May 23, 1933.

P. L. MYER ET AL

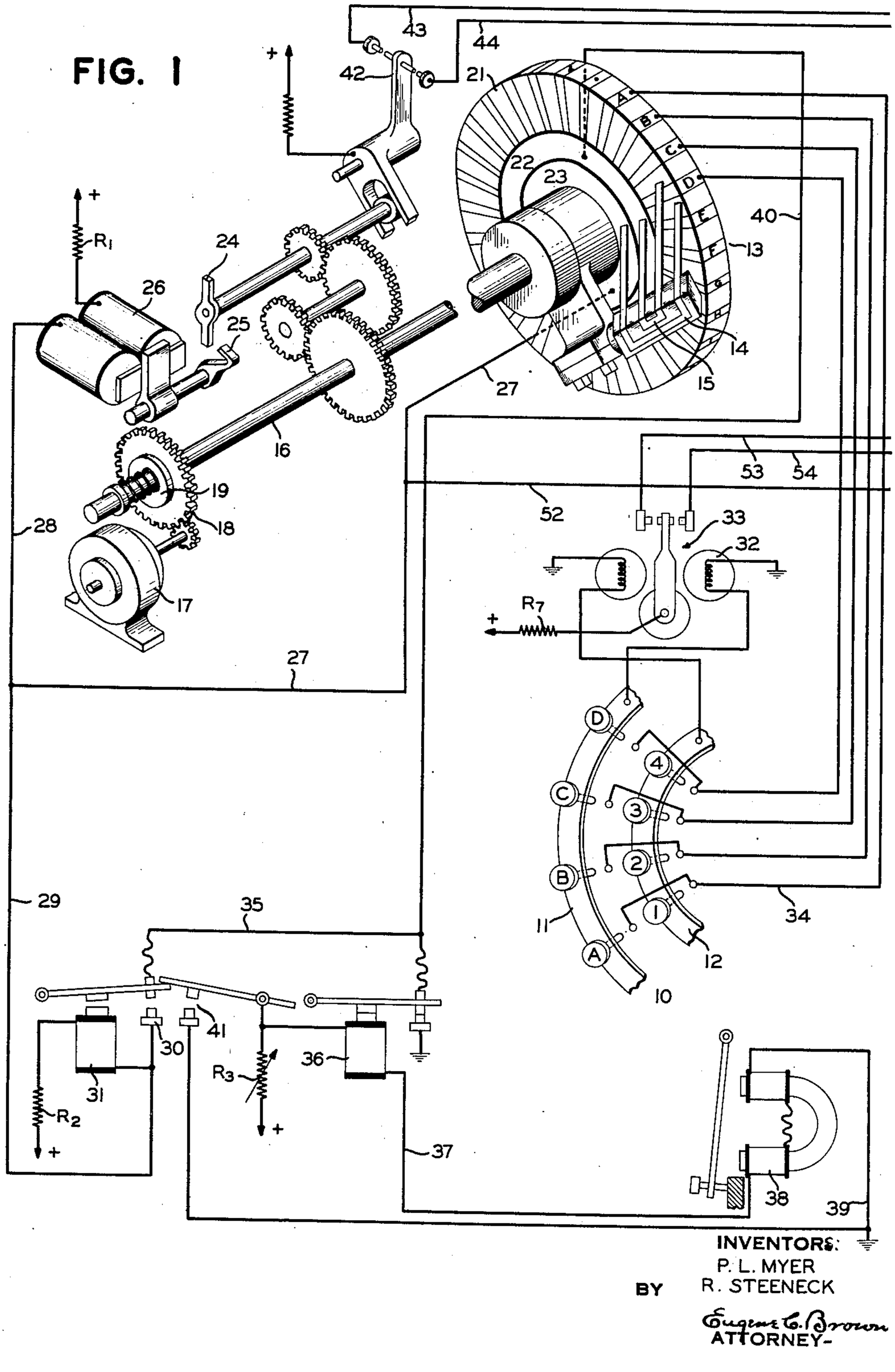
1,910,122

TICKER SYSTEM

Filed Nov. 10, 1931

2 Sheets-Sheet 1

FIG. 1



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2 Sheets-Sheet 2

FIG. 1-A

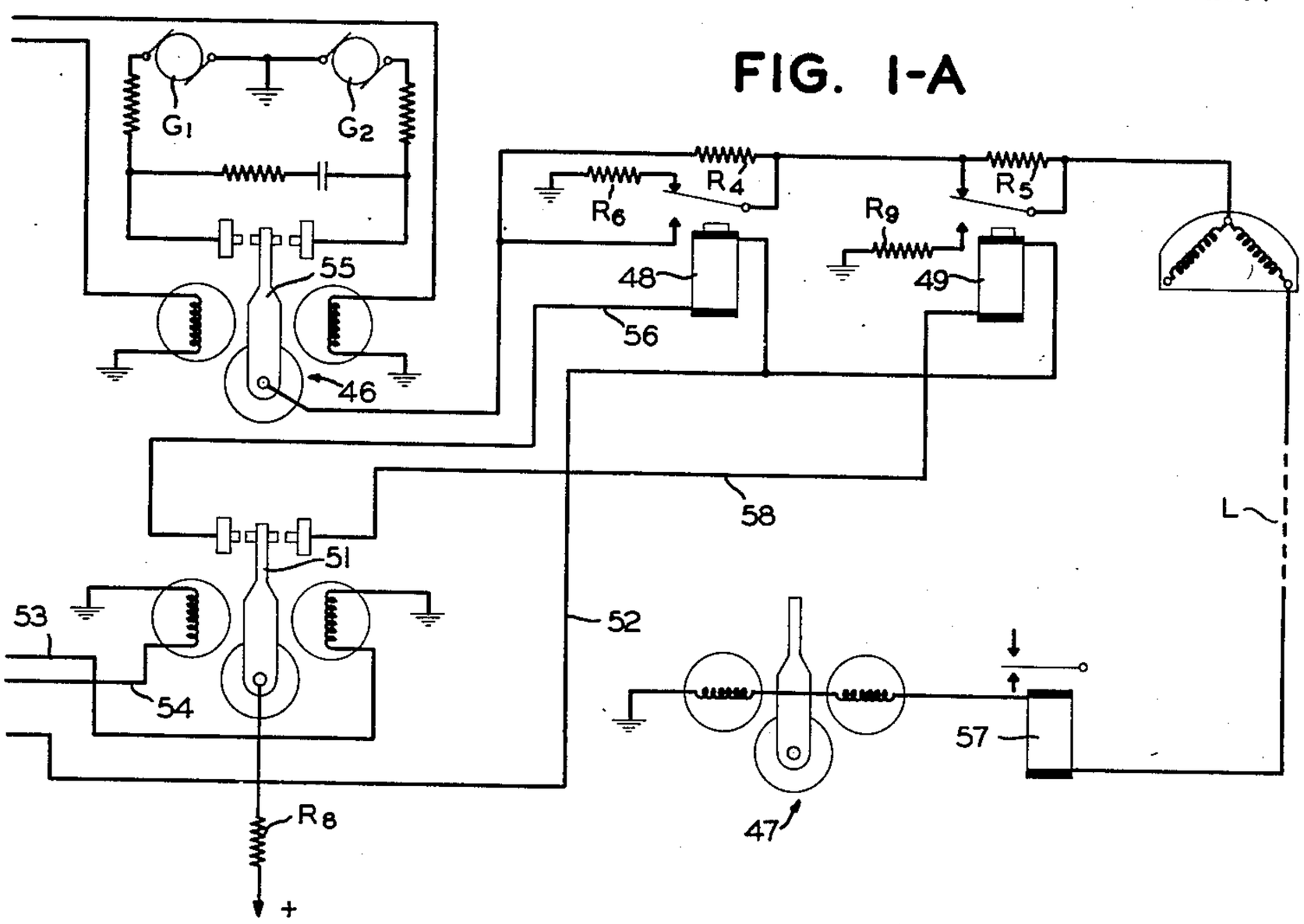
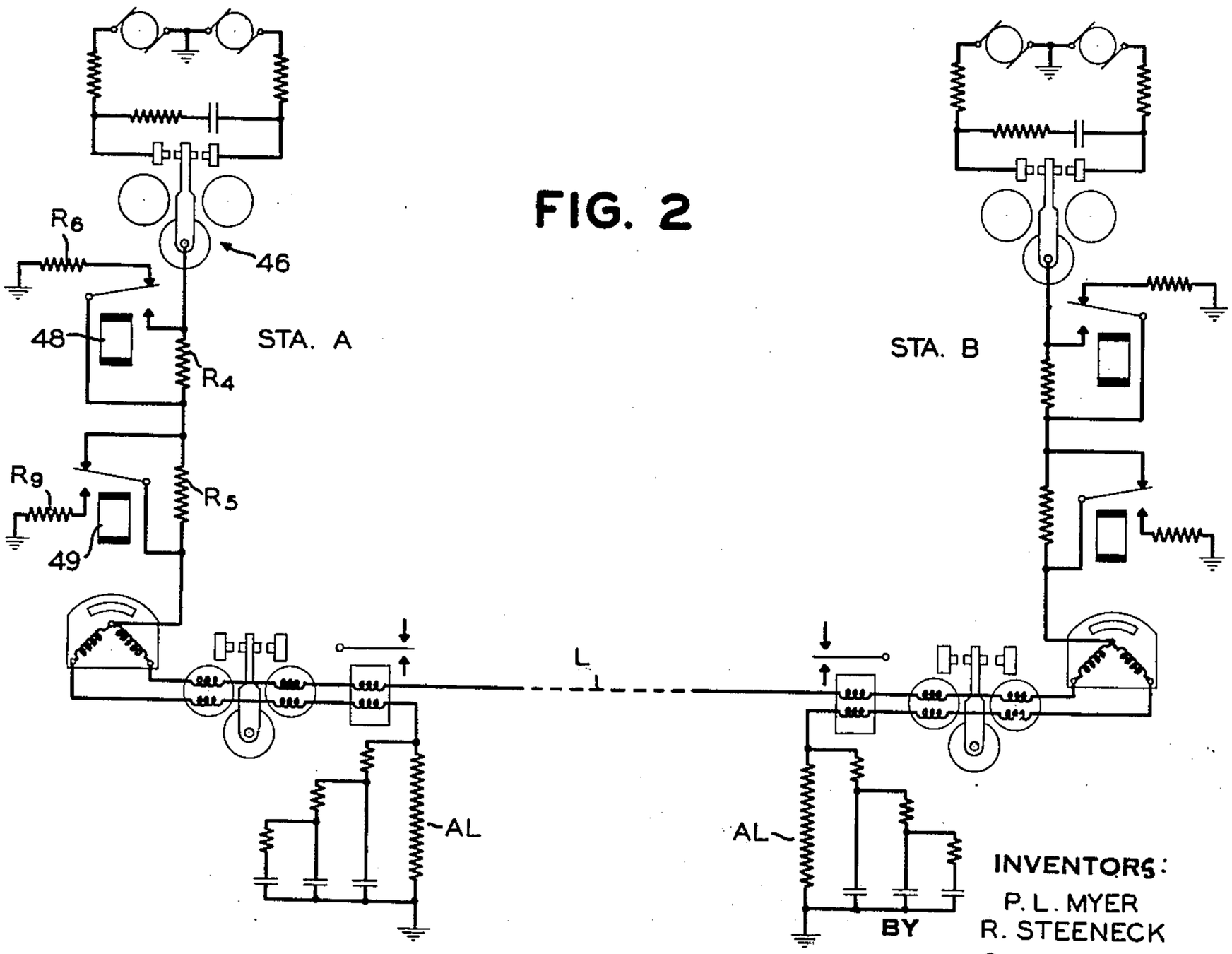


FIG. 2



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UNITED STATES PATENT OFFICE

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TICKER SYSTEM

Application filed November 10, 1931. Serial No. 574,192.

This invention relates to ticker systems and other step-by-step telegraph systems. More particularly it relates to such a system utilizing three values of current.

In certain single line, long distance ticker systems it is customary to transmit three distinct types of signals, namely, rapid reversals or current alternations, for operating the escapement mechanism of the step-by-step printers, long impulses of low value direct current and long impulses of comparatively high value direct current.

The rapid reversals are for the purpose of controlling the rotation of the type wheel of the ticker, step-by-step, in synchronism with the ticker transmitter. The long impulses of direct current are the printing impulses and the magnitude thereof determines whether a letter or a figure character is to be printed. The low current is used to select a figure character and the high current to select a letter character.

Heretofore, for the transmission of the current alternations, a pole changer has been ordinarily employed, the pole changer being stopped at the proper time on one or the other of its contacts to allow the current in the line to build up to its normal direct current value for the transmission of the prolonged impulses to the line. The current value of the prolonged impulse is varied by including or excluding a resistance from the line circuit. The resistance is normally in the line circuit during the transmission of the current alternations and the direct current of low value is short circuited to transmit the direct current of higher value. A neutral relay for selecting the case shift at the receiving station is adjusted so as to respond to the prolonged high value of current but is non-responsive to the prolonged low value of current.

With the above arrangement it is evident that a sufficient difference between the high and low values of the direct current impulses must be maintained to give a safe operating margin on the neutral relay at the receiving station. The low current also must be of such value that when vibrations or current alternations are being transmitted, the alternating current is of such a value that the polar escapement relay at the receiving station responds in a satisfactory manner. The value of this alternating current is necessarily determined by the current requirements of the relay and the amount of interference currents on the line wire. The normal current which must be maintained in order to supply the required value alternating current at the receiving printer, is usually fixed by line conditions. Similarly, the high value of current which may be transmitted is also fixed by the physical resistance of the circuit, including the tap resistance, line resistance and the resistance of the receiving relays. Under the conditions imposed by the circuit, sufficient operating margin is not always available.

Therefore, one of the objects of the present invention is to provide a transmitting arrangement for a ticker system by which the operating margin may be increased.

Another object is to enable three separate values of current to be transmitted for the control of step-by-step printers.

A further object is to provide, in a duplex telegraph system, means for transmitting two or more values of current without changing the terminal impedance of the line.

A still further object is to independently control each value of current transmitted.

Other objects and advantages of the invention will hereinafter appear.

In accordance with our invention we provide a plurality of current controlling net-works, each being arranged to independently vary the line current without changing the terminal impedance. The net-works are made selective depending upon whether high or low current is to be transmitted. Preferably we employ a current value for the rapid alternations which is intermediate the high and low steady current values, the system being normally conditioned to transmit such intermediate value of current. Each network is controlled by an individual neutral relay one of which, when energized, decreases the signal current by inserting suitable resistance in the circuit, the other relay, when energized, increasing the line current by

short-circuiting resistance in the circuit. A leak path to ground is provided between each resistance and the opposite terminal and is adjusted to maintain the terminal impedance constant, as viewed from the distant station and thereby to retain the duplex balance of the circuit.

The invention will be more fully understood by reference to the accompanying drawings in which:

Figures 1 and 1*a* are diagrammatic illustrations of a ticker transmitting system embodying our invention and,

Figure 2 is a circuit diagram showing the invention applied to a duplex line.

The invention is described herein with particular reference to the system of timing the prolonged impulses shown in a copending application of Myer Serial #530,078 filed April 14, 1931, and entitled "Manually operated transmitters for ticker or step-by-step telegraph systems".

Referring to Figures 1 and 1*a*, the transmitter is controlled by a manual keyboard 10 having a letters ring 11 and a figures ring 12. The keyboard is associated with a selector head 13 having two sets of brushes 14 and 15 carried by a shaft 16 driven by an electric motor 17, through suitable reduction gear 18 and a slip clutch 19. The selector head is provided with a peripheral segmented ring 21 consisting of narrow metal segments separated by comparatively wide insulating segments. Within the segmented rings are two continuous inner rings 22 and 23 which serve as a means of making contact connections with the brushes 14 and 15. The outer shorter brush 14 is the selecting brush and the inner brush 15 is a holding brush, as will presently appear. The mehanical relationship between the brush settings, selector head segments and the stop clip 24 should be substantially as shown in Figure 1. As indicated in the figure, the selecting brush 14 has just passed off of the conducting segment D and the stop clip 24 is in a vertical position having about 90 degrees to travel before it engages the stop arm 25. The holding brush 15 is just about to make contact with the D segment. When the stop clip 24 engages the arm 25, the holding brush 15 will be in contact with D segment and the selecting brush will be about two-thirds of the distance across the insulating segments. It will thus be evident that an impulse received through the selecting brush is of very short duration but that the impulse received by the stop magnet 26 through a circuit to be traced is in ample time to move the stop arm 25 into position to be engaged by the stop clip.

The inner solid ring 23 is connected through a circuit including conductors 27 and 28 to the winding of the stop magnet 26 and resistance R_1 to positive battery. A circuit connection is also made from the ring 23 through conductor 29, winding of the locking control relay 31, and resistance R_2 to positive battery. Assuming that the A key in the letters row is depressed, then as the selecting brush 14 passes over the A segment, a circuit is established from ground through the letters coil 32 of the master shift relay 33, through the letters ring 11, the A contact thereof, conductor 34, the A segment, selecting brush 14, solid inner ring 23, conductors 27 and 28 to the stop magnet 26, and thence to positive battery. At the same time a branch circuit is established through the conductor 29 and locking control relay 31 to positive battery. The relay 31 thus receives the selecting impulse simultaneously with the stop magnet and moves its armature to its front contact 30.

It will be noted that the armature of the locking relay 31 is connected by a conductor 35 with the armature of a timing control relay 36, and that the relay 36 normally holds its armature against its front contact through a circuit completed from positive battery through a resistance R_3, winding of the relay 36, conductor 37, an adjustable loading coil 38 and conductor 39 to ground. The front contact of relay 31 is connected through the conductors 27 and 29 to the inner ring 23 of the selector head.

When the armature of the locking control relay 31 is moved to its front contact a circuit is established from ground at the front contact of relay 36, through the conductor 35, armature and front contact 30 of relay 31, and from this point through the winding of the relay 31 to positive battery, and also through the stop magnet 26 to positive battery. Thus both the relay 31 and the stop magnet are locked up until released by opening of the timing control relay 36.

The armature of the relay 31 controls a set of contacts 41 which close whenever the relay 31 is energized and establish a short circuit about the relay 36 and the loading coil 38, thereby causing them to discharge their magnetism. This discharge action requires a fixed interval of time depending upon the current flowing in the circuit and the reactance of the relay and loading coil. Therefore, after this fixed interval the relay 36 deenergizes, opening its contacts and breaking the circuit to the locking ground, thereby releasing the relay 31 and stop magnet 26 unless the operator is still depressing the A key on the keyboard, in which case the ground through the letters coil 32 of the master shift relay 33 is applied through the conductor 34, A segment of the selector head, and the holding brush 15 which is now resting on the A segment, to the outer solid ring 22, thence through conductors 40 and 35 to the armature of the relay 31 and through the front contact 30 to the relay 31 and the

stop magnet 26. The stop magnet is thus energized as long as the key is depressed.

As soon as the operator releases the key, the circuit to the relay 31 and the stop magnet 26 is broken, allowing the contacts of the relay 31 to open and at the same time opening the contacts 41 so as to break the short circuit and permit the relay 36 to again become energized in preparation for the next selection.

The number of impulses transmitted by the pole changer 42 over the conductors 43 and 44 to the coils of the polar line relay 46 (Figure 1*a*) is determined by the distance the brushes travel before engaging the segment of the selector head corresponding to the key depressed. The armature 55 of the polar line relay follows the movement of the pole changer 42 and through the generators G_1 and G_2 transmit alternate positive and negative impulses over the line L to operate the coil of the polarized escapement relay 47 at the distant station, thereby causing a corresponding letter on the type wheel of the receiving printer to be positioned. When the transmitter is stopped by the action of the stop magnet 26 causing the stop clip 24 to engage the stop arm 25, a prolonged impulse is transmitted for the press circuit of the printer, the magnitude of this prolonged impulse determining the shift function of the printer.

The current flow of the prolonged impulse is controlled by two neutral relays 48 and 49 having one terminal of their windings connected to the left and right contacts, respectively, of a relay 51, and their opposite terminals connected by a common conductor 52 and the conductors 27 and 29 to the front contact 30 of the relay 31. The relay 51 is controlled by the master shift relay 33 over the conductors 53 and 54.

The tongue 55 of the pole changing relay 46 is connected to the outgoing line through resistances R_4 and R_5 in series. With both neutral relays 48 and 49 deenergized and their tongues resting on the back contacts thereof, a leakage path to ground is provided between the resistance R_4 and the distant station through the resistance R_6, and a short circuit is provided around the resistance R_5. This is the normal position of the relays for transmitting current alternations and provides for an intermediate flow of current from the generators G_1 and G_2.

Assuming one of the keys of the letter ring to be depressed, a circuit is completed as the brush 14 passes onto the segment corresponding to the depressed key, through the right hand winding of the master shift relay 33 as previously described, thus moving the armature of this relay to its right contact, and completing a circuit from positive battery through the relay tongue, right contact and conductor 54 to the left hand coil of the relay 51. The tongue of relay 51 is thus moved to its left contact, completing a circuit from positive battery through the resistance R_8, tongue of the relay, left contact thereof, conductor 56, relay 48, conductors 52, 27 and 29, to the front contact 30 of the relay 31, and thus by conductor 35 and the normally closed contacts of relay 36 to ground. The letter shift relay 48 thereupon attracts its armature to its front contact, short circuiting the resistance R_4 and disconnecting the leak resistance R_6 from the line. The removal of resistance R_4 from the line decreases the line resistance, increasing the line current sufficiently to operate the neutral shift relay 57 at the receiving station.

After a predetermined interval relay 36 is released, allowing its contacts to open and interrupting the circuit to the relay 48 to again include the resistance R_4 in the line circuit and the leak resistance R_6 in shunt thereto, during the transmission of the succeeding group of current alternations.

If now a key in the figures row 12 be depressed, the left winding of the master shift relay 33 will be energized as the brush 14 passes onto the segment corresponding to the depressed key and as a consequence a circuit will be completed from battery through the tongue and left hand contact of relay 33 and conductor 53 to the right hand winding of the relay 51, thereby completing a circuit for the figure shift magnet 49 from battery through the tongue of relay 51, the right contact thereof, conductor 58, relay 49 and conductors 52, 27 and 29 to the front contact of the relay 31 and thence by conductor 35 to the grounded contact of the relay 36. The energization of the relay 49 serves to open the short circuit around resistance R_5 and introduces a resistance R_9 in shunt to the line circuit. With resistances R_4 and R_5 both in the line circuit, the current value is reduced below the normal value used for transmitting the current alternations and to such an extent that the neutral relay 57 at the receiving station will not respond.

It will be noted, therefore, that we have produced an arrangement whereby a definite value of current flow is normally maintained over the line during the transmission of current alternations or escapement impulses, and that upon the selection of a letter character the current value of the steady or prolonged press impulse is increased above this normal, and upon the selection of a figures character the current value of the prolonged impulse is reduced below this normal or intermediate value.

Consequently, the magnitude of the current used for driving the polar relay 47 may be independent of either the low direct current value or the high direct current value, and may be adjusted properly with respect to line interference and other limiting fac-

tors. At the same time a suitable operating margin may be maintained between the high and low values of the steady current without employing an unduly high maximum value of current.

Referring to Figure 2, we have shown the invention applied to a duplex telegraph system in which the line L and the terminal apparatus are balanced by an artificial line AL at each of the stations A and B. Obviously, if the resistance of either terminal is varied, the duplex balance at the opposite terminal will be destroyed. To obviate this difficulty each of the line resistances R_4 and R_5 is provided with the leak resistances R_8 and R_9, respectively, adjusted so as to maintain the current flow from the opposite terminal uniform whenever either or both of the resistances R_4 and R_5 are included in or excluded from the line circuit. With the terminal impedance thus maintained at a uniform value, the duplex balance is not disturbed by varying the value of the transmitting current.

It is obvious, of course, that many changes and modifications may be made in the details of the system without departing from the invention, and therefore, we do not desire to be limited to the exact construction shown and described herein.

What we claim is:

1. A telegraph transmitting system comprising means controlled by a single key for transmitting variable numbers of current alternations followed by sustained impulses, said sustained impulses being of variable current value and the current alternations being of a value different from said sustained impulses.

2. A telegraph transmitting system comprising means controlled by a single key for transmitting variable numbers of current alternations followed by sustained impulses, said sustained impulses being selectively of high or low value and the current alternations being of a value intermediate said high and low values of the sustained impulses.

3. In a telegraph transmitting system, a line, terminal apparatus for said line comprising a source of current supply, means for transmitting over the line variable numbers of current alternations of definite magnitude, means for producing a sustained current flow over the line following said current alternations and means for varying the magnitude of said sustained current flow either above or below the value of said current alternations without materially varying the impedance of the line as viewed from the opposite end.

4. In a telegraph transmitting system, a balanced duplex line, terminal apparatus for said line comprising a source of current supply, means for transmitting over the line variable numbers of current alternations of definite magnitude, means for producing a sustained current flow over the line following said current alternations and means for varying the magnitude of the sustained flow selectively to one of a plurality of values different from the value of said current alternations while maintaining the balance of the duplex line.

5. In a printing telegraph system having at one terminal a printer provided with a type wheel positioned by step-by-step signals, a press mechanism operated by sustained impulses and a shift mechanism controlled by the magnitude of the sustained impulses, means at the opposite terminal for transmitting sustained impulses of either high or low value, means for transmitting step-by-step signals of an intermediate value and means for maintaining the impedance at the transmitting terminal, as viewed from the other terminal, substantially uniform during the transmission of said sustained impulses and step-by-step signals.

6. In a duplex telegraph system having a line balanced by an artificial line, means for selectively transmitting three or more values of current over the line and means for maintaining the impedance at each end of the line substantially constant, as viewed from the distant end, during the transmission of said values of current.

7. In a telegraph transmitting system, a first station, transmitting apparatus at such station comprising a source of current, a series resistance in the line, a second station, a leak resistance connected to ground between said series resistance and second station, said leak resistance being adjusted to such value as to nullify the effect of said series resistance to current flow from the second station, a short circuit around said series resistance and means arranged to selectively complete said short circuit to transmit one value of current or to include said series and leak resistance in the line to transmit a different value of current.

8. In a telegraph transmitting system, a first station, transmitting apparatus at said station comprising a source of current, a pole changer arranged to transmit current alternations over the line, a series resistance in the line, a second station, a leak resistance connected to ground between said series resistance and the second station and adjusted to such value as to nullify the effect of said series resistance to current flow from the second station, a short circuit around said series resistance, a relay arranged to selectively complete said short circuit to transmit one value of current or to include said series and leak resistance in the line to transmit a different value of current and a selective contact apparatus for controlling the operation of said relay and pole changer.

9. In a telegraph transmitting system, a first station, transmitting apparatus at said

station comprising a source of current, a plurality of series resistances in the line, a second station, a leak resistance connected to ground between each of said series resistances and a second station adjustable to such value as to nullify the effect of said series resistance to current flow from the second station, a short circuit around each of said series resistances and means arranged to selectively complete any or all of said short circuit paths to transmit different values of current or to include any or all of said series and the leak resistances in the line to transmit other values of current.

10. In a telegraph transmitter, a first station, terminal apparatus thereat comprising a source of current, a pair of series resistances in the line, a short circuit around each resistance, a second station, a source of current at said second station, a leakage path to ground between each resistance and the source of current at the second station, a relay for selectively completing the short circuit or the leakage path associated with each resistance whereby the magnitude of the current transmitted over the line from the first station may vary without varying the magnitude of the current transmitted from the second station to the first station.

11. In a telegraph transmitter, a first station, terminal apparatus thereat comprising a source of current, a pair of series resistances in the line, a short circuit around each resistance, a second station, a source of current at said second station, a leakage path to ground between each resistance and the source of current at the second station, a relay for selectively completing the short circuit or the leakage path associated with each resistance whereby the magnitude of the current transmitted over the line from the first station may vary without varying the magnitude of the current transmitted from the second station to the first station, the contacts of said relays being arranged relative to the leak paths and short circuit paths whereby one of said resistances is normally short circuited and the other connected in the line and selectively actuated contact apparatus for controlling said relays to reverse the connections of said short circuit and leakage paths with respect to the line.

In testimony whereof, we affix our signatures.

PERCY L. MYER.
ROBERT STEENECK.