reproduced in the form of a printed page.

The principal object of this invention is to organize a minimum number of elements or devices into a compact unit which will be capable of rendering efficient and reliable service in carrying out the various operations necessary to the proper recomposing of telegraphic impulses into a printed message.

In accordance with this invention there is provided a plurality of electroresponsive devices, each of which is capable of performing compound operations with respect to functions which are of a strictly mechanical nature and other functions which relate more particularly to the control of current carrying circuits. The mechanical and electrical relation or arrangement of the various devices represent such a coördination of parts as may result in a realization of the objects sought to be attained by this system.

This invention is illustrated diagrammatically in the accompanying drawing in which, for the sake of clearness, only so much of a telegraph receiving system has been shown as will be necessary to a clear understanding of the features of the invention.

Referring to the drawing, Figure 1 illustrates an organization of receiving devices suitable for practising the features of this invention; Fig. 2 is a fragmentary view illustrating in detail a selecting unit employed in the system; Fig. 3 shows an alternate arrangement which may be substituted for the selecting unit shown in Fig. 2; while Fig. 4 shows a condenser arrangement which may be substituted for a device indicated by the reference character 30 in the first figure of the drawing.

In describing this invention, the reference numeral 1 is employed to indicate a line conductor which may extend to a remote station (not shown), this line conductor being connected through the winding of a polarized line relay 2 to earth. The transmission of messages in the present embodiment of this invention is, for convenience, based on the five-unit impulse code of Baudot. As well understood in connection with this code, each character or other operation necessary to the printing of a message is conveyed by means of five impulse intervals formed by different combinations of positive and negative currents. In arranging a system to be operated by this code, it is necessary to employ spacing and marking impulses, the spacing impulses being the impulse which serves merely to retract the armature of a line relay to its normal position, while the marking impulses bias the relay to engage its contacts whereby circuits may be completed to set up action with respect to receiving devices. In the present system, positive currents correspond with spacing impulses while negative currents correspond with marking impulses. Accordingly, the armature of relay 2 under such currents will be respectively biased to engage its lowermost or idle contact stop or its uppermost contact stop, respectively. Therefore, each negative impulse incoming from the line 1 biases the relay 2 to complete a circuit from a battery 3 to a collector ring 4 of a distributer A. Segments 6—10, positioned adjacent the collector ring 4, serve therewith to form a path traversed from left to right by a brush 5 which successively completes a circuit from the collector ring 4 to these segments. As well understood in connection with multiplex working, incoming impulses from the line 1 will occur at the moments the brush 5 is over corresponding ones of the segments 6—10. Therefore, assuming that a negative impulse is present in the line 1 at the instant the brush 5 is over the segment 6, a circuit will be completed whereby current from the battery 3 may traverse the contacts of the line relay 2, the collector ring 4 and the brush 5 to the segment 6, thence through the winding of a selecting magnet 11 to a bus conductor 16 which is connected through normally closed contacts 43 of a right-hand release magnet 40 to earth. Current through this circuit causes operation of the magnet 11 whereby its contacts 20 are closed to complete a holding circuit which may be traced from a negatively poled battery 19, through an associated re-

sistance unit, thence over the contacts 20 of the selecting magnet 11 to the winding of this magnet, in substitution of the battery 3 by which the magnet 11 was initially operated. It will be noted that a condenser 21 is connected in bridge around the windings of the selecting magnet 11. The purpose of this condenser is to secure prolonging of the current interval whereby operation of the magnet 11 will be assured. This effect results from the fact that on the instant the brush 5 is over the segment 6, as assumed, the condenser 21 will receive a charge from the battery 3 and since the brush 5 moves at a relatively high speed it may pass from the segment 6 before the current through the winding of the selector magnet 11 would have built up sufficiently therein to effect operation of this magnet. On the instant the brush 5 passes from the segment 6, the condenser 21 will discharge in closed circuit through the winding of this selector magnet and thereby complete the operation of the magnet which will be retained operated by the locking circuit already traced through the contacts 20. In a corresponding manner, a circuit from the battery 3 may be closed by the brush 5 through the magnets 12—15, as the brush successively passes over the segments 7—10, provided that at such corresponding moments negative impulses are received over the line 1 to close the active contacts of the polar relay 2. It will be obvious that at such moments as positive impulses are biasing the relay 2 to its idle contact position in phase with the instants the brush 5 may be over either of the segments 6—10, no circuit may be completed through the distributer, and the associated selector magnets will accordingly remain unoperated.

