

March 16, 1937.

E. R. WHEELER ET AL

2,074,066

MOTOR OPERATED INDICATOR DIAL

Filed April 11, 1930

3 Sheets-Sheet 1

FIG. 1.

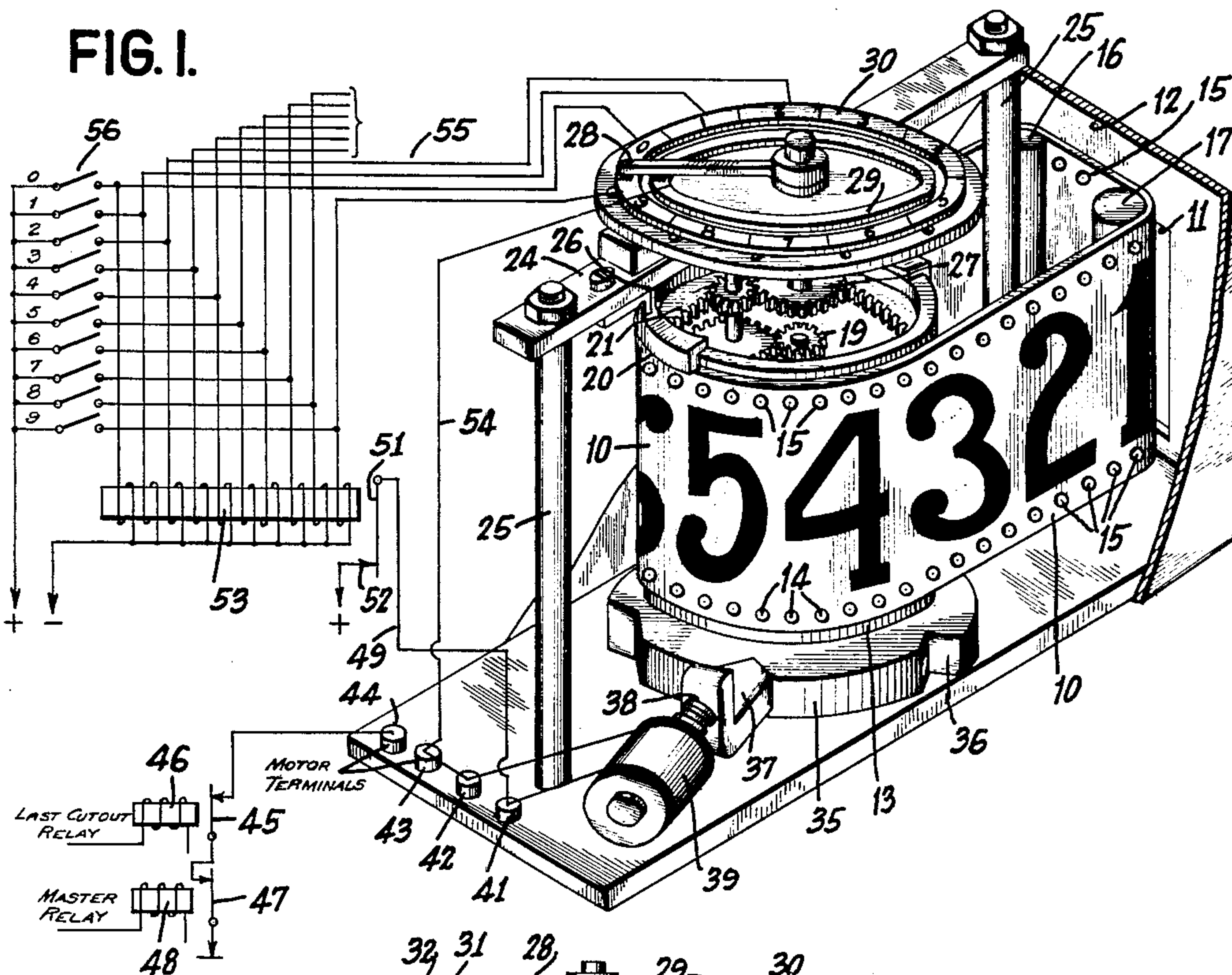
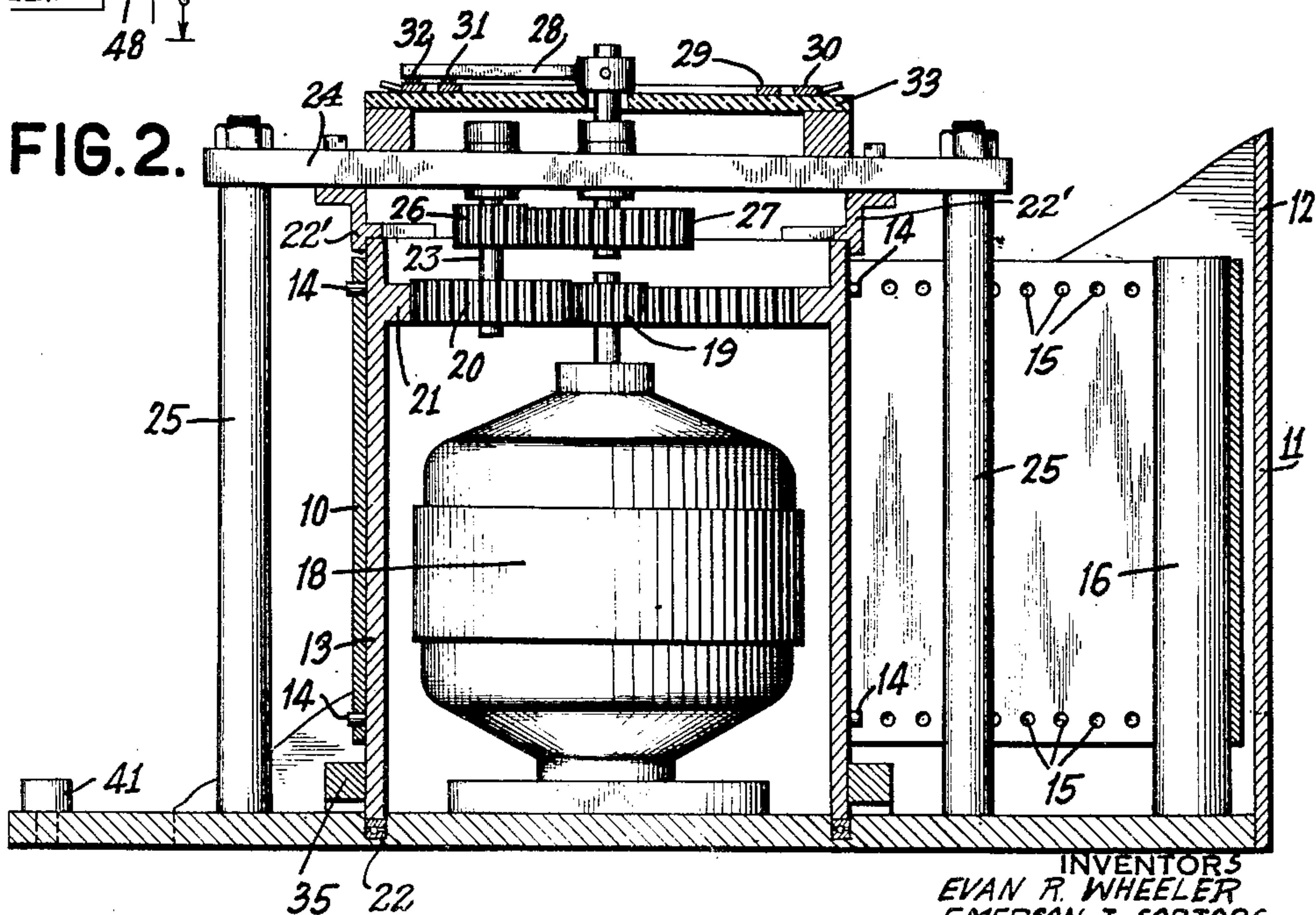


FIG. 2.



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3 Sheets-Sheet 2

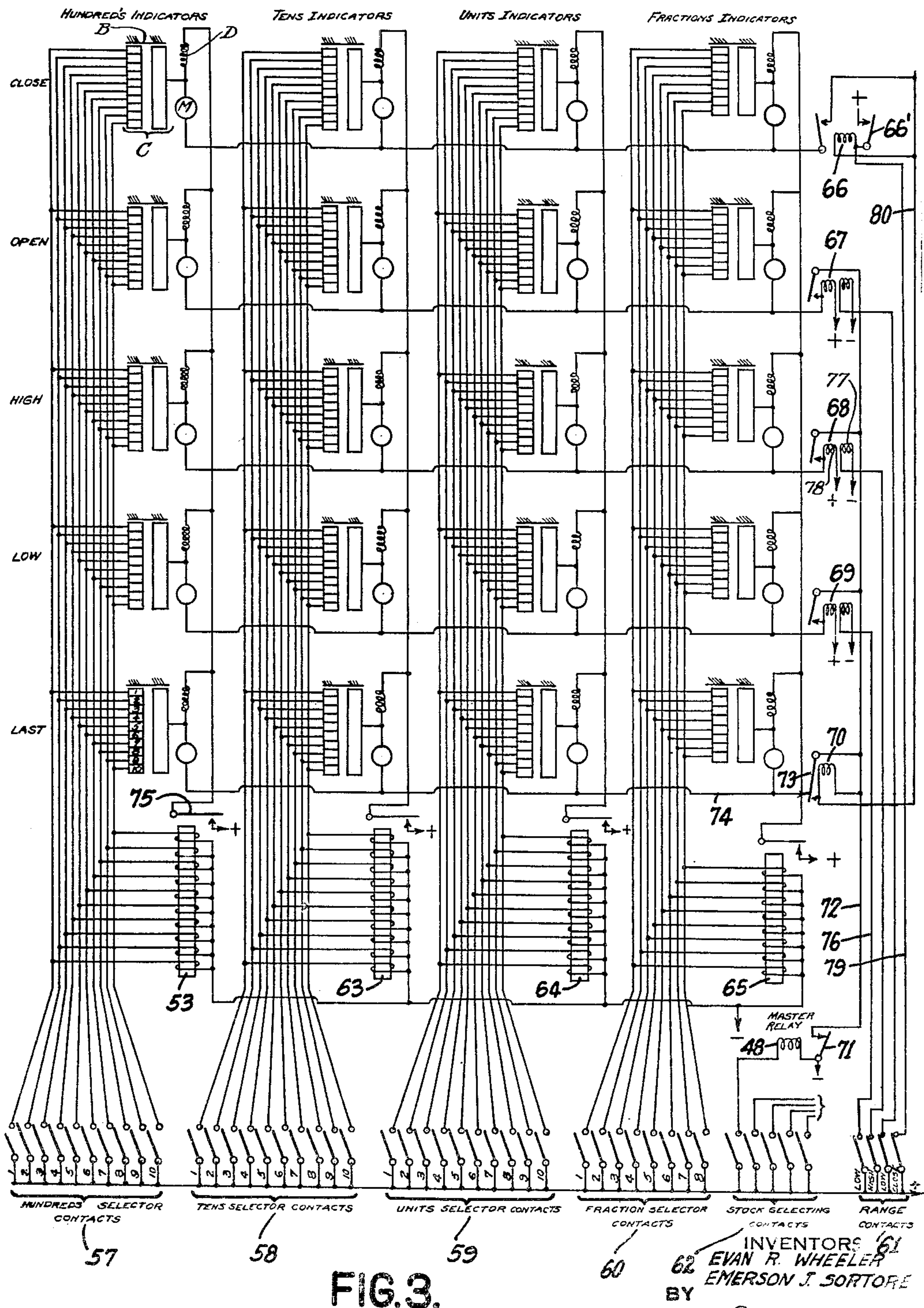


FIG. 3.

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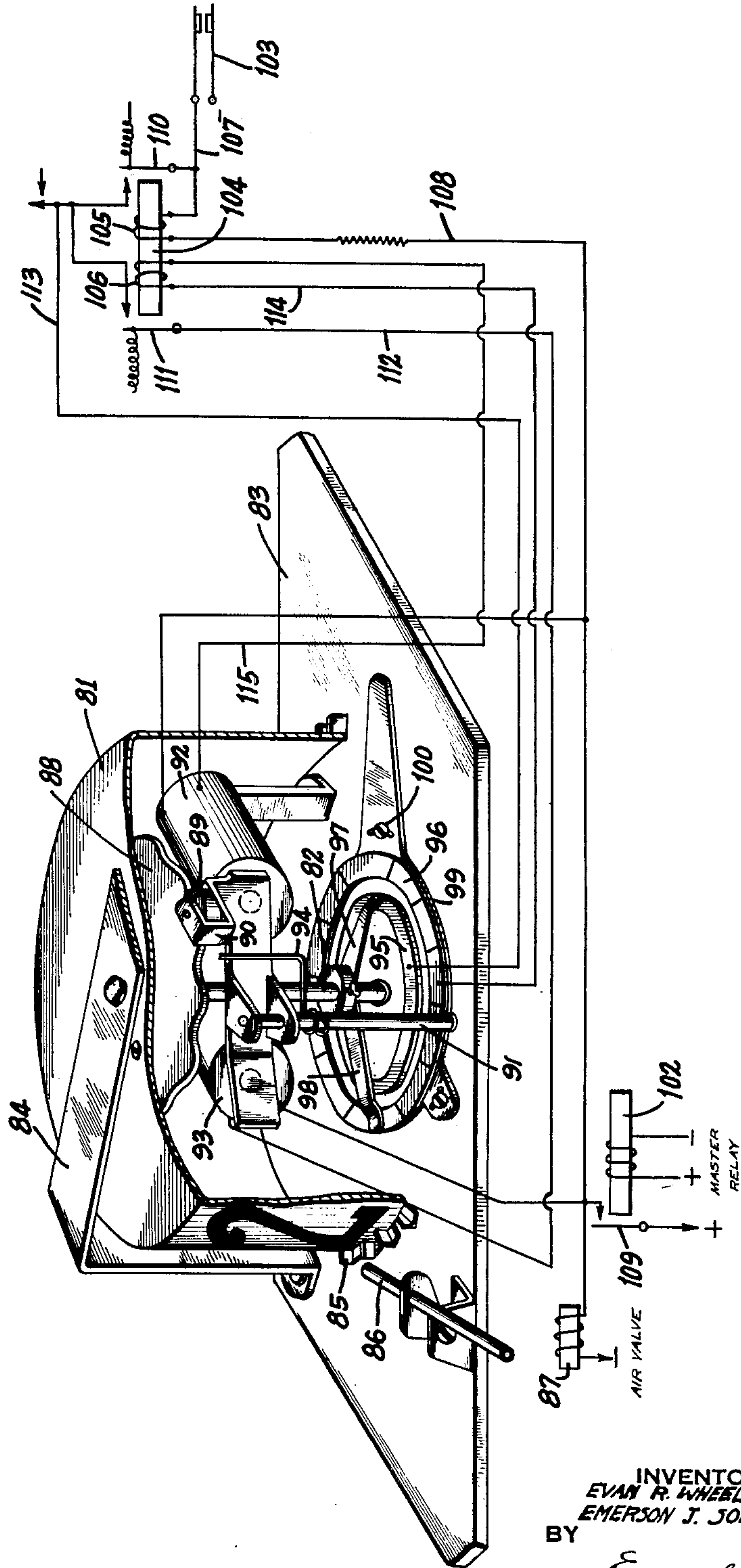
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3 Sheets-Sheet 3

FIG. 4.



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2,074,066

MOTOR OPERATED INDICATOR DIAL

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Application April 11, 1930, Serial No. 443,597

2 Claims. (Cl. 177—337)

This invention relates to motor operated indicator units, type wheels and similar devices, and more particularly to apparatus for setting character carrying elements in predetermined positions in response to telegraph signals. The apparatus is especially applicable to automatic quotation board systems, but is not limited thereto.

One of the objects of the invention is to produce a simple and reliable motor operated character carrying element which may be quickly and readily operated into a plurality of positions, in response to telegraph code signals of a simple nature.

Another object is to produce an indicating or recording unit in which each setting of the device will be independent of the preceding setting, that is in which it is not necessary to restore the indicator to an initial position prior to the effecting of a new setting thereof.

Another object is to provide an indicator unit or type wheel operating mechanism in which the character bearing element is locked in each set position.

Another object is to provide an indicating unit for a quotation board which will occupy a relatively small area of the board while enabling relatively large characters to be employed.

Other objects and advantages will appear from the following description.

The invention will now be specifically described in connection with the accompanying drawings wherein:

Figure 1 is a perspective view of an indicator unit applicable for stock quotation boards, showing the circuit connections therefor;

Figure 2 is a vertical sectional view of the indicator shown in Figure 1;

Figure 3 is a wiring diagram showing the circuit arrangement for operating a complete set of indicators for a single stock; and

Figure 4 is a perspective view partly in section of a turbine operated dial and the operating circuit arrangement therefor.

Referring first to the form of the invention illustrated in Figures 1 and 2, we have shown an embodiment of the invention comprising an endless belt 10 having the numerals 1 to 9 and 0 thereon. The belt is adapted to be moved past a window 11 provided in the front wall 12 of the casing of the indicator unit. The belt 10 is driven by a drum 13 having two series of peripheral pins 14 engaging in perforations 15 in the margins of the belt. Adjacent the window 11 the belt passes around two idler rollers 16 and 17.

The drum 13 is rotated by an electric motor 18 disposed therein, through a train of gears comprising a spur gear 19 on the motor shaft, an intermediate gear 20 and an internal ring gear 21 on the inner surface of the drum. The intermediate gear 20 is suspended by its shaft 23 from a bracket 24 extending across the top of the drum and carried by vertical posts 25. A second gear 26 on the shaft 23 meshes with a gear 27, also suspended from the bracket 24, for rotating a brush arm 28 over a pair of commutator rings comprising an inner solid ring 29 and an outer segmented ring 30. The segmented ring has one segment for each character on the belt 10 and the gear ratio is such that the brush arm 28 crosses each segment in the time required for a single character to pass the window 11. The brush arm is provided with a pair of brushes 31 and 32, engaging the rings 29 and 30 respectively, to bridge the same. The rings are carried on an insulating disk 33 mounted upon the bracket 24.

A detent wheel 35 is secured to the lower end of the drum and is provided with circumferentially disposed notches 36 adapted to be engaged by a detent 37 to lock the drum in a set position. The detent 37 is pressed inwardly against the detent wheel by a spiral spring 38 and may be withdrawn from engagement with the detent wheel by a magnet 39.

The terminals of the detent magnet 39 are connected to the binding posts 41 and 42 and the terminals of the motor 18 are connected to the binding posts 43 and 44. Binding posts 42 and 43 are connected together so that normally the detent magnet and the motor are connected in series. The binding post 44 is connected through the back contact and tongue 45, of the "last" cutout relay 46 and the front contact and tongues 47, of the master relay 48, to a source of negative potential. The binding post 41 is connected by conductor 49 through the tongue 51 and the contact 52 of plural winding relay 53, to a source of positive potential. The binding post 43 is connected by conductor 54 to the solid ring 29 of the commutator, and the segments of the ring 30 of the commutator are connected by a group of conductors 55 to the stationary contacts of a selector 56, the opposite contacts of which have positive potential applied thereto. The stationary contacts of the selector are also connected to separate windings of the plural winding relay 53 and thence to a common source of negative potential.

Assuming the master relay 48 to be operated and the "last" cutout relay 46 to be unoperated, the actuation of the indicator to a definite posi-

tion may be controlled by closing one of the contacts of the selector 56, depending upon the character to be displayed before the window 11. For instance, if it is desired to post the numeral 3, the selector contact numbered 3 is closed in any desired manner. Upon closing of this contact, a circuit is completed from a positive source of potential through selector contact numbered 3 and the corresponding winding of the relay 53, to negative potential, thus causing the contact tongue 51 of this relay to close, and thus apply positive battery through the conductor 49 to the detent magnet and motor in series and thence through the contact tongues 45 and 47 of relays 46 and 48 to a source of negative potential.

The detent magnet withdraws the detent 37 from the detent wheel, allowing the motor to rotate the drum 13 to move the belt 10 past the window 11, and at the same time to rotate the brush 28 over the segments of the commutator. This rotation continues until the brush engages segment numbered 3 of the commutator, at which time the winding of the detent magnet is short circuited through the commutator and the selector contact, causing the detent 37 to be released and to arrest the drum against further rotation. The circuit to the motor is maintained, however, as long as the selector contact remains closed.

It will be understood, however, that the selecting contacts 56 are closed only for a short period. For instance, with quotations transmitted at the rate of thirty quotations per minute and in which the information transmitted in each quotation comprises three digit stock selecting signals, a range signal and four digit price signals, or a total of eight signals for each quotation, each digit signal will consume one-quarter of a second. The contact 56 if it happens to be associated with the hundreds price indicators will remain closed only until the tens digit of the price has been received, that is, for one-quarter of a second, at which time it will be opened and one of the contacts of the receiving selector corresponding to the tens digit will be closed. The motor 18 must rotate the drum 13 at a sufficient rate to present the character to be displayed into position within this short period. It will be evident that while the motor 18 will be stalled for a portion of this period, that is, after the belt has been positioned and detent 39 released but before the contacts 56 have opened, this period in any case will be short and overheating of either in ordinary series or shunt wound motor will not occur.

The drum 13 is preferably supported upon roller bearings 22 and is guided at its upper end by opposite arcuate guides 22' carried by the bracket 24.

The function of the master relay 48 is to determine which of a large number of indicator units is to be operated. For instance, in a stock quotation system, it is usual to employ a number of groups of indicators for each stock, to post the opening, high, low and last quotations of the day, and the closing quotation of the preceding day, and for each of these quotations a separate indicator, such as shown in Figure 1, is employed for the hundreds, tens, units and fractional values of the stock. A single group of selector contacts such as 56, is common to the hundreds indicators, another group is used for the tens indicators, another for the units indicators, and another for the fractions indicators of each stock, appearing on the quotation board. A sepa-

rate master relay is provided for each stock and serves to complete the motor and detent magnet circuit of a single stock at a time.

In Figure 3 we have shown diagrammatically the indicators employed for a single stock on a stock quotation board, four indicator units being employed for posting the hundreds, tens, units and fractions values of each of the "yesterday's close", "open", "high", "low" and "last" quotations. Each indicator is represented diagrammatically by a commutator C, having a segmented and a solid ring adapted to be traversed by brushes B, an operating motor M and the winding D of the detent magnet.

A receiving selector which is common to all stocks, has a group of ten "hundreds" selector contacts 57, ten "tens" selector contacts 58, ten "units" selector contacts 59, eight "fractions" selector contacts 60, a group of four "range" selector contacts 61 for controlling the operation of the "last", "low", "high", "open" or "close" indicators, and a group of stock selecting contacts 62.

Associated with each of the hundreds, tens, units and fractions selector contacts, are the plural winding relays 53, 63, 64 and 65 respectively. Range relays 66, 67, 68, 69 and 70 are also provided, common to all stocks, for preparing circuits to the operating motor and detent magnets of the "yesterday's close", "open", "high", "low" and "last" sets of indicators, respectively. The range relays are controlled by the range contacts 61. A master relay 48 is also provided for each stock.

The circuit connections and the operation of the system will be understood from the following examples:

Assuming it is desired to post the "last" quotation of the particular stock represented by the indicators in Figure 3, having a value of 237 $\frac{7}{8}$, the master relay 48 of the particular stock is first operated through the stock selecting contacts 62. For simplicity we have shown the master relay operated directly through one of the stock selection contacts, but it is to be understood that a small group of stock selecting contacts may be employed to select a large number of stocks through a coding arrangement of intermediate relays in any suitable manner such, for instance, as that described in our copending application, Serial #422,150, filed January 20, 1930, and entitled "Selecting system".

Upon closing of the master relay 48, a circuit is prepared for the "last" set of indicators from a source of negative potential through the tongue 71 of the master relay, conductor 72, tongue 73 and back contact of the range relay 70, and conductor 74, to the operating motor and detent magnets of each of the "last" indicators, and thence to the contact tongues 75 of the plural winding relays 53, 63, 64 and 65. The circuits to the "yesterday's close", "open", "high", and "low" sets of indicators are open at the contacts of their respective range relays.

The hundreds, tens, units and fractions selector contacts corresponding to the digits 2, 3, 7 and $\frac{7}{8}$ of the quotation are next closed in succession. This may be accomplished when using a receiving selector of the type described in our copending application, Serial #422,148, filed January 20, 1930 and entitled "Stