Aug. 4, 1936. M. L. HASELTON 2,049,499

INDICATOR

Original Filed Jan. 27, 1930 2 Sheets-Sheet 1

Fig. 1.

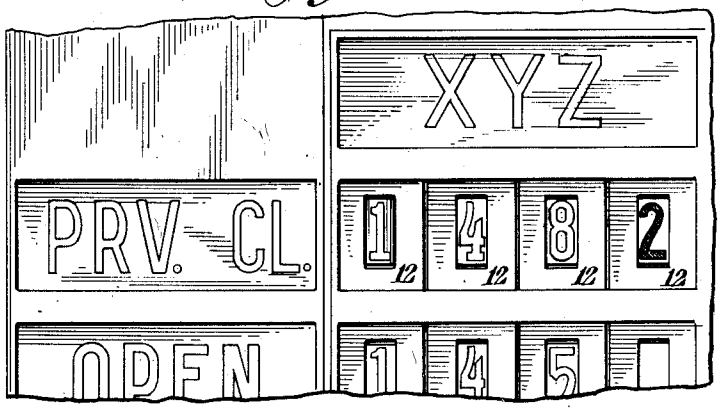


Fig. 2.

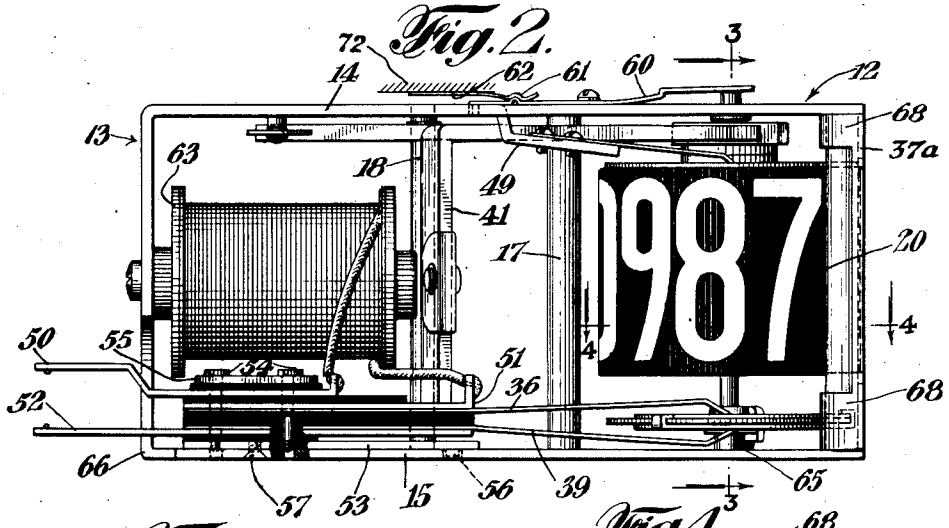


Fig. 3.

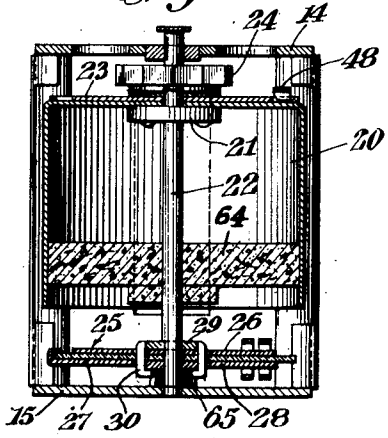
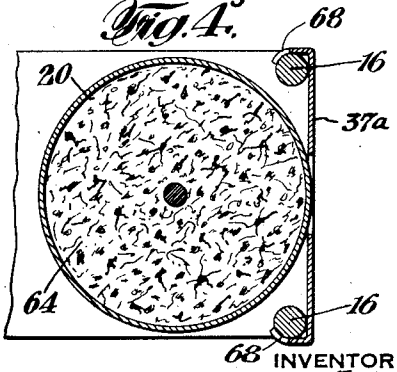


Fig. 4.



INVENTOR
Merton L. Haselton
BY
Ward Crosby & Neal
ATTORNEYS

Aug. 4, 1936. M. L. HASELTON 2,049,499

INDICATOR

Original Filed Jan. 27, 1930 2 Sheets-Sheet 2

Fig. 5.

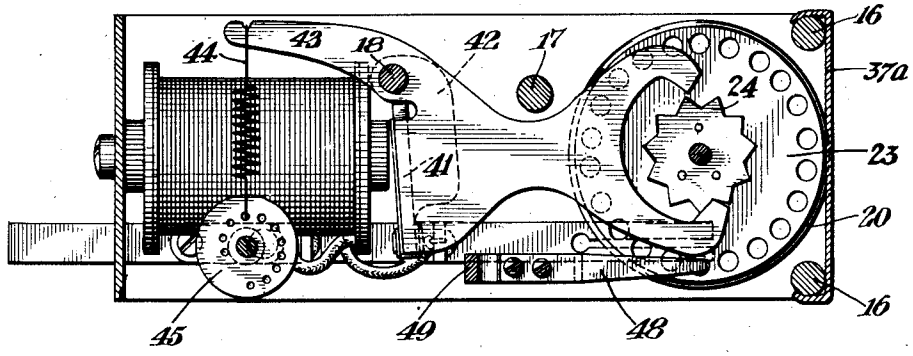


Fig. 6.

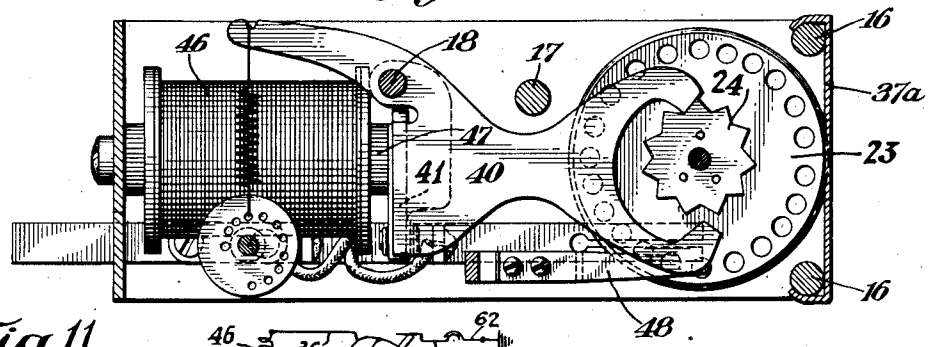


Fig. 11.

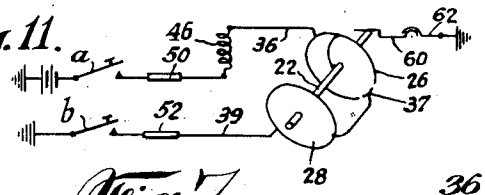


Fig. 7.

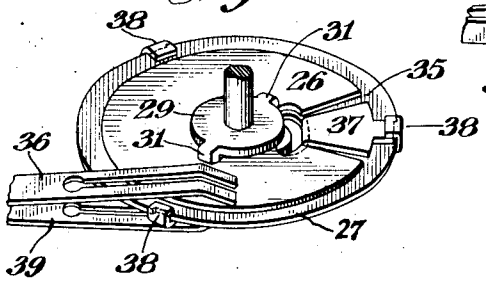


Fig. 8.

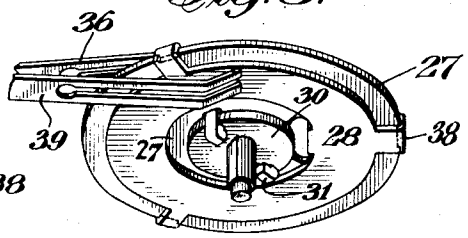
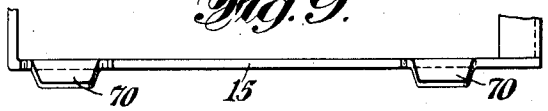


Fig. 10.



Fig. 9.



INVENTOR
Merton L. Haselton
BY
Wood Cook & Neal
ATTORNEYS

Patented Aug. 4, 1936 2,049,499

UNITED STATES PATENT OFFICE

2,049,499

INDICATOR

Merton L. Haselton, Rye, N. Y., assignor to The Teleregister Corporation, New York, N. Y., a corporation of Delaware

Application January 27, 1930, Serial No. 423,599
Renewed February 12, 1934

9 Claims. (Cl. 177—328)

This invention relates to indicating systems and more particularly to an improved indicator unit construction of the character shown in my application Ser. No. 276,883, filed May 11, 1928.

Among the objects of this invention are the provision of improved indicating means which is highly dependable, efficient, and silent in operation, inexpensive to manufacture, maintain and assemble, and which is provided with simplified and efficient means to permit its restoration to blank or home position and its forward actuation to display the new or changed item of information.

The invention consists in the novel features of construction, arrangements, combinations of parts and electrical connection as hereinafter described, but by way of example only, as being illustrative of preferred embodiments of the invention.

Other objects will appear from the following description taken in connection with the accompanying drawings in which—

Fig. 1 shows a portion of a stock quotation board disclosing several indicator units in position;

Fig. 2 is a left side view of an indicator unit;

Fig. 3 is a vertical section on line 3—3 of Fig. 2;

Fig. 4 is a horizontal section on line 4—4 of Fig. 2;

Fig. 5 is a top plan view of the movable parts in the position they occupy when the actuating magnet is de-energized;

Fig. 6 is a view similar to Fig. 5, showing the parts in the position they occupy when the magnet is energized;

Fig. 7 shows the upper side of the commutator as viewed in Figs. 2 and 3;

Fig. 8 shows the lower side of the commutator;

Fig. 9 shows the lower wall or base of the indicator frame provided with positioning lugs;

Fig. 10 is a cross section of the base in position in the board, and—

Fig. 11 is a diagrammatic view of the circuits controlled by the commutator.

The indicator unit 12 disclosed for illustrative purposes, may be mounted in a stock quotation board as illustrated. Each item of information concerning a stock may be displayed by four or more or fewer indicator units as desired and the right hand unit may indicate fractions, as for example, two-eighths may be indicated by a two (2) preferably of different color from the whole digit indicia, one-four-eight (148). The latter may be white indicia in a black background and the fraction indicia may be orange in a black background.

Each indicator unit 12 preferably comprises a U-shaped frame 13 of magnetic material, the top and bottom walls 14 and 15 of which are held spaced by posts 16, 17 and 18 having shoulders abutting the inner faces of the walls and secured in the outer faces of the walls by spinning operations.

Each indicator unit comprises a drum 20 secured to a flange 21 on a vertical shaft 22 mounted in bearings in the top and bottom walls 14 and 15. The upper end of the shaft is journaled in a brass bearing in the upper wall 14 to provide a better bearing for this end of the shaft to which the actuating force is applied.

Secured against the outer face of the drum 20 is a steel disk 23 provided with a circular series of holes equal to twice the number of teeth on a star wheel 24, which is spaced therefrom by spacer disks. The star wheel, spacers, perforated disk and drum are preferably secured to the flange 21 by rivets arranged at the apices of an isosceles triangle or in any other equivalent manner to insure proper assembly of the parts on the shaft and with relation to a commutator 25 at the other end of the shaft which comprises a bronze disk 26, an insulating disk 27, a second bronze disk 28 and hub members 29 and 30, all of which parts except the disk 28 are provided with holes to fit the flattened end of the shaft. This insures proper assembly of all the parts on the shaft fixed with respect to each other. The disks 26 and 27 are provided with holes through which extend clamping fingers 31 on the hub member 29. These fingers engage in notches in the hub member 30 and their ends are bent against the outer face of the hub member 30. The hub members are secured in position on the shaft by spinning.

The drum is provided with indicia 1 to 0 and a blank space between the 0 and 1. The disk 26 is cut away as at 35, the arrangement being such that the disk is engaged by a spring brush 36 whenever the indicator shows a number through the mask 37*a*. As the drum is moved into position to display the blank position, the contact between disk 26 and brush 36 is broken. The brush 36 when the drum is in this position, engages a sector 37 of the disk 28 which as shown occupies the space provided by the cut-away portion of the disk 26. This sector is blanked with the disk 28 and is extended through a hole in the disk 27 and is bent into position and held there by one of the radial fingers 38 on the disk 28 which engage peripheral notches in the disk 27 and have their ends abutting against the disk 27 with one of them engaging the sector

37. The lower disk 28 is insulated electrically from the upper disk 26 and the indicator shaft. The disk 28 is a continuous ring and is at all times engaged by a spring brush 39. Each brush 36 and 39 is preferably split as shown to provide for better contact with the disks.

The star wheel 24 which as stated is connected to the indicator shaft and indicator drum, may be actuated by a double pawl or fork member 40 pivoted on the spacer post 18 which is preferably of bronze so as not to interfere with the magnetic lines of flux through the armature as will be apparent.

The fork 40 is of the general form shown, comprising a bearing on the shaft 18 in its main portion, and provided with a right angular armature portion 41 which terminates in a portion 42 parallel to the main body portion constituting a second bearing on the shaft 18. The armature portion 41 as shown in Fig. 2 terminates close to the walls 14 and 15 to provide a substantially continuous path for the lines of magnetic flux through the frame, armature and core of the magnet later referred to. The main body portion of the fork 40 is extended as at 43, to which is secured a return spring 44, anchored for purposes of adjustment in one of a spiral series of holes in a disk 45 rotatable on a pin supported in the top wall 14 of the frame. The spring normally holds the fork in the position shown in Fig. 5.

A magnet 46 is secured in the end wall of the frame and is provided with a core 47 cooperating with the armature portion 41 of the fork 40. Fig. 6 shows the armature portion 41 attracted by the core 47 of the magnet.

The construction of the parts is such that energization of the magnet 46 will move the fork 40 from the position shown in Fig. 5 to that shown in Fig. 6 which rotates the drum substantially one twenty-second of a revolution. Deenergization of the magnet permits the spring to return the fork into the position shown in Fig. 5 and rotates the drum substantially another twenty-second of a revolution. These two movements of the fork will rotate the drum to display the next indicia. The drum is held in position after each such movement by a spring pawl 48 secured to a lip 49 struck in from the upper wall 14, and having its free end cooperating with the holes in the disk 23.

The terminals of the winding of the magnet are preferably soldered to plates 50 and 51, Fig. 2, insulated from each other, the plate 51 being in contact with the brush 36. The brush 39 engages a plate 52 insulated from the plate 51 and brush 36 and from a base plate 53 to which all these parts are secured by screws 54, whose heads bear on a washer plate 55 insulated from the plate 50, and whose shanks are insulated from all the metallic parts of this assembly except the base plate through which they are threaded and beyond which they extend and engage in apertures in the lower wall 15. The base plate 53 is provided with a pin 56 engaging a hole in the wall 15. The base plate is drawn against and secured to the wall 15 by a screw bolt 57.

When the drum is in any of its several indicating positions, the magnet may be energized by a circuit through the plate 50, coil of magnet, plate 51, brush 36, disk 26, shaft 22, and to ground through a spring finger 60 secured to the upper wall 14 and having its free end bearing on the end of the shaft and its other end engaging a hole in the wall 14 to maintain the free end on the shaft. The spring finger 60 is provided with a hump or raised portion 61 which engages a spring clip 62 on the frame 12 of the quotation board 13 when the indicator frame is in position within the quotation board. This slip retains the indicator unit in place and grounds the circuit to the frame 12 to which the clip is secured. The spring also retains the shaft 22 in its lowermost position and prevents any endwise vibration thereof.

The magnet may be successively energized by impulses over the plate 50 until the disk 26 breaks contact with the brush 36 which breaks the connection to ground over the slip 62 preventing further impulses over the plate 50 from stepping the indicator ahead. By this means, as a series of impulses causes the drum to be moved toward the blank position, the ground for this circuit will be broken as the indicator drum reaches the blank position.

The plate 52 which engages the brush 39 may now be grounded, which through the disk 28 and its sector 37 engaging the brush 36, provides a ground for the circuit of the magnet to move the drum to indicate one (1). After it has arrived in this position, the ground through brush 39 is again broken and the ground connection is again made through the indicator shaft, and the drum is rotated a number of steps equal to the indicia to be displayed with the exception that it is moved ten steps for the zero position. Of course the circuits might well be completed by other means than grounding.

In Fig. 11 is shown a wiring diagram for the purpose of more clearly disclosing the circuits made and broken over the commutator. In this diagram various elements are designated by the same reference characters which designate these elements in the other figures in which their structure is disclosed. The interrupted disk 26 and the sector-shaped portion 37 of the commutator disk 28 are in the position they occupy when the indicator drum exhibits a numeral, such as the numeral 6, through the mask 37*a*, Figs. 4, 5 and 6. When a key, such as *a*, Fig. 11, is closed the circuit for the operating magnet 46 may be traced from battery, across the key *a*, slip joint 50, coil of the magnet 46, brush 36, commutator disk 26, indicator shaft 22, and connections 60 and 62, to ground. This causes the driving fork to be moved from the position shown in Fig. 5 to the position shown in Fig. 6 which moves the indicator drum and shaft a distance substantially equal to one-half of a division on the drum. When the circuit is broken by opening the connection at the key *a*, the return spring 44, Fig. 5, will move the operating fork from the position shown in Fig. 6 to the position shown in Fig. 5 whereby the indicator shaft and drum are advanced substantially another half division. These two operations cause the drum to exhibit the next higher numeral. By giving the key *a* a number of operations the indicator drum will be moved into a position to exhibit blank, in which position the commutator disk 26 will have moved out of contact with the brush 36 and the sector 37 will have moved into contact with the brush 36. A further depression of the key *a* will have no effect. Ground for operating the indicator from the blank position may be supplied by pressing the key *b* which through the slip connection 52 and brush 39 grounds the disk 28 and the sector 37. If the key *a* is depressed while the key *b* is held depressed, the indicator shaft and indicator will be advanced from

blank position to the 1 position. If it is desired to set up the number 6, for example, the key *a* will then be depressed five additional times to move the indicator from the 1 position to the 6 position. For these five operations ground will be supplied over the connections 60 and 62, the shaft 22 and the commutator disk 26 with which the brush 36 is in contact for every position of the indicator except the blank position.

The heel end of the core is provided with a copper slug or washer 63 to cause the magnet to release slowly to counteract the action of the spring and thereby prevent a hammer blow engagement between the fork and star wheel. The noise produced by engagement of the fork and star wheel is further reduced by the use of a fiber or non-metallic star wheel. Such a star wheel of non-magnetic material also avoids any liability of "sticking" action with respect to the fork arising from residual magnetism.

The indicator drum is preferably made of thin sheet metal and its open end is provided with a cork disk 64 secured thereto by glue or shellac to provide for rigidity and also to prevent the drum from acting as a bell and accentuating the noise produced by the fork and star wheel. As shown, this cork disk may be provided with a thicker central portion acting as spacing means in the event the cork should become released from the drum and drop against the commutator.

A fiber washer 65 on the shaft 22 maintains the commutator spaced from the wall 15.

The armature is preferably covered by a sheet of fibrous material to reduce noise and to prevent direct contact of the armature and core to provide for free releasing movement of the armature without any "sticking" action arising from residual magnetism. The frame 13 is cut away as at 66, Fig. 2, to provide space through which the free ends of the plates 50 and 52 extend.

The mask 37*a* comprises a generally rectangular thin plate with a central opening as shown in the figures, and with its side edges bent at right angles. Near each corner and on the side edges is a bent clip portion 68 which may be sprung over the posts 16 as shown to removably retain the mask in position. The end of the side edges and portions 68 engage the inner faces of the walls 14 and 15 of the frame and thus position the mask vertically. By using short bent portions and locating them at the corners of the mask, it is obvious that the portion of the mask immediately adjacent the drum will not be distorted during assembly or disassembly nor when the mask is in position. This is important as the small clearance shown in Fig. 4 is necessary to bring the indicia near to the outer surface of the mask. Any binding action between the mask and drum would tend to cause imperfect operation.

As shown in Fig. 9 the base 15 of the indicator frame may be provided with lugs 70 cooperating with a raised portion 72 (Fig. 10) on the base of the indicator compartment in the quotation board. As shown a continuous sheet may be provided with alternate raised portions 72 and depressed portions 74 and this may constitute the support for a series of indicator units.

The indicator unit disclosed, which was designed primarily for use in connection with an automatic broker's blackboard, comprises an electromagnetically operated drum bearing the indicia from 1 to 9, zero, and blank. This drum rotates about a vertical axis to permit the use of a digit having a vertical dimension greater than the horizontal dimension with a minimum of board space. If the digits were arranged upon a drum revolving about a horizontal axis the circumference of said drum would be considerably greater than that of the arrangement shown. Since these drums must have clearance, a horizontal drum shaft would require greater vertical spacing between adjacent horizontal rows of indicator units. The inertia of the drum having a greater circumference would be increased in accordance with the physical laws governing such matters, and the speed of operation would be proportionately reduced. Since the drum comes to rest twice for each successive digital movement, there are eleven equally spaced rest positions and eleven additional equally spaced rest positions interposed between each of the first named eleven positions for the drum for each revolution of the same. The energy required to start and stop the drum increases with the inertia of the drum and for a fast operating unit this inertia should be kept to a minimum, as has been done in the case of the indicator unit shown in these applications. The tendency to overthrow in the case of a drum having a large inertia with the same speed of operation is greatly increased. The arrangement of vertical drum axes eliminates the necessity for a side member to support the drum which results in a corresponding decrease in the horizontal spacing of adjacent digit indicators of the same assembly.

During the operating stroke of the driving fork, the inertia of the drum assembly may cause the star wheel to move momentarily past its rest position, and since pressure may be at this time exerted by the driving fork against the next succeeding face of the star wheel tooth, the drum will start rotating reversely. If, during this reverse rotation, the driving fork moves in the other direction, there is a possibility that the opposite tooth of the fork will engage against the non-working face of the star wheel, causing the drum to continue its reverse movement until the tooth of the driving fork has reached the bottom of the star wheel tooth with the result that the drum will move back to the rest position where it stood before the pulse was received. To overcome this difficulty, the ratchet spring 48 has been shown engaging with the perforated disk 23 in such manner that the drum is not permitted to move backwardly beyond the corresponding rest position. This insures reliability of operation, as required for blackboard service.

The arrangement of the fork and star wheel shown permits very close spacing between adjacent digits on the drum since the drum is centered in the rest position by the tip of the driving fork resting against the bottom of the star wheel tooth by the action of the coil spring 44.

The indicator frame serves not only to support the unit, but furnishes a portion of the circuit required for the attraction of the armature. It is of just sufficient size to protect the drum from mechanical injury and permit insertion into a supporting panel with a minimum of clearance between adjacent drums of the same assembly in a horizontal direction.

The electromagnet is provided with a copper slug 63 on the heel end of the magnet to retard the decay of the flux in the coil and lessen the force of a blow of the fork against the star wheel on the release stroke of the armature. A minimum operated air gap between the armature of the magnet core is assured by means of an armature shade to eliminate these parts coming

into direct contact and retarding the release of the armature due to the decreased reluctance of the ferric circuit. The armature is mounted on a phosphor bronze bearing shaft to insure accuracy of movement and ease of operation. The armature and driving fork are of one-piece construction, with tabs formed parallel and close to either side of the top and bottom frame members to insure a minimum of reluctance in the ferric circuit at these points.

The ratchet spring is mounted on a lip or tab struck from the top of the frame and integral therewith to provide means for adjusting the tension of the ratchet spring against the disk **23** by bending said tab.

The arrangement of the star wheel and fork above, and the commutator below, the drum does not require any additional spacing in the horizontal direction between the adjacent drums required for these members, the additional space being in a vertical direction.

The commutator shown in Figs. 7 and 8 is of the revolving disk type, making engagement with commutator springs **36** and **39**. The commutator spring **36** is connected to one winding of the electromagnet and completes a circuit for the operation of the same in all positions, except the home position, to commutator disk **26**, and from thence through the drum shaft and spring **60** bearing thereon, spring **62** to one side of the battery. As the commutator disk **26** is open in the blank position of the drum, the commutator spring **36** is no longer in engagement therewith but is in contact with segment **37** which is integral with the insulated commutator disk **28** and in circuit with brush **39** to which is connected, through the slip connection **52**, at the rear of the unit, one side of the battery.

The cork disk **64** is firmly attached to the indicator drum and the drum shaft to give mechanical support to the lower portion of the drum, and to eliminate the objectionable noise of the indicator unit in operation. The clearance between the drum and the mask **37***a* is small to avoid the possibility of viewing more than one character when the unit is in the rest position. This small clearance is maintained throughout the entire revolution of the drum by the cork disk.

The driving fork comprises long and short arms so that a maximum rotational force is applied to the drum on both the operate and release strokes of the armature with a minimum of radial thrust at the drum bearing. If these forks were of equal length a greater component of force would be exerted in a radial direction with a corresponding loss of the turning moment applied to the drum. This condition is obtained in part by the location of the armature bearing to one side of the magnet core. Such an arrangement provides unequal degrees of movement of the drum for the operate and release strokes, which compensates in part for the action of the magnet in the building up and decay of the flux thereof for one cycle of operation in combination with the action of the coil spring **44**.

For maximum efficiency of the unit under a given set of operating circuit conditions particular adjustment of the retractile spring **44** is required. This adjustment is obtained by inserting a hooked end of the retractile spring in one of the various holes in the adjusting disk **45**, the holes thereof being arranged in a spiral.

While only one embodiment of the invention has been shown, and this in connection with a specific use, it is to be understood that this is for illustrative purposes and that various features can be modified and that the invention can be used in various other forms of devices and machines in which items of information are to be displayed, registered or recorded. It is to be understood that words of description imported from the specification into the claims are not to be considered as words of limitation, and that the claims are to be considered as broadly as the art permits, and that the features disclosed but not claimed in this application are not relinquished but are claimed in my copending divisional application Ser. No. 517,186, filed February 20, 1931.

What I claim is:

1. In a device of the class described, a rotatable member having a home position and a plurality of moved positions, electromagnetic means for rotating said member, a plurality of terminal connections, a switching device including means rotatable with said member for completing a circuit between one terminal of said electromagnetic means and one of said terminal connections when the said member is in the home position, and for completing a circuit between said terminal of said electromagnetic means and another of said terminal connections when the member is in any moved position.

2. An indicator unit comprising a rotatable indicator drum, a pawl and ratchet mechanism for rotating said drum, an electromagnet for operating said pawl, said drum having a home position and a plurality of moved positions, a plurality of operating circuits for said electromagnet, circuit closing means rotatable with said drum and adapted to close one of said operating circuits for said electromagnet in the home position of the indicator whereby the indicator may be moved out of home position, and other means rotatable with said drum adapted to close another of said operating circuits for said electromagnet in every moved position of said indicator whereby said indicator may be moved from its first position into any other moved position and into home position.

3. An indicator unit comprising a rotatable indicator having a home position and a plurality of moved positions, a pawl and ratchet mechanism for operating said indicator, an electromagnet for operating said pawl mechanism, a first circuit for operating said electro-magnet when the indicator is in the home position, a second circuit for operating the electromagnet when said indicator is in any moved position, means including a conducting sector mounted on said shaft for making effective said first circuit, and means including an interrupted disc on said shaft for making effective said second circuit.

4. In a device of the class described, an indicator shaft, an indicator drum on said shaft having a home position, a commutator on said shaft comprising two disks on opposite sides of a non-conducting disk, one of said disks being electrically connected to the shaft and cut away at a point corresponding to the home position of the indicator drum, a sector located in the space provided by said cut-away portion and in electrical connection with the other disk, electromagnetic means for actuating said shaft, a spring brush connected to the ground terminal of said electromagnetic means and cooperating with said interrupted disk, and a spring finger in contact with the other disk and adapted when the drum is in home position and the ground through the

first disk is broken, to supply when grounded a second ground for said electromagnetic means.

5. In a commutator, a non-conducting supporting disk, a conducting disk of sheet material in contact with one side of said disk, a sector-shaped portion integral with said conducting disk and extending through said supporting disk and bent into contact with the other side of the supporting disk, and a finger also integral with said conducting disk bent against the free end of said sector-shaped portion to hold it against said supporting disk.

6. In combination with a shaft, a commutator on said shaft, of a hub for supporting said commutator on said shaft comprising members on opposite sides of said commutator, and fingers on one of said members extending through the commutator and bent around the peripheral edge of the other member.

7. In combination with a shaft, a commutator on said shaft, of a hub for supporting said commutator on said shaft comprising members on opposite sides of said commutator, notches in the periphery of one of said members, and fingers on the other of said members extending through the commutator and bent into the notches and against the outside face of the other member.

8. In combination with a shaft, a commutator on said shaft comprising a supporting disk of non-conducting material and a disk of conducting material lying against one face of said supporting disk, a hub for said commutator comprising members on opposite sides of said disks, and means extending through said disks for clamping said members against said disks.

9. In a detachable indicator unit, an indicator frame, an indicator shaft having one end projecting through the frame and constituting a portion of a ground connection for an indicator operating magnet, a spring contact member secured to said frame and engaging the said end of said shaft, a raised portion on said member, means for supporting the indicating frame, a spring latch grounding element secured to said supporting means and engaging said raised portion to hold the indicator unit in position on said supporting means and to connect said spring contact member to ground when the indicator unit is in position on said supporting means.

MERTON L. HASELTON.