Referring to Fig. 2 of the drawing, a magnet 115, armature 116 and contacts 117 will be understood as corresponding with each selector magnet 11—15 and its associated armature contacts. In addition to the armature 116, each one of these selector magnets also carries an armature 118 which is pivoted at 119 to control a member 120 which engages a selector disk 101, at a notch 121, in such a manner that movement of this armature will cause the disk 101 to be rotated on its axis to a limited extent. The armature 116 is so proportioned that it will respond very quickly to current through the magnet and act in advance of the disk controlling armature 118. This is to insure that the contacts 117, which correspond with the contacts 20 of the selector magnet 11 and the corresponding contacts of the other selecting magnets 12—15, and which are under the control of the armature 116, will be closed more nearly coincident with the beginning of the current impulse through the winding 115, thereby establishing a locking circuit which corresponds with the holding circuit already described in connection with the selecting magnet 11, to permit additional time for the more heavily loaded armature 118 to operate. The selecting disk 101 corresponds with the similarly numbered selecting disk shown in Fig. 1 of the drawing. This disk and the four additional selecting disks 102—105 are respectively under control of the selecting magnets 11—15, each magnet being connected to move its respective disk in a manner similar to that illustrated and already described in connection with Fig. 2 of the drawing. As well understood in the art, the five selecting magnets 11—15 and the associated selecting disks 101—105 correspond respectively with the five unit impulse intervals of the transmission code employed in this system.

In the present system selecting operations are carried out in a manner similar to that shown in Patent No. 1,201,809 to A. F. Dixon, October 17, 1916, it being provided that notches at predetermined points around the periphery of the selecting disks, as the notches 110—113 (Fig. 2), be so arranged on the several disks that right-angle selecting levers, as the levers 63, 70, 73, 76, etc., may not normally enter these slots due to the fact that a notch in at least one of the disks will be out of alinement with similar notches in the other disks. In response to the operation of one or more of the selecting magnets 11—15, however, the correspondingly associated disks will be moved in such a manner that at some point adjacent a selecting lever the notches in the five disks will jointly present an alined opening to receive the corresponding lever, following which, operations may take place to translate such selection either into a printed character or other operation of the receiving devices necessary in the reproduction of a message.

As an example whereby the operations necessary in the reception of one impulse combination may be traced, let it be assumed that a character, say the letter E, which is represented by a first negative impulse followed by four positive impulses is received from the distant station. In phase with the first negative impulse, the brush 5 of the distributer A, will be present over the segment 6, thereby completing the circuit already traced from the battery 3 to operate the selecting magnet 11. Operation of this magnet will revolve the disk 101 sufficiently to bring a notch in this disk into alinement with notches in the remaining disks 102—105 which stand normally alined. Since the last four impulses from the distant station are of positive polarity, no action will take place with respect to the selecting magnets 12—15 during the time the brush 5 is traversing the corresponding segments 7—10. In order to describe a further operation carried out by either one of the selecting disks

101—105 which relates to the control of auxiliary contacts 26, a brief digression from the example under consideration will now be made.

In addition to the notches in the disks and the selecting levers respectively associated therewith, each disk carries an outstanding member 24 adapted to engage a pivoted member 25, which in turn controls the contacts 26. During the time the disks are in their normal position, the contacts 26 remain open, as shown in the drawing, but when any one of the disks 101—105 is moved by its respective magnet in making a selection, the corresponding member 24 of the shifted disk will engage and move the master member 25 to close the contacts 26. Therefore, in the present example, in addition to alining the notches of the disks to receive, say, the selecting lever 63, movement of the disk 101 also effects closing of the contacts 26. While the circuits are in this condition the brush 5, after passing from the segment 10 and the collector ring 4, joins a segment 28 with a segment 29, thereby completing a master circuit from a grounded battery 27 through the contacts 26 and the winding of a release control magnet 30. Operation of the latter magnet completes a circuit from the grounded battery 31 through contacts 32 of this magnet, thence by way of a bus conductor 33 through two parallel paths, the first of which comprises an operating winding 41 of the right-hand release magnet 40, while the second path extends through the operating winding 51 of a left-hand release magnet 50. The armature 44 of the magnet 40, which is pivoted at 45, is now attracted to cause separation of the contacts 43 and also at its outstanding end to release downward pressure normally exerted against the inwardly extending angle of selecting levers as the lever 63. At the same instant, armature 54 of the magnet 50, which is pivoted at 55, is also attracted to close its contacts 53 and at its outstanding end to release retaining pressure which it normally exerts against selecting levers which, it will be understood, are positioned under this lever in a manner corresponding with the position of the lever 63 under one end of the armature 44. For convenience of description, it may be understood that the selecting lever 63 corresponds with the control necessary for the printing of the letter E assumed in the example under discussion. It will also be pointed out that selecting levers 70, 73, 76, 79, 82, 85 and 88 although shown, for convenience in the drawing, remote from the selecting crown formed by the disks 101—105, will nevertheless be understood to be suitably positioned around the selcting disks in a manner corresponding with the position of the lever 63, and further, it will be understood that the outstanding ends of the armatures 44 and 54 of the release magnets are enlarged in the form of a semi-circle, thereby rendering each arm capable of controlling the respective depressing or releasing of all selecting levers positioned on the corresponding side of the selecting crown. It may also be here mentioned that in addition to the selecting and printing of the words of a message, various auxiliary operations, such as, letters-spacing, carriage-return, line-feed, letters-shift, figures-shift, break-signal, etc., are necessary in the proper control of a receiving printer. In the commercial operation of printing telegraphs such operations are commonly referred to as "stunts" and in the present illustration of this invention such operations are under control of the selecting levers other than the selecting lever 63. In proceeding with the example under consideration, following the operation of the release magnets 40 and 50 as described, a retaining circuit for these magnets may be traced from a grounded battery 39 by way of contacts 71 of line feed control lever 70, contacts 74 of space control lever 73, contacts 77 of carriage return control lever 76, contacts 83 of figure-shift control lever 82, contacts 86 of letters-shift control lever 85, the contacts 96 of a shift magnet 93, the winding of a start magnet 56, the contacts 53 of the release magnet 50, thence over two parallel paths, the first of which extends through winding 52 of the release magnet 50, while the second path extends through the windings 42 of the release magnet 40, thence merging at and continuing through the contacts 68 of a spacing magnet 67 to earth. In addition to providing holding circuits for the release magnets 40 and 50, current through the path traced effects operation of the start magnet 56 which attracts its armature to remove a holding pawl 57 from engagement with a ratchet wheel 58 thereby releasing a shaft 59 which carries a type wheel 60. The shaft 59 is continually stressed by means, not shown, tending to cause it to revolve in the direction of the arrow; therefore, the releasing of this shaft by the start magnet 56 permits it to revolve until a conducting arm 62, which is rigidly fixed to the shaft, engages the inwardly extending end of the selected lever 63 which is also of conducting material, the end of the lever 63 having been raised into the path of the stop member 62 by action of a retractile spring 38 which moved the downwardly extending arm of the lever 63 into the alined slots of the disks 101—105 following such positioning of the disks under the action of the five impulses under consideration. The selecting lever is pivoted in the manner of a bell crank lever, as indicated by the conventional pivot spotting on each lever. In addition to mechanically

stopping the rotation of the type wheel shaft 59, engagement of the arm 62 with the lever 63 also completes a circuit from a source of grounded current 61 which may then extend through a printing magnet 66 and the winding of a spacing magnet 67 to earth. As well understood in connection with printing devices of this character, the letter E of the type wheel will now be positioned at a proper point with respect to an impression sheet 64, usually of paper, for receiving the message record, and an armature 65 operated by the magnet 66 will now respond to thrust the paper against the type wheel, thereby printing this character. The time constant relation of the magnet 66 with respect to the magnet 67 is such that the first or printer magnet will operate in advance of the latter spacing magnet; therefore the printing operation will have been completed before the armature of the magnet 67 has moved sufficiently to separate its contacts 68 whereby the holding circuits through the windings 42 and 52 of the magnets 40 and 50 are opened. It will be noted that the release control magnet 30 is of a slow release type as indicated by the conventional copper core-sleeves in the drawing. This is to insure that the operating circuit traced through the magnets 40 and 50 may continue for a sufficient time to permit the carrying out of "stunt" operations on which no printing is required as will presently appear. As an alternate arrangement, a condenser 125 (Fig. 4) may be substituted for the relay 30. In making this substitution, after dispensing with the relay 30 and battery 31, one end of a lead 127 may be connected to the bus conductor 33, while the opposite end of this lead may be connected to the conductor which extends from the contacts 26. The condenser 125 as connected to earth from the lead 127 then forms a circuit parallel to the windings 41 and 51 of the magnets 40 and 50 to act in prolonging or accelerating the operation of these magnets in a manner similar to that already described in connection with the action of the condensers connected in bridge on the selecting magnets 11—15. This arrangement of the circuits is to compensate for the relatively short period of time during which the brush 5 of the distributer may be over the segments 28 and 29 in completing the operating circuit already traced for energizing the release control magnets 40 and 50. At the instant the spacing magnet 67 operates, the relay 30 will ordinarily have already released and separated its contacts 32; therefore, separation of the contacts 68 of the spacing magnet disconnects the holding windings and permits the release magnets 40 and 50 to restore. Cessation of current through the holding circuit of the release magnet also effects restoring of the start magnet 56, whereupon the pawl 57 reëngages the teeth of the ratchet wheel 58 to hold the type shaft 59 stationary. Therefore, when the outstanding end of the armature 44 descends to depress the end of the selecting lever 63 to clear the stop arm 62 and cause the opposite end of the lever to move outwardly in clearing the disks 101—105, the shaft 59 will be held stationary while the disks will assume their normal positions prepared to receive another selection from their respective control magnet, while the contacts 43 of the release magnet 44 will be reëstablished to complete the operating circuit of the selecting magnets 11—15.

In order to secure an overlap effect, which is an operation understood in connection with printing telegraphs, the contacts 69 of the spacer magnet 67 are connected in parallel with the contacts 43 of the release magnet 40, thereby insuring that during the time the spacing magnet may be operated the contacts 69 will be closed in substitution of the contacts 43, thereby providing a circuit to permit initial operation of the selector magnets 11—15 through the contacts 69 to ground instead of through the contacts 43. This is desirable in case a lag should occur with respect to the releasing of the magnet 40 and the corresponding closing of the contacts 43. In addition to performing the circuit control operations as described, the armature of the spacer magnet 67 also effects mechanical operations whereby movement of the paper 64 will take place in order to present a clear or new surface for the printing of a next character.

The type wheel 60 carries the usual double row of characters. As shown in the drawing, the lower row comprises letters while the upper row is formed of figures, punctuations and also certain vacant spaces corresponding with some of the stunt operations which will be presently described. The type wheel 60 is arranged to be moved vertically on the shaft 59, such vertical movement being under the control of an armature 92 of the shift control magnet 93. Shift operations are usually referred to as the operations whereby either the letters or the figures may be brought to the proper printing point or alinement with the receiving sheet. Such operations are, of course, under the control of the distant transmitter and are referred to as letters-shift or figures-shift respectively. As shown in the drawing, the type wheel is positioned for the printing of letters; therefore, let it be assumed that a combination of five impulses is now transmitted from the distant station whereby the type wheel will be shifted for the printing of characters in the figures row. A usual combination for this operation is two negative, a positive and two negative impulses; therefore, during the time that

brush 5 may be passing over the segments 6 and 7 in phase with the two first incoming negative impulses from the line 1, the relay 2 will establish the battery 3 over the circuits already traced and respectively effect operation of the selector magnets 11 and 12. The third impulse being of positive polarity and corresponding with a spacing interval, no effect will take place at the instant the brush 5 is over the segment 8. At the instant the brush successively passes over the segments 9 and 10, however, the last two negative impulses will position the line relay 2 to effect operation of the selecting magnets 14 and 15. These selections result in the movement of the disks 101, 102, 104 and 105. Assuming that such position of the disks presents an alinement of notches whereby a figures-shift lever 82 may enter such notches, the response of the magnet 30 as the brush 5 passes over the segments 28—29 will establish operation of the release magnets 40 and 50 as already described. Operation of the selecting lever 82 thereby permitted, establishes a circuit which may be traced from battery 39 by way of the contacts 71, 74, 77 and 84 of the levers 70, 73, 76 and 82, respectively, thence through an associated resistance and a winding 94 of the shift magnet 93 to earth. In responding to current through this path, a self-locking circuit is established from a battery 37 through an associated resistance and the contacts 98 of the relay 93 to the winding 94 in substitution of the battery 39. The armature 92 of the relay 93, by means not shown, may now move the type wheel 60 downwardly to present the upper or figures row of characters in alinement with the printing armature 65. The present shift operation being a strictly mechanical one no printing is required; therefore, separation of the contacts 83 effected by the described movement of the selecting lever 82 disconnects the start control circuit in order to insure suspension of printing action at this time. Since no circuit may now be completed through the star magnet 56 and the holding windings 42 and 52 of the release magnets 40 and 50 only a momentary operation of the latter magnets will take place in phase with the passing of the brush 5 over the segments 28 and 29. From the description already given it will be clear that for this stunt operation on which printing is not required the response and relatively non-delayed restoring of the release magnets 40 and 50, respectively, correspond with the releasing of the selecting levers 63, 70, etc., separation of the contacts 43 to permit restoring of any of the selecting magnets, which in the present example correspond with the selecting magnets 11, 12, 14 and 15, and the depressing of all the selecting levers to clear them from the disks. In the present assumed case, the lever 82 may move in and is then moved out of the alined slots of the selecting disks. During the time the shift magnet 93 is held locked in its operated position, printing operations may be carried on to reproduce characters which may be selected in the figures-row of type, until such time as a letters-shift combination of impulses may be transmitted from the distant station. Since the contacts 96 of the magnet 93 disconnect the starting and holding circuit previously traced, a substitute circuit whereby energization of the start magnet 56 and the holding of the release magnets 40 and 50 may be effected for printing in the figures-shift position, will now be considered.

It is well known that combinations of impulses employed in selecting characters in the letters-row of type may also be employed for selections in the figures-row of type. For example, the letter E and the figure 3 as usually positioned in their respective row of type are in alinement, one with the other, and selectable by the same combination of impulses, therefore, since one negative followed by four positive impulses may select the letter E during the time the printer may be in the letter-shift position as already assumed, the same combination of impulses may select the figure 3 during the time the type wheel may be held in the figures-shift position. Accordingly, let it be assumed that such a combination of impulses is now received from the distant station as described for the letter E. Such a combination of impulses results in the operation of the selecting relay 11 and movement of the disk 101 while the selecting magnets 12—15 continue inert and the corresponding disks 102—105 would also continue in their normal position. The contacts 26 being also closed through the movement of the disk 101, as described, the brush 5 in passing over the segments 28 and 29 effects operation of the magnet 30 to in turn initially operate the release magnets 40 and 50. The lever 63, as previously assumed, corresponds with the present selection and is released by the lifting of the armature 44 to enter the alined slots in the disks, thereby standing positioned to engage the stop arm 62. At such instant the combined starting and holding circuit will now be established from the battery 39 by way of the contacts 71, 74, 77, 83 and 86 of the respective selecting levers 70, 73, 76, 82 and 85, thence this circuit continues through the contacts 97 of the shift magnet 93, the contacts 80 of the selecting lever 79, the contacts 89 of the through selecting lever 88, thereafter continuing over the circuits already traced, through the winding of the start magnet 56 and the holding windings 42 and 52 of the release magnets 40 and 50 respectively, thence by way

of the contacts 68 of the spacing magnet 67 to earth. The type shaft 59 will now be released and the printing magnet 66 as well as the spacing magnet 67 will be operated to respectively print the figure 3 and to clear out this selection in a manner similar to that already described in connection with the printing of the letter E.

When it is desired to transfer the type wheel from the figures to the letters characters a combination of five negative impulses will be transmitted from the distant station in the regular way. This will result in the operation of each one of the selecting magnets 11—15 and the consequent movement of each one of the disks 101—105. Following this operation of the selecting magnets the brush 5, in passing over segments 28 and 29, initiates operation of the release magnets 40 and 50, thereby disconnecting the circuit of the selecting magnets and permitting the selecting lever 85 to mesh in an associated slot presented by the present selected position of the disks. This movement of the lever 85 separates its contacts 86 and closes its contacts 87, thereby establishing a circuit for deënergization of the shifting magnet 93 which may be traced from the battery 39 over the contacts 71, 74, 77, 83 and 87 of the selecting levers 70, 73, 76, 82 and 85 respectively. This circuit continues through a resistance unit 99 and a winding 95 of the relay 93 to earth. The connective relation of the windings 94 and 95 of the relay 93 is differential, one winding with the other, and the batteries 37 and 39 will be understood to be of equal potential, or, preferably, these batteries may be one and the same source of current, therefore, the equally opposing action of the current last traced through the winding 95 neutralizes the effect of the holding current present through the winding 94 of the shift magnet 93, thereby causing this magnet to release its armatures. This action moves the type wheel 60 to present the letters-row of characters to the printing armature 65, while separation of the contacts 97 disconnects the combination starting and holding circuit which is effective during printing operations for the figures position of the type wheel. The closing of the contacts 96 of the magnet 93 restores the start and holding circuit for letters printing as first traced in connection with the letter E.

When it is desired to transmit a line feed operation from the distant station a combination comprising a positive, a negative and three positive impulses is transmitted. This results in operation of the selecting magnet 12 and movement of the disk 102 whereby movement of the corresponding selecting lever 70 may take place. Since no printing takes place for this operation, separation of the contacts 71 of the lever 70 disconnects the battery 39 from the circuits which would otherwise extend through the start magnet and the holding windings of the release magnets 40 and 50. Closing of the contacts 72 of the lever 70, however, connects the battery 39 through the winding of a line feed magnet 130 to earth. The initial movement of the armature of this magnet closes contacts 131, thereby connecting a battery 132 to the line feed magnet in substitution of the battery 39. The circuit continues through the contacts 131 until an instant before the forward movement of the armature of the magnet 130 is entirely completed. A momentum effect carries the armature sufficiently beyond the point where the contacts 131 may separate, following which the armature of this magnet returns and by means of a tilting or cam action present in the control of the contacts 131, these contacts will not be reëstablished during the return stroke of the armature. The magnet 130 controls mechanism, not shown, to advance the sheet 64 a distance of one line. The contacts 131 insure the necessary time interval energization of the line feed magnet 130 for carrying out the shift operations irrespective of a quick release which may occur with respect to the release magnets 40 and 50 which follow in a proper order as described, when the brush 5 passes from the segments 28 and 29. For the convenience of the attendants at the receiving station a manually operated key 134 is also provided for the control of the line feed magnet 130.

For effecting the operation of carriage return, three positive, a negative and a positive impulse combination may be transmitted from the distant station. Such a combination effects operation of the selecting magnet 14 and movement of the disk 104, following which the release magnets 40 and 50 will be operated and the selecting lever 76 thereby permitted to move into alined notches of the selecting disks. Since no printing is required for this operation, separation of the contacts 77 of the selecting lever 76 disconnects the path through the start magnet 56 and the holding coils of the magnets 40 and 50. Operation of the lever 76 also establishes a circuit which may be traced from the battery 39 by way of the contacts 71, 74 and 78 of the respective levers 70, 73 and 76, after which this circuit continues through the winding of a carriage return magnet 135 to earth. Such initial flow of current through the magnet 135 causes it to close its contacts 136, thereby establishing a self-locking circuit which substitutes the battery 132 for the battery 39, this locking circuit being further completed through contacts 137 which will be understood as present at the return side of the printer. Therefore, such continued ener-

gization of the magnet 135 causes the carriage for the paper 64 to be moved to its return position for the beginning of another line, at which point the contacts 137 are opened by mechanism, not shown, to de-energize the carriage return magnet 135. A manually operable key 141 is also provided for controlling operation of the carriage return magnet 135, as may be desired by an attendant at the receiving station. A resistance unit connected in parallel with the winding of this carriage return magnet 135 is for the purpose of absorbing inductive current surges from this winding.

When spacing other than the single clearance spacing as between the letters of a word, etc., is necessary, as required between words, figures, etc., spacing impulse combinations are transmitted from the sending station, such selecting combination usually comprises two positive, a negative and two positive impulses. A spacing combination results in the operation of the selecting relay 13 and a corresponding movement of the disk 103, the release magnets 40 and 50 responding, as described, to permit the space selecting lever 73 to move into adjacently alined slots in the selecting disks. No printing being required for this operation, separation of the contacts 74 of the lever 73 disconnects the common start and lock control circuit and establishes a circuit from the battery 39 by way of the contacts 71 and 75 of the levers 70 and 73 respectively, thence by way of a conductor 138 through the winding of the spacing magnet 67 to earth. Such operation of the spacer magnet mechanically steps the sheet 64 ahead. Such advance usually corresponds with the space interval of a single character; therefore, for additional spacing movement, repetitions of this impulse combination are required from the distant sending station which will result in single step spacing as described.

In the handling of telegraphic service it is frequently necessary for an attendant at the sending station to communicate with an attendant at the receiving station and in printing telegraphs this is ordinarily carried out by means of one or more strokes or single operations of a signal bell. Such strokes on the bell being translated in accordance with a predetermined, arbitrary code, usually relate to requests as follows: start, rerun, re-punch, stop, etc. Each communication of impulses transmitted corresponds with a single operation or tap of the bell and in order that the receiving circuits may be in proper position for the reception of such signals it is necessary that the printer first be set to the figures-shift position; therefore, a combination of impulses first sent out by the transmitting station is composed of two negative, a positive and two negative impulses. This impulse combination results in the operation of the selecting lever 82 whereby initial energization of the shift magnet 93 takes place, following which this magnet is retained locked through its contacts 98, as already described. During the time the receiving devices are in this figures-shift position, a combination of two negative, a positive, a negative and a positive impulse which ordinarily corresponds with the letter J for the letters-shift position of the printer, will result in the operation of the signal. Such a combination of impulses effects operation of the selecting magnets 11, 12 and 14 to correspondingly move the disks 101, 102 and 104 to permit the signal control selecting lever 79 to move into associated alined slots of the disks. Since no printing is required during the signaling operation, contacts 80 of the lever 79 are now separated to disconnect the start and lock control circuits, already described, while a circuit is completed which may be traced from the battery 39 by way of the contacts 71, 74, 77, 83 and 86 of the selecting levers 70, 73, 76, 82 and 85 respectively, thence continuing over the contacts 97 (now closed) of the shift magnet 93 and the contacts 81 of the lever 79, and through a signal 140 to earth. Current through this circuit results in a single operation of the bell 140 and since the signal operating selection as set up by the receiver equipment is cleared out following the advance of the brush 5 from the local control segments 28 and 29, additional operations of the bell are effected only in phase with additional or repeated transmission of the signal combination of impulses already described.

The selecting lever 88 corresponds with stunt operations commonly known as "through." In certain situations this operation applies to the automatic control of a reperforator whereby operations carried out at the receiving equipment will prepare a tape record of a message received in order that the tape may be employed in retransmitting the message to another station. In other situations the through operation may relate to the control of a second signal bell known as "bulletin." This signal is usually operated for the purpose of calling the attention of attendants to items of particular importance which may be coming through. In initiating a through signal from the transmitting station, a combination of impulses for shifting the type wheel of the printer into the figures position is first carried out as already described. The "through" position on the figures row of type corresponds with the letter S; therefore a negative, positive, negative and two positive impulses, which correspond with the letter S, must be transmitted for carrying out this stunt operation. On the reception of these impulses the lever 88 will move to sep-

arate its contacts 89 and to close its contacts 90. Separation of the contacts 89 will disconnect one branch to the start and lock control circuit while another branch of this circuit stands disconnected at the separated contacts 96 of the shift relay 93 which now stands locked in its operated position as effected by the reception of the combination of impulses already assumed to have been received for shifting the receiver to the figures position. This disabling of the start circuit is to prevent printing during the time the "through" operation is under way. The circuit which may be traced from the battery 39 extends over the contacts 71, 74, 77, 83 and 86 of the selecting levers 70, 73, 76, 82 and 85 respectively, continuing from this point over the contacts 97 of the shift magnet 93, thence over the contacts 80 of the selecting lever 79 and the contacts 90 of the selecting lever 88 to a conductor 91. It will be understood that the conductor 91 may be connected to suitable devices for the operation of a signal, or to such devices as may control the conditioning of a reperforator mechanism for translating a message, which may now follow, into a tape record as well as a printed record. In case a through operation conditions the equipment for reperforating work, the devices are usually arranged so that reperforating will continue until such time as the transmitting station may send out a certain combination of impulses which will control a selecting lever (not shown) to discontinue the reperforating operations.

Referring to the alternative disk control arrangement shown in Fig. 3 of the drawing, the selecting disk 101, magnet 115, armature 116 and the contacts 117 controlled by this armature, will be understood as corresponding with the similarly designated parts shown in Fig. 2 of the drawing. An armature 122 is secured to the periphery of the selecting disk 101 in such a manner that energization of the magnet 115 attracts the armature 122 to move the disk 101. Such movement of the disk may correspond with the movement which may be set up by operation of the armature 118 (Fig. 2). Referring to Fig. 1, each of the selecting magnets 11—15 may therefore be arranged to respectively control armatures, as the armature 122, which may be provided for each one of the selecting disks 101—105.

From the foregoing description it will be clear that the selecting magnets 11—15 perform the compound operation of mechanically controlling the disks 101—105 and also the closing of self-locking circuits for respectively continuing their energization. It will also be pointed out that the two coils of each of these selecting magnets are connected in parallel, one coil with the other. This is to secure an advantage with regard to the time constant of their operation.

It will also be noted that the spacer magnet 67, shift magnet 93, line feed magnet 130 and carriage return magnet 135 are each arranged in a manner to perform compound operations with respect to mechanical functions and the control of electrical circuits. It will also be clear that the present embodiment of this invention provides that, by the system of interconnections described between the various stunt selecting levers and other control devices of the system, the matter of printing intervals and non-printing intervals may be entirely under the control of the distant transmitting station, while the operations with respect to movement of the type wheel from figures to letters position, and vice versa, may be carried out by means of a single electro-responsive device.

Referring to the various condensers and associated resistances not previously mentioned, these are for the purpose of eliminating sparking on the different contacts, as the contacts 131 of the line feed magnet 130, the contacts 81 of the selecting lever 79, the contacts 84 of the selecting lever 82 and the contacts which may be completed through the stop arm 62 of the type wheel shaft and different ones of the selecting levers.

Although the present embodiment of this invention represents what is considered to be a preferred arrangement for carrying out the features of this system, it will be understood that various changes in the organization of the equipment may be made without departing from the spirit of this invention.

What is claimed is:

1. In a telegraph receiving system, the combination with a printing device, of auxiliary function mechanisms, a plurality of devices for selectively controlling said mechanisms, and a series circuit controlled by each of said selecting devices for disabling said printing device.

2. In a printing telegraph receiver, a selecting mechanism comprising a plurality of selecting disks, an armature carried by each of said disks, and a plurality of electromagnets coöperating with said armatures to move said disks.

3. In a printing telegraph receiver, a plurality of rotatable disks, selecting levers cooperating therewith to select the desired character for printing, selecting magnets for moving said disks, contacts controlled by each of said magnets and arranged to close a holding circuit therefor when said magnet is energized, means for releasing said selecting levers, and contacts actuated thereby for opening said holding circuit.

4. In a printing telegraph receiver, a plurality of selectable electromagnets, a plurality of selecting disks, an armature car-

ried by each of said disks and arranged to be attracted by a corresponding one of said magnets, a plurality of characters selectable by said disks, and means for printing said selected characters.

5. In a printing telegraph receiver, a source of current, a type wheel, a plurality of rows of type on said wheel, means for selectively printing from said type wheel, electroresponsive means for selectively controlling the row of type from which printing may take place, and means for establishing said source of current to act differentially in controlling said means for selecting said rows of type.

6. In a printing telegraph receiver, the combination with a type wheel having a plurality of rows of characters, means for shifting said type wheel to bring a desired row of characters into printing position, an electromagnet for operating said shifting means, an operating winding therefor, selecting mechanism for closing a circuit through said winding to energize said magnet, a neutralizing winding for said electromagnet, and a circuit therefor under the control of said selecting mechanism for restoring said shifting means.

7. In a printing telegraph receiver, the combination with a printing device, of auxiliary function mechanisms, a plurality of devices for selectively controlling said mechanisms, contacts controlled by said selecting devices, and a circuit for the control of said printing device connected serially through the contacts of said selecting devices.

8. In a printing telegraph receiver, pluralities of characters, means for selecting said characters, a plurality of auxiliary function mechanisms, a plurality of selectable devices for controlling said mechanisms, means for printing selected characters, a plurality of current paths for controlling said printing operations, and serially connected contacts at said selectable devices for controlling said plurality of printing control current paths.

9. In a printing telegraph receiver, a type wheel, pluralities of rows of type for said wheel, means for making predetermined selection of said type, a source of current, a compound-wound electromagnet, means controlled by said magnet for controlling the selection of said different rows of type, selective means for including said source of current to act through one winding of said electromagnet for effecting its initial operation, means for establishing said current to continue the energization of said magnet, and selective means for including said source of current with a second winding of said magnet to effect its deënergization.

10. In a printing telegraph receiver, a type wheel, a plurality of rows of characters on said type wheel, means for selecting said type, and means for printing said selected type, a compound-wound electromagnet for controlling the positioning of said rows of type with respect to a printing point, a plurality of selecting devices for the control of said electromagnet, contacts controlled by said selecting devices, a plurality of contacts controlled by said magnet, and a plurality of current paths jointly controlled by the selecting devices and said electromagnet for controlling said printing operations.

11. In a selecting system, a plurality of characters, means for selectively controlling said characters, means for printing said selected characters, a plurality of auxiliary function mechanisms, a plurality of devices for selectively controlling said mechanisms, contacts controlled by said selecting devices for said mechanisms, a circuit extending serially through the contacts of said mechanism selecting devices, and branches extending from various points on said serially connected circuit for respectively controlling the operation of said mechanisms.

12. In a selecting system, a type wheel, a plurality of rows of type on said wheel, a compound wound magnet for controlling the selection of said rows of type, means for the selection and printing of said type, a plurality of auxiliary function mechanisms, a plurality of selecting devices for controlling said mechanisms, contacts controlled by said selective devices of said function mechanisms, a plurality of circuits for the control of printing operations separately routed through the contacts of said mechanism selecting devices, and means controlled by said compound wound magnet for selectively controlling said plurality of control circuits.

13. In a printing telegraph receiver, a type wheel, a plurality of rows of characters for said wheel, means for selectively controlling said characters, means for printing said selected characters, a compound wound magnet for controlling the selection of said rows of type, a plurality of auxiliary function mechanisms, selecting devices for controlling said mechanisms, contacts controlled by said mechanism selecting devices, a plurality of circuits routed through the contacts of said mechanism selecting devices for the control of the printing operations, and means controlled by said compound wound magnet for transferring said printing control circuit for use in performing auxiliary function operations.

14. In a printing telegraph receiver, a plurality of characters, means for selectively positioning said characters at a printing point, means for printing the selectively positioned characters, a plurality of selectable devices for the control of auxiliary func-

tion mechanisms, a compound wound electromagnet for the control of certain said auxiliary function mechanisms, contacts controlled by said electromagnet, and a circuit extending serially through the contacts of said selectable devices and of said electromagnet for the control of the printing operations.

15. In a printing telegraph receiver, a plurality of characters, a plurality of devices for selectively controlling said characters, a plurality of selecting magnets, a plurality of armatures for said magnets, a self-locking circuit for each magnet, contacts controlled by one armature of each magnet for completing this self-locking circuit, means controlled by another armature of said magnets for respectively controlling said character selecting devices, electroresponsive means for operatively controlling said character selecting devices, master means responsive to each one of said character selecting devices, and circuit control means operated by said master means to prepare a circuit for the electroresponsive means which controls the operativeness of said character selecting means.

16. In a printing telegraph receiver, selecting magnets, a plurality of characters, selecting disks, means controlled by said selecting magnets for movably controlling said selecting disks, distributer means for selectively controlling said magnets, master means controlled by the movement of said disks for preparing a master circuit, electromagnets controlled by said master circuit for releasing selecting levers to be controlled by said disks in selecting from said characters, means controlled by said distributer for energizing said master circuit, means for controlling the printing of a selected character, means controlled by said electromagnets for completing said printing circuit, means controlled by said electromagnets for disabling said selecting magnets, a spacing magnet controlled by said printing circuit, and contacts controlled by said spacing magnet for reëstablishing an operative condition of said selecting magnets in substitution of the circuit disabled by said electromagnets.

In witness whereof, I hereunto subscribe my name this 16th day of April, A. D., 1918.

MARK B. KERR.