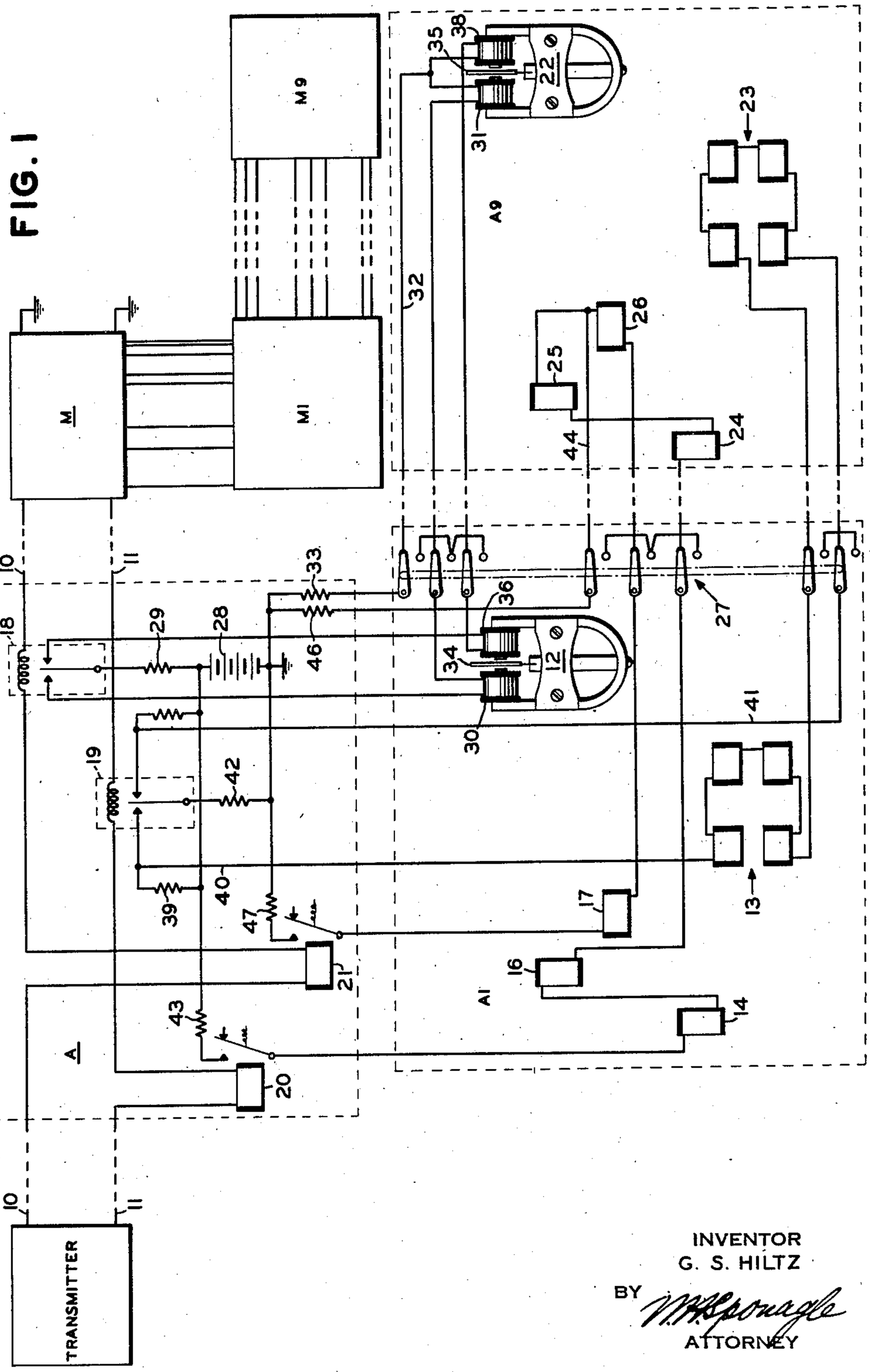
Oct. 21, 1941 G. S. HILTZ 2,259,523

PRINTING TELEGRAPH REPEATER

Filed April 20, 1938 2 Sheets-Sheet 1

FIG. 1



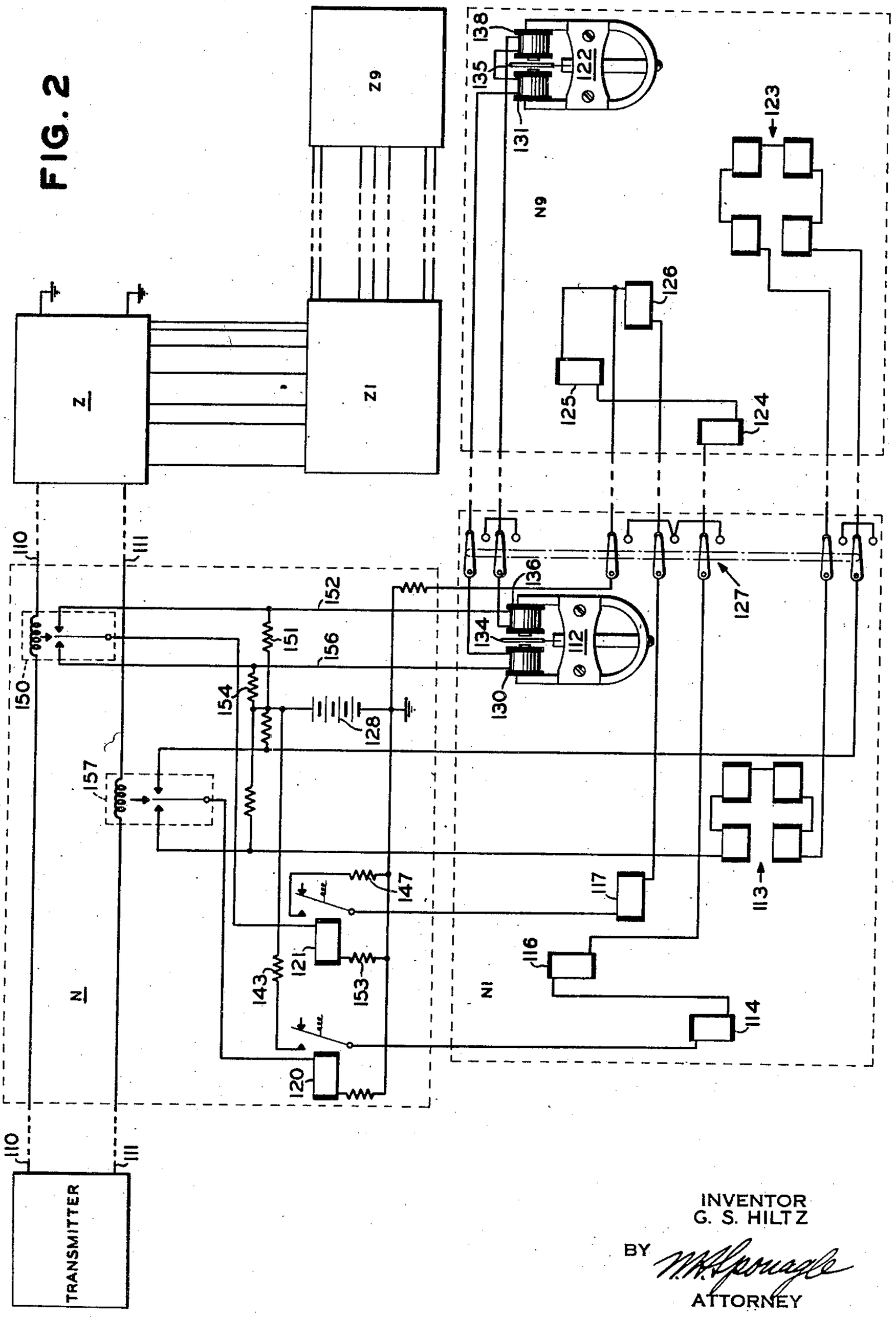
INVENTOR
G. S. HILTZ
BY W. R. Sprowle
ATTORNEY

Oct. 21, 1941. G. S. HILTZ 2,259,523

PRINTING TELEGRAPH REPEATER

Filed April 20, 1938 2 Sheets-Sheet 2

FIG. 2



INVENTOR
G. S. HILTZ

BY W. H. Sponagle

ATTORNEY

Patented Oct. 21, 1941 2,259,523

UNITED STATES PATENT OFFICE

2,259,523

PRINTING TELEGRAPH REPEATER

George S. Hiltz, Brooklyn, N. Y., assignor, by mesne assignments, to The Western Union Telegraph Company, New York, N. Y., a corporation of New York

Application April 20, 1938, Serial No. 203,036

3 Claims. (Cl. 178—73)

This invention relates, in general, to printing telegraph systems and has particular reference to the local repetition of telegraph signals to one or more receiving instruments.

The major object of the instant invention is to increase the number of recorders which may be operated from a single circuit.

Another object of the invention is to provide a telegraph system wherein the value of the line current employed is substantially less than in similar systems in use at the present time.

Still another object of this invention is to improve the operation of the recording devices by energizing the electromagnets thereof from local sources.

A further object of the invention is to provide for the operation of a plurality of receivers from a single repeater.

A still further object of this invention is to obviate any tendency which may exist to demagnetize certain of the polarized devices employed in the receiving instruments.

In printing telegraph systems employed for the dissemination of news or other information, it is customary to operate a plurality of receiving devices from a single circuit. In systems of this type certain of the electromagnetic instrumentalities comprising the receivers are connected directly in the line circuits. Where the receiving devices are of the type shown in Patent No. 680,693 granted to John Burry on August 20, 1901, the line current which is necessary to operate these instruments is comparatively high. Consequently the receiving devices which may be connected into a single circuit is limited to a relatively small number. Also where the receivers are located at some distance from the transmitting station it is frequently necessary to extend a separate circuit to each receiving instrument.

In cases where two or more receiving instruments are located close to one another, as for example in the same building, it is advantageous to be able to provide local repetition to such receivers. Heretofore in instances of this nature the instruments themselves have been connected directly in the line circuits, thereby reducing the number of other receivers which might have been connected in this particular circuit.

Inasmuch as the line conductors which are generally used to constitute such a circuit, are of relatively small size and capable of transmitting currents which are limited to small values, it will be appreciated that a change in the mode of operation of the receiving instruments whereby the value of the line currents may be substantially reduced will effect a marked improvement in such a system. Also by providing local energization of the electromagnets comprising the receiving instruments, uniformity in the operation thereof is attainable. Such uniformity has always been lacking in systems of this type because of extraneous influences to which the line conductors are frequently exposed. Hence by interposing between the recorders and the line circuits sensitive relays which are responsive to the telegraph signals impressed upon the line conductors and which effect the actual operation of the printing devices by means of power supplied to their contacts locally, the results obtainable are vastly improved. At the same time, by properly choosing the amount of local potential supplied and by suitably adjusting the values of current limiting resistors, a plurality of receiving devices may be operated locally from the contacts of one group of relays.

The attainment of the aforementioned objects and others incidental thereto will be apparent from the following description of the invention taken in conjunction with the accompanying drawings, of which

Fig. 1 is a diagrammatic showing of a printing telegraph system embodying one form of the instant invention; and

Fig. 2 also is a diagrammatic representation of a second embodiment of the invention.

Having reference first to Fig. 1 there is shown a printing telegraph circuit comprising the two line conductors 10 and 11 which emanate from a transmitter and pass successively through a series of repeaters, two of which A and M are shown, finally terminating in ground. To each of the repeaters may be connected a plurality of recording instruments, two of which A1 and A9 are shown connected to repeater A and two others of which M1 and M9 are connected to repeater M. For the detailed operation of these receiving instruments reference may be had to the aforementioned patent to Burry. For the purpose of describing the present invention, a general description of such operation will suffice. By transmitting polar signals over line conductor 10 the escapement magnet 12 of printer A1 is energized to step the typewheel to the character which is to be printed. Following this selection, an impulse of the proper polarity is transmitted over line conductor 11 whereby the shift magnet 13 is properly positioned to effect the desired shifting of the typewheel. At the same time the lower and upper press magnets 14 and 16 are energized to effect the printing of the character selected.

The so-called square magnet 17 is also energized simultaneously with the press magnets.

The escapement magnet 12 is operated locally from the contacts of a polarized relay 18 which is connected with its winding in series with the line conductor 10. A similar polarized relay 19 is connected in circuit with the line conductor 11 to control the operation of the shift magnet 13. The operation of the press magnets and the square magnet is effected by the operation of two single current or neutral relays, one of which 20 is connected in circuit with the line conductor 11 and the other 21 is connected in series with the line conductor 10. In order to operate one or more additional receiving instruments from the repeater A, corresponding electromagnets of the printers or tickers are connected in series relation, for example, the escapement magnet 22 of repeater A9 is connected in series with the escapement magnet 12 of ticker A1. Similarly the shift magnet 23, the press magnets 24 and 25, and the square magnet 26 of ticker A9 are connected in series with their respective counterparts of ticker A1. These connections may be established by placing the arms of a switch 27 in their upper positions as shown. When moved to their lower positions, the arms of the switch are instrumental in disconnecting the above described circuits to ticker A9 and in establishing, in their stead, the connections necessary to complete the operating circuits of ticker A1.

In order to describe the operation of the escapement magnets from the contacts of relay 18 in response to reversals of the current in line conductor 10, assume that in response to a line signal, the tongue of relay 18 is positioned on its left hand contact. A circuit is then established from any convenient source of direct current such as a rectifier, a generator or, as shown in the drawings, a grounded battery 28, through resistance 29, the tongue and left hand contact of relay 18, one of the windings 30 of escapement magnet 12, a corresponding winding 31 of escapement magnet 22, conductor 32, and resistance 33 to the grounded terminal of the battery 28. The direction of the current through the windings of the escapement magnets is such that the poles of the permanent magnets with which the windings are associated are materially strengthened, thereby attracting the armatures 34 and 35. Upon a reversal of the current in line 10, the tongue of relay 18 is moved to its right hand contact, thereby energizing windings 36 and 38 of escapement magnets 12 and 22 respectively. The energization of these windings moves the armatures 34 and 35 to the right.

It will be noted that only one of the windings of the escapement magnets is energized at any one time and such energization is always of such a nature that the strength of the permanent magnet tends to be increased. This is important because of the fact that the relay 18 is of such character that its tongue remains engaged with one or the other of its contacts until such time as the line current is of a polarity which will cause the tongue to move to its opposite contact. It frequently occurs that the source of local power is left connected to the apparatus during periods when the circuit is idle. Such a condition would in time cause a deterioration of the permanent magnets of the escapement magnets if the connection to the windings thereof remained as they are connected in present systems. This latter arrangement is one whereby the two windings such as 30 and 36 of the escapement magnet 12 are connected in series relation and the direction of the current which is supplied thereto is periodically reversed in order to obtain the desired operation. It is well known that in such an arrangement the movement of the armature 34 is effected by the strengthening of one of the poles of the permanent magnet at the same time that the opposite pole is weakened by means of the windings. Under normal conditions of operation such an arrangement has no detrimental effects since these conditions are not permitted to exist for any appreciable period of time. But it will be apparent that in any such arrangement where the windings 30 and 36 are left energized in this manner for long periods of time, such as over night when the circuits are normally idle, the life of the permanent magnets may be substantially reduced.

After the selection of the desired character, a potential is maintained in connection with the line conductor 10 and has the polarity which was that of the last impulse required to step the typewheel of the printing instrument to effect the proper character selection. There is no potential applied to line conductor 11 during the series of selection impulses which are transmitted over line conductor 10. Following the selection, a potential is impressed upon line conductor 11 and has whatever polarity is necessary to produce the proper action of the shift magnets 13 and 23. In order to trace the operating circuit for these magnets assume that the tongue of relay 19 is positioned on its right hand contact. There is then established a circuit from battery 28, through resistance 39, conductor 40, the shift magnet 13 of ticker A1, the shift magnet 23 of ticker A9, conductor 41, right hand contact and tongue of relay 19 and resistance 42 to the grounded terminal of the battery 28. In order to produce a shift of the typewheel of an opposite nature, the tongue of relay 19 is positioned on its left hand contact and a similar circuit is established to impress the local potential of battery 28 upon the shift magnets 13 and 23, this time conducting current through the windings of these electromagnets in the opposite direction.

During the transmission of the series of reversals whereby selection is effected, the single current relay 21, in series with line conductor 10, may be operated or its tongue may chatter on its front contact, depending upon the adjustment of the relay. Whether the contact between the tongue and the front contact is firmly made or not has no bearing upon the operation of the receiving instruments. However, as soon as selection has been completed and a steady current is flowing in line conductor 10, the tongue of relay 21 is attracted into solid engagement with its front contact. Then, when the line conductor 11 is rendered conductive by the transmission of the shift impulse, the armature of relay 20 is moved into engagement with its front contact, thereby closing a circuit from battery 28 which includes resistance 43, press magnets 14 and 16 of printer A1, press magnets 24 and 25 of printer A9 to a forked circuit, one branch of which includes conductor 44, resistance 46 and terminates at the grounded terminal of the battery 28, and the other branch of which includes square magnets 26 and 17 of printers A9 and A1 respectively, tongue and front contact of relay 21, resistance 47, and also terminates at the grounded terminal of the battery 28. The operation of the press magnets, among other things, effects the printing of the selected character.

The operation of the square magnets accomplishes nothing at this time. Their purpose is to effect a carriage return which is accomplished in the following manner. After the printing of the selected character, a flow of current is maintained in line conductor 11, thereby sustaining the operation of relay 20. During this period of sustained operation of relay 20 the current in line conductor 10 is reduced to zero thereby allowing the tongue of relay 21 to break its engagement with the front contact. It may be seen from the drawings that the circuit for the square magnets 17 and 26 is thus opened permitting these magnets to be restored to normal. At the same time the press magnets 14 and 16 of printer A1 and 24 and 25 of printer A9 are maintained in their operative condition since the circuit therefor is still intact through resistance 46 to the grounded terminal of the battery 28. Potential is again applied to line conductor 10 at the transmitter causing the relay 21 to attract its tongue to its front contact and again closing the operating circuit for the square magnets 17 and 26 whereupon they become reenergized. This sequence of operations is one which is peculiar to the Burry ticker and performs the function of carriage return in a manner which is set forth in the aforementioned patent to Burry.

A second modification of the instant invention is illustrated in Fig. 2. The line conductors 110 and 111 are shown extending from the transmitter through a plurality of repeaters, of which two are shown, namely N and Z, and finally terminating in ground. A plurality of receiving instruments may be connected to any of the repeaters. Two of such receiving instruments N1 and N9 are shown connected to repeater N and instruments Z1 and Z9 are shown connected to repeater Z. In the following description the various instrumentalities which comprise the printers or tickers and repeaters, and which are similar to those previously described, bear the same reference characters with a prefix 1, as their counter-parts of Fig. 1. The character of the line signals which are employed to operate the receiving devices is the same as that described previously.

The line conductor 110 is connected through the winding of a three-position polarized relay 150, the tongue of which is responsive to the signals being transmitted over this line. The oscillation of the tongue of relay 150 between the two extreme contacts is instrumental in controlling the operation of the escapement magnets 112 and 122 of tickers N1 and N9, respectively. For example, assume that the tongue of relay 150, in response to a line signal, is positioned on its left hand contact. There is then established a circuit from battery 128, through resistance 151, conductor 152, winding 136 of escapement magnet 112, windings 138 and 131 of escapement magnet 122, winding 130 of escapement magnet 112, left hand contact and tongue of relay 150, winding of relay 121 and resistance 153 to the grounded terminal of the battery 128. The effect of this circuit upon the escapement magnets 112 and 122 is that the windings 130 and 131 are poled to aid in the permanent magnets and windings 136 and 138 are poled to oppose the permanent magnets. It will be noted that a resistance 154 is connected in shunt with the series connection of the escapement magnet windings and the resistance 151. However, these two resistances are equal and are so proportioned with respect to the resistance of escapement magnet windings that in the division of current between the two parallel paths the current which is conducted through the windings is sufficient to effect the movement of the armatures 134 and 135 to the left. Similarly, when the tongue of relay 150 is moved into engagement with its right hand contact, a circuit is established from battery 128 through resistance 154, conductor 156, the windings of the escapement magnets 112 and 122 in a reverse direction to that previously described, right hand contact and tongue of relay 150, winding of relay 121 and resistance 153 to the grounded terminal of the battery 128. Accordingly the tongues of the escapement magnets are moved to the right.

It will be noted that the winding of relay 121 is included in the local circuit controlled by the contacts of relay 150. The position of the tongue of this relay during the series of selective impulses transmitted over conductor 110 has no effect upon the operation of any of the ticker mechanism. However, at the conclusion of the series of selection impulses, conductor 110 is maintained in a conductive condition thereby effecting the full operation of the tongue of relay 121. The operation of the shift magnets 113 and 123 is accomplished by the transmission of a suitable impulse over line conductor 111 in substantially the same manner as hereinbefore described in connection with Fig. 1. In this case it is the three position polarized relay 157 which is used to control this operation. The single current relay 120 is connected in the local circuit of the relay 157 and responds to either polarity used to operate the shift magnets in the desired manner.

By the use of the special three-position line relays 150 and 157, it will be seen that the precautions which were taken against the prolonged connection of local power to certain of the electromagnetic instrumentalities comprising the tickers are not necessary in the instant embodiment. As soon as either or both of the line conductors are opened at the transmitter or elsewhere, the line relays are of such a character that the tongues become disengaged from either of their extreme contacts and assume an upright intermediate position, thereby severing the connections between the local power and the ticker magnets. It is therefore possible to connect the windings of the escapement magnets in the conventional manner heretofore employed. Because of this, it is possible to obtain satisfactory operation of these magnets with smaller values of current than those which are necessary where only one winding is energized at a time. It will also be observed that by removing the single current relays, by which certain of the functional operations of the tickers are controlled, from the line circuit and placing them in local circuits where closer control of the operating currents may be obtained, better operating characteristics of the tickers may be attained.

The two embodiments of the invention disclosed herein illustrate the essential attributes of the instant invention, but numerous modifications thereof may be made without departing from the spirit of the invention. It should be apparent to those skilled in the art that certain features of the two circuit arrangements may be interchanged with one another wherever it may be found convenient to do so. Hence, it is desired that this invention be not limited to the specific arrangements shown and described herein but shall also include all equivalent arrangements. Accordingly the scope of the invention is set forth in the following claims.

What is claimed is:

1. In a printing telegraph receiver, a polarized electromagnetic device having a series connection of two operating windings, a neutral electromagnetic device having an operating winding, a source of direct current potential connected with the same polarity to each of the terminals of said series connection, a relay having contacts responsive to telegraph line signals, return paths from said terminals to the opposite polarity of said potential, and means including said relay contacts for successively rendering said paths alternately conductive and nonconductive to produce current reversals through the operating windings of said polarized device and a unidirectional current flow through the operating winding of said neutral device.

2. In a printing telegraph receiver, an escapement device having a permanent magnet and an electromagnet disposed adjacent each of the poles of said permanent magnet, said electromagnets being connected in series, a source of direct current potential, a relay having two stationary contacts and an armature connected to said source of potential and arranged to oscillate between said contacts in response to telegraph line signals, means for connecting the terminals of said series connection to the respective stationary contacts of said relay, and circuits including said relay contacts and armature, said electromagnets and said source of direct current potential for operating said escapement device in accordance with the telegraph line signals without causing sustained electromagnetic opposition of said permanent magnet.

3. In a printing telegraph receiver, an escapement device having a permanent magnet and an electromagnet disposed adjacent each of the poles of said permanent magnet, a source of direct current potential, a line relay responsive to telegraph line signals and having two operative and one inoperative contact positions, either of said operative contact positions being instrumental in simultaneously energizing said electromagnets in response to said line signals, and said inoperative contact position being instrumental in deenergizing said electromagnets in response to a no-current line condition.

GEORGE S. HILTZ.