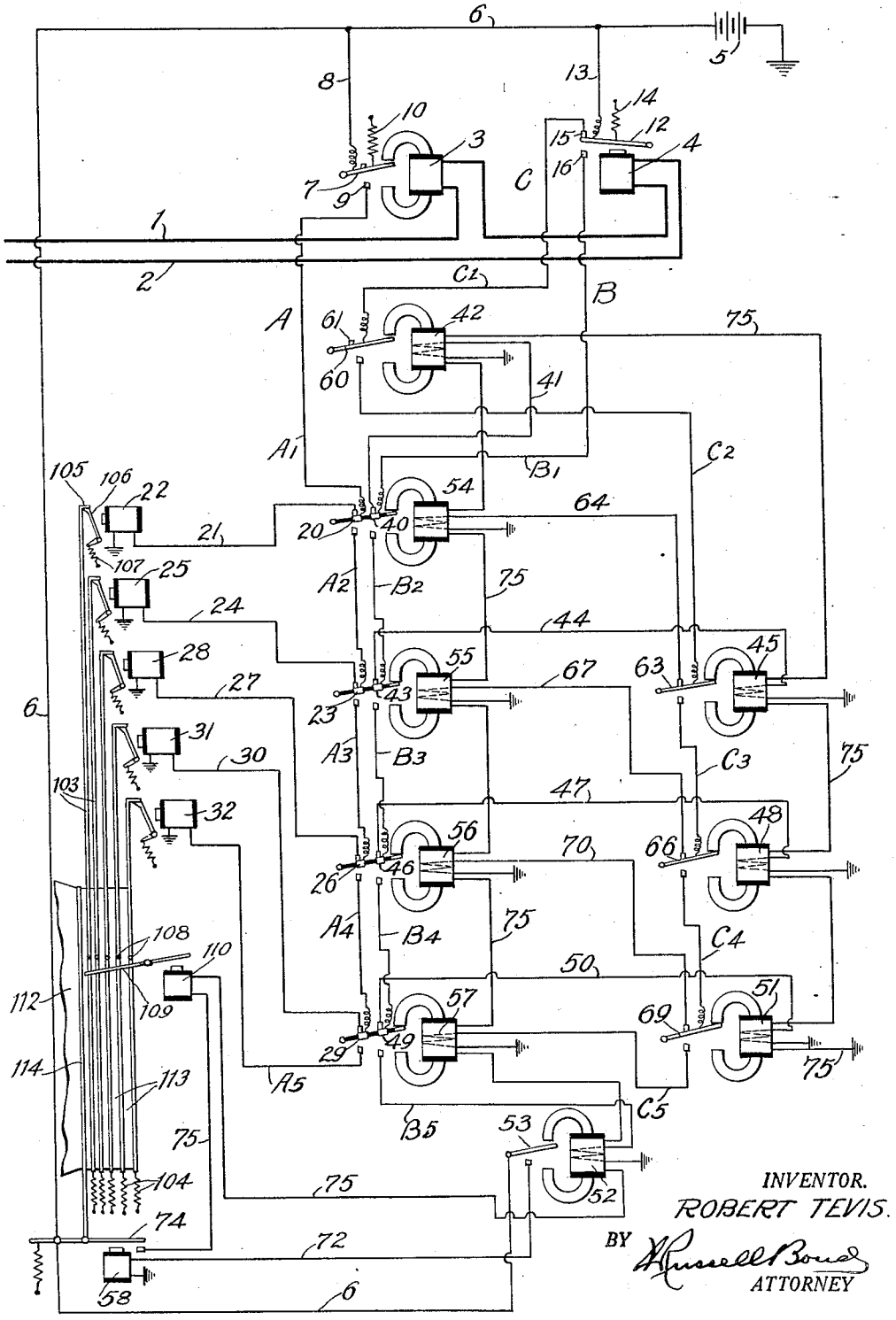
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PRINTING TELEGRAPH RECEIVER

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PRINTING TELEGRAPH RECEIVER

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The present invention relates to printing telegraph receivers and has for an object to provide a simple selective apparatus therefor.

The invention is adapted for use with telegraph systems in which each signal is composed of a combination of impulses which do not vary in length as in the Morse system. Heretofore it has been common practice in such systems to use synchronous motors, one at the transmitting station to control the transmission of the impulses at definite time intervals, and the other at the receiving station for distributing the impulses to a series of magnets controlling a permutation apparatus for the selection of the characters to be printed. A serious drawback to such systems lies in the fact that it is difficult to maintain the motors at the two stations in perfect synchronism and, owing to the high speed at which the signals are sent, slight variation in relative speed of the motors will result in the transmission of false signals. To keep the motors in synchronism requires constant servicing which involves a material item of expense.

Another disadvantage lies in the fact that such systems are inflexible, since they must always run at one speed. If set for a maximum speed to take care of maximum service, demands that the apparatus must run at this speed even during periods when a much lower speed would suffice,—and as a result the wear and tear on the mechanism is always at a maximum.

It is an object of my invention to dispense with synchronous motors, thereby materially reducing, if not entirely overcoming, the service expense.

Another object of the invention is to provide a flexible system in which the rate at which the signals are sent may be varied at will, and the receiving apparatus while normally running at a comparatively low average rate, will automatically adjust itself to the speed of the transmitter. To this end, in place of a motor-driven distributor at the receiving station, I use, in connection with a set of electro-magnets for operating a permutation mechanism, a set of distributing relays which are so interconnected that in response to the successive line impulses, said magnets will be sequentially connected for operation. I am aware that systems of distributing relays have been previously used, to dispense with synchronous motors, but heretofore such systems have involved the employment of such a large number of relays, magnets and switch contacts, that the apparatus was complicated and expensive and was difficult to keep in order.

It is an object of my invention to overcome this difficulty by providing an apparatus in which the number of relays and switch contacts is reduced to a minimum.

Other objects of my invention will appear in the following description of a preferred embodiment and thereafter the novelty and scope of the invention will be pointed out in the claims.

The accompanying drawing is a diagrammatic representation of a printing telegraph receiver embodying my improved selective apparatus, the actual printing mechanism not being shown, as it forms no part of the present invention.

In general my improved receiving apparatus is adapted to respond to signals each made up of a fixed number of electric impulses, said impulses being variable as to polarity and being arranged in different combinations to represent different characters.

For purposes of illustration, I have chosen an apparatus with which five-impulse signals are employed. Thirty-two different permutations are possible with the five selective impulses, so that the apparatus illustrated has a capacity of thirty-two characters. However, the apparatus may very easily be adapted for six-impulse signals, thereby doubling

the number of different characters that may be taken care of. It will be understood therefore, that I do not limit myself to the particular apparatus illustrated, but may employ the principles hereinafter more fully brought out, in connection with an apparatus of a capacity either smaller or greater than the one shown in the diagram.

In the main line are two relays, one of which is polarized so that it will respond only to impulses of a certain polarity,—say positive impulses. The other main line relay is neutral and will respond to each impulse whether negative or positive. Both of the main line relays control local power lines which may be fed from a battery, a motor-generator, or some other local power source. There is a series of five selecting magnets which are sequentially switched into one of the local power lines so as to be operated by the polarized relay. These magnets will therefore be operated only by positive impulses coming over the main line but will be left in their normal positions by negative impulses. The switching of the magnets into the local power line is controlled by the neutral relay, through two sets of control relays, and the switching actually takes place during intervals after the successive impulses. The control relays are polarized, each being provided with an actuating winding and a restoring winding. One set of control relays effects the switching of the electro-magnets into the local power line, and the other set controls the successive operation of the relays in the first set.

Thus, step by step, the electro-magnets are connected sequentially into the power line and this line is energized or not according to whether the line impulse passing through the main line polarized relay is positive or negative. The last impulse of the signal causes the operation of a printing relay by which the printing of the character selected by the magnets is effected, and immediately thereafter means are provided for restoring all the parts to their initial position.

Referring now more particularly to the accompanying drawing, I show a pair of main line wires 1 and 2 over which the signal impulses are received. If desired, a ground may be substituted for one of these wires. A pair of relays 3 and 4 are connected across the lines either in parallel or preferably in series as shown. The relay 3 is polarized and will respond to say positive line impulses. The relay 4 is neutral and will respond to impulses of either positive or negative polarity. These relays control three local lines A, B and C which receive energy from a battery 5, or other source of electrical energy, one terminal of which is grounded and to the other terminal of which is connected a battery main 6. The armature 7 of the relay 3 serves as a main switch for the local power line A. A spring 10 holds the switch 7 normally clear of the contact terminal 9. Whenever the relay 3 is energized by a signal impulse of positive polarity, the selective line A is powered by the closing of the switch 7 against the contact 9.

The armature 12 of the neutral relay 4 is connected by a lead 13 to the battery main 6. This armature serves as a two-way switch to connect the control lines B and C alternately to the battery. Thus, in normal position the armature or switch 12 is held by a spring 14 in engagement with the back-stop 15 which constitutes a contact terminal for the control line C, while the front stop 16 forms a contact terminal for the control line B. Normally, then, the secondary control line C is connected to power, but whenever the relay 4 is energized by a signal impulse coming over the main line, the switch 12 disconnects line C and connects the primary line B to the battery.

The local power line A comprises a series of normally disconnected sections indicated in the drawing by the reference numerals A^1, A^2, A^3, A^4 and A^5. Each of these sections except the last is provided with a switch by which it may be connected to the next adjacent section. These switches are indicated in the drawing at 20, 23, 26, and 29. A switch 20 of section A^1, when in normal position connects said section to a branch line 21 which runs through the energizing coil of an electro-magnet 22 and thence to ground. The switch 23 normally connects section A^2 to a branch line 24 running through an electro-magnet 25 to ground. Similarly, the switch 26 normally connects section A^3 by way of a branch line 27 through electro-magnet 28 to ground and switch 29 normally connects section A^4 through branch line 30 and electro-magnet 31 to ground. The last section A^5 is permanently connected through the energizing coil of a magnet 32 to ground. Each of the switches 20, 23, 26 and 29 may be operated to break engagement with its branch line and connects its line section to the next adjacent line section. Means are provided for operating these switches successively, after the respective impulses of the signal, as will be explained more fully hereinafter.

It will be observed that the electro-magnet 22 is normally connected with line A and will be energized by the first impulse of a signal, if said impulse is of such polarity as to actuate the relay 3. Thereafter the switch 20 is thrown, disconnecting electro-magnet 22, but switching in the line section A^2 so that the electro-magnet 25 may be operated during the second impulse of the signal, if said second impulse is of proper polarity, and so on. Thus, at each impulse of the signal, a different electro-magnet is connected into the line A, to be operated if said line is powered by actuation of the relay 3.

The line B, which may be termed the "pri-

mary control line, comprises a series of normally disconnected sections B^1, B^2, B^3, B^4 and B^5, each except the last, being provided with a switch by which it may be connected to the next adjacent section of the line. These switches are indicated in the drawing by the reference numerals 40, 43, 46 and 49, respectively. The switch 40 of section B^1 normally connects the latter to a branch line 41 which runs through an actuating coil of a polarized relay 42 to ground. The switch 43 normally connects section B^2 to a branch line 44 running through the actuating coil of the polarized relay 45 to ground. The switch 46 normally connects the section B^3 to a branch line 47 running through the actuating coil of a polarized relay 48 to ground, and the switch 49 connects section B^4 to a branch line 50 running through the actuating coil of the polarized relay 51 to ground. The last section B^5 is permanently connected through the actuating coil of a relay 52 to ground.

Like the switches of line A, the switches of line B are successively actuated after the respective impulses of a signal to break engagement with their respective branch lines and make connection with the next adjacent section of the line B. The switches of the line A are, therefore, mounted to operate with the corresponding switches of the line B. Thus, switches 20 and 40 consist of mutually insulated contact members mounted on the armature of a polarized relay 54. Similarly, switches 23 and 43 are mounted on the armature of a polarized relay 55, switches 26 and 46 on the armature of a polarized relay 56, and switches 29 and 49 on the armature of a polarized relay 57.

The line C, which may be termed the "secondary control line," comprises a series of normally disconnected sections C^1, C^2, C^3, C^4 and C^5, each of these sections except the last being provided with a switch by which it may be connected to the next adjacent section. These switches are indicated in the drawing at 60, 63, 66 and 69, and constitute the armatures of the polarized relays 42, 45, 48 and 51, respectively. The switch 60 of section C^1 in its normal position rests idle against a back-stop 61. The switch 63 of section C^2 normally connects the latter to a branch line 64 running through the actuating coil of the relay 54 to ground. Similarly switch 66 normally connects section C^3 to a branch line 67 running through the actuating coil of the relay 55 to ground, and switch 69 of section C^4 normally connects the latter to a branch line 70 running through the actuating coil of relay 56 to ground. The last section C^5 is permanently connected through the actuating coil of relay 57 to ground.

It will be observed that the B line controls the throwing of switches in the C line, and the C line in turn controls the throwing of switches in lines A and B. Although the section C^1 is normally connected to the battery, no current flows therethrough because the switch 60 is normally open.

The drawing shows the normal position of all of the switches. The first signal impulse by energizing the neutral relay 4 connects the B line to power and thereby actuates relay 42. The current may be traced from battery 5, line 6, lead 13, relay armature 12, section B^1, switch 40, line 41, actuating coil of relay 42, and through ground back to the battery. This throws switch 60, connecting sections C^1 and C^2, but no current flows through the C lines at the moment because the main switch 12 has been drawn away from the back-stop 15. As soon as the first impulse ceases and the spring 14 draws the armature 12 back into engagement with the back-stop 15, current will flow from the battery through sections C^1 and C^2 and thence by way of switch 63, line 64 and actuating coil of relay 54 to ground. It will be understood that because the relays controlled by the lines B and C are polarized they will hold their armatures in said position until restored by means which will be explained hereafter. As soon, therefore, as the relay 54 is actuated, which actuation takes place in the interval between the first and second signal impulses, the switches 20 and 40 will be thrown disconnecting the branch lines 21 and 41 and connecting the sections A^1 and B^1 to sections A^2 and B^2, respectively.

During the second signal impulse the B line will again be energized and current flowing through sections B^1 and B^2 will energize relay 45 thereof, throwing switch 63 to extend the line C so as to include the section C^3. Hence, during the next interval between signal impulses the relay 55 which is normally connected to section C^3 will be actuated, throwing switches 23 and 43. Thus, during successive signal impulses relays 42, 45, 48 and 51 will be successively energized to set the switches of line C so that during intervals between signal impulses the switches in lines A and B will be operated sequentially. In other words, current flowing through section B^1 will connect sections C^1 and C^2, current flowing through section C^2 will connect sections B^1 and B^2, current flowing through the latter section will then add section C^3 to the C line and current then flowing through the latter will add section B^3 to the B line, etc. Thus alternate switching in of the line sections will continue under control of and in timed relation to the signal impulses. During the fifth signal impulse the switch 49 is thrown to connect section B^5 to the B line and thereby energizing the polarized relay 52. The armature 53 of this relay is normally connected to the main battery line 6. The front stop 71 of this armature forms a terminal of a branch line 72 running through a neutral relay 58.

Thus, on the last impulse the relay 52 is operated and this in turn operates the relay 58. The latter, however, operates a moment after the electro-magnet 32 because it is not connected to power until after the relay 52 has operated.

All of the polarized relays except the main line relay 53 are provided with restoring coils and are connected in series in a restoring circuit 75. This restoring circuit is adapted to be connected to the battery main by operation of the relay 58.

The selecting magnets 22, 25, 28, 31 and 32 are adapted to control any suitable permutation apparatus or mechanism for controlling the printing of the characters in response to the signals received. The exact nature of this permutation mechanism forms no part of the present invention, since a wide variety of different arrangements could be controlled by these selective magnets.

In the diagram I have shown a set of plates 103, there being one for each magnet. Each plate is urged downward by a spring 104, but the plates are held in raised position by means of latches. To this end each plate 103 is formed at its upper end with a lug 105 which engages the end of a latch 106. Each latch constitutes the armature of one of the electro-magnets, so that when one of said magnets is energized the latch will be withdrawn from the lug 105, permitting the plate to slide downward in response to the pull of its spring 104. As soon as an electro-magnet is de-energized the armature 106 is swung outward by a spring 107 so as to be in position to snap past the lug 105 when the plate is raised, as will be explained presently. Each plate is provided with a laterally projecting pin 108 adapted to be engaged by a lever 109, one arm of which constitutes the armature of a restoring magnet 110. The plates 103 are perforated with openings set at such relative positions as to provide 32 different permutations, giving at each setting a single passage running completely through the entire system of plates. Such a system of perforated plates could be used, as shown in the drawing, in connection with a tracker board 112 of a pneumatic typewriter, to select particular typebars for operation in accordance with the combinations provided by the plates 103. The plates 103 may slide in contact one with another, or fixed spacer plates 113 may be provided between them. A shutter 114 is interposed between the plates and the tracker bar, and this shutter is actuated by the armature 74 of relay 58, so that although the plates 103 may be set for a particular signal while the signal impulses are being received, the actual printing will not take place until the printing relay 58 is operated, on the last impulse of the signal.

Instead of passing air through the plates 103 to operate pneumatics light may be passed through them to operate photo-electric cells for selective control of the printing mechanism. Again, toothed permutation bars may be operated by the electro-magnets in place of the plates 103, such as the bars 9*a* to 9*e* shown in Patent No. 1,229,201, or, again, the electro-magnets may operate a series of switches such as the switches of relays 35 to 39 shown in Patent No. 982,274. Thus, the particular mechanism operated by the selective magnets may be widely varied, and does not form a part of the present invention.

The operation of this apparatus will be clearly understood. We shall assume, for example, that a signal is received consisting of a series of impulses arranged as follows:

Plus, plus, minus, plus, minus. The first signal impulse is positive, and will actuate both of the line relays 3 and 4, connecting lines A and B to the battery. Current flowing through line A will immediately actuate the electro-magnet 22 and thus will release the first of the plates 103, permitting it to drop until its pin 108 rests upon the restoring lever 109. At the same time, current flowing through the line B will actuate the relay 42, throwing switch 60 to connect with the section C^2. Immediately after the impulse ceases both of the line relays will return to normal under the influence of their springs 10 and 14, respectively. The armature of relay 4 will then power the C line, causing operation of relay 54 and throwing the switches 20 and 40 so as to connect with lines A^2 and B^2, respectively. The next signal impulse being positive, will cause the operation of both line relays, and current will flow through electro-magnet 25, releasing the second of the plates 105, and at the same time current flowing through the B line, which has now been extended to include section B^2, will operate relay 45 to connect section C^3 to the C line. During the interval following the second impulse, the C line will be powered and will operate relay 55 to throw switches 23 and 43 so as to connect with lines A^3 and B^3, respectively. The third signal impulse being negative will operate the neutral relay 4 only. Thus, although electro-magnet 28 is now connected into the A line it will not be energized and the plate 103 which it controls will remain in raised position. Current flowing through the B line which has now been extended to include section B^3 will operate relay 48 to add section C^4 to the C line, so that in the interval between impulses current flowing through the C line will actuate relay 56 to throw the switches 26 and 46 and connect sections A^4 and B^4 to the A and B lines, respectively. The fourth impulse being positive will actuate both of the line relays and cause electro-magnet 31 to be actuated, releasing its plate 103. At the same time the B line being energized, will operate re-

lay 51 to throw the switch 69 and connect section C^5 to the C line. During the fourth interval the relay 57 is actuated to throw switches 29 and 49 so as to connect sections A^5 and B^5 to the A and B lines. The fifth and last impulse of the signal being negative, will not operate relay 3, and consequently the electro-magnet 32 will remain inactive. However, the neutral relay 4 will be actuated, and will cause current to flow through the B line, actuating relay 52, and the latter in turn will connect the printing relay 58 to power, withdrawing the shutter, and permitting the printing mechanism to operate. Immediately thereafter, the armature of relay 58 closes the restoring circuit 75, which not only energizes the restoring relay 76 to raise all of the plates 105 to normal position, but also passes current through all of the restoring windings of the polarized relays (except relay 3), returning the armatures of all these relays to normal position. Thereby the parts are all restored to the positions shown in the drawing.

While I have described a specific embodiment of my invention, it will be understood that this is to be taken as illustrative and not limitative of the invention, and that I reserve the right to make such changes in form construction and arrangement of parts as fall within the spirit and scope of the following claims.

I claim:—

1. In a printing telegraph apparatus for received signals each composed of a plurality of impulses variable as to polarity, a main relay responsive only to signal impulses of a predetermined polarity, a neutral relay responsive to all signal impulses, a local power line controlled by said main relay, a plurality of electrically operable selective means, and means controlled by the neutral relay for connecting said selective means sequentially to said line.

2. In a printing telegraph apparatus for receiving signals each composed of a plurality of impulses variable as to polarity, a polarized relay responsive only to signal impulses of a predetermined polarity, a neutral relay responsive to all signal impulses, a local power line controlled by the polarized relay, a plurality of electrically operable selective means, and means controlled by the neutral relay for connecting said selective means sequentially to said line during intervals between impulses.

3. In a printing telegraph apparatus for received signals each composed of a plurality of impulses variable as to polarity, a main relay responsive only to signal impulses of a predetermined polarity, a neutral relay responsive to all signal impulses, a local power line controlled by said main relay, a plurality of electrically operable selective means, one of said selective means being normally connected to said line, and means controlled by the neutral relay for connecting the others of the selective means sequentially to said power line in substitution for the selective means normally connected thereto and in successive substitution one for another, such substitution taking place in the order in which the successive signal impulses are received.

4. In a printing telegraph apparatus for receiving signals each composed of a plurality of impulses variable as to polarity, a polarized relay responsive only to signal impulses of a predetermined polarity, a neutral relay responsive to all signal impulses, a local power line adapted to be energized at each actuation of the polarized relay, a plurality of electrically operable selective means, a switch for connecting each of said selective means into said power line, a pair of control circuits adapted to be energized alternately by the neutral relay, and means actuated by said control circuits for operating said switches successively to effect sequential individual connection of said selective means to said power line.

5. In a printing telegraph apparatus for receiving signals each composed of a plurality of impulses variable as to polarity, a polarized relay responsive to signal impulses of a predetermined polarity only, a neutral relay responsive to all signal impulses, a local power line comprising a plurality of normally disconnected sections, a switch for each section except the last and adapted when thrown from normal position to connect its section to the next adjacent section, a series of electrically operable selective means, each switch in normal position connecting its section to one of said selective means, the last section being permanently connected to the last of the selective means, and means controlled by the neutral relay for successively throwing said switches in the order of and during intervals between impulses.

6. In a printing telegraph apparatus for receiving signals each composed of a plurality of impulses variable as to polarity, a polarized relay responsive to signal impulses of a predetermined polarity only, a neutral relay responsive to all signal impulses, a local power line comprising a plurality of normally disconnected sections, a switch for each section except the last, and adapted when thrown from normal position to connect its section to the next adjacent section, a series of electrically operable selective means, each switch in normal position connecting its section to one of said selective means, the last section being permanently connected to the last of the selective means, a local polarized relay for throwing each switch, and means controlled by the neutral relay for operating the local polarized relays successively in the order of and during the successive intervals between signal impulses.

7. In a printing telegraph apparatus for receiving signals each composed of a plurality of impulses variable as to polarity, a polarized relay responsive to signal impulses of a predetermined polarity only, a neutral relay responsive to all signal impulses, a local power line comprising a plurality of normally disconnected sections, a switch for each section except the last and adapted when thrown from normal position to connect its section to the next adjacent section, a series of electrically operable selective means, each switch in normal position connecting its section to one of said selective means, the last section being permanently connected to the last of the selective means, a local polarized relay for throwing each switch, means controlled by the neutral relay for operating the local polarized relays successively in the order of and during the successive intervals between signal impulses, and means controlled by operation of the last of said switches for restoring the local polarized relays to normal.

8. In a printing telegraph apparatus for receiving signals each composed of a plurality of impulses variable as to polarity, a polarized relay responsive to signal impulses of a predetermined polarity only, a neutral relay responsive to all signal impulses, a local power line comprising a plurality of normally disconnected sections, a switch for each section except the last and adapted when thrown from normal position to connect its section to the next adjacent section, a series of electrically operable selective means, each switch in normal position connecting its section to one of said selective means, the last section being permanently connected to the last of the selective means, a local polarized relay for throwing each switch, means controlled by the neutral relay for operating the local polarized relays sucessively in the order of and during the successive intervals between signal impulses, a restoring circuit for all of the local polarized relays, and means for energizing the restoring circuit when the last impulse of the signal has been received by the neutral relay.

9. In a printing telegraph apparatus for receiving signals each composed of a plurality of impulses variable as to polarity, a main relay responsive only to signal impulses of a certain polarity, a neutral relay responsive to all signal impulses, a local power circuit controlled by the main relay, a primary control circuit adapted to be energized at each operation of the neutral relay, a secondary control circuit adapted to be energized at each return of the neutral relay to normal, a set of polarized relays controlled by each of the primary and secondary circuits, means interconnecting the polarized relays to effect alternate sequential connection thereof to the primary and secondary circuits, a plurality of electro-magnets, and switches controlled by the polarized relays of the secondary circuit for causing sequential connection of the electro-magnets to the power circuit.

10. In a printing telegraph apparatus for receiving signals each composed of a plurality of impulses variable as to polarity, a main relay responsive only to signal impulses of a certain polarity, a neutral relay responsive to all signal impulses, a local power circuit controlled by the main relay, a primary control circuit adapted to be energized at each operation of the neutral relay, a secondary control circuit adapted to be energized at each return of the neutral relay to normal, a set of polarized relays controlled by each of the primary and secondary circuits, means interconnecting the polarized relays to effect alternate sequential connection thereof to the primary and secondary circuits, a plurality of electro-magnets, switches controlled by the polarized relays of the secondary circuit for causing sequential connection of the electro-magnets to the power circuit, and means for restoring said polarized relays to normal position at the end of each signal.

11. In a printing telegraph apparatus for receiving signals each composed of a plurality of impulses variable as to polarity, a main relay responsive only to signal impulses of a certain polarity, a neutral relay responsive to all signal impulses, a local power circuit controlled by the main relay, a primary control circuit adapted to be energized at each operation of the neutral relay, a secondary control circuit adapted to be energized at each return of the neutral relay to normal, a set of polarized relays controlled by each of the primary and secondary circuits, means interconnecting the polarized relays to effect alternate sequential connection thereof to the primary and secondary circuits, a plurality of electro-magnets, switches controlled by the polarized relays of the secondary circuit for causing sequential connection of the electro-magnets to the power circuit, selective means controlled by said magnets, a printing relay adapted to be actuated by the primary control circuit during the last impulse of each signal, and means controlled by the printing relay for restoring the selective means to normal position.

12. In a printing telegraph apparatus for receiving signals each composed of a plurality of impulses variable as to polarity, a main relay responsive only to signal impulses of a certain polarity, a neutral relay responsive to all signal impulses, a local power circuit controlled by the main relay, a primary control circuit adapted to be energized at each operation of the neutral relay, a secondary control circuit adapted to be energized at each return of the neutral relay to normal, a set of polarized relays controlled by each of the primary and secondary circuits, means interconnecting the polarized relays to effect

alternate sequential connection thereof to the primary and secondary circuits, a plurality of electro-magnets, switches controlled by the polarized relays of the secondary circuit for causing sequential connection of the electro-magnets to the power circuit, selective means controlled by said magnets, a printing relay adapted to be actuated by the primary control circuit during the last impulse of each signal, and means controlled by the printing relay for restoring the selective means and the polarized relays to normal position.

In testimony whereof, I have signed this specification.

ROBERT TEVIS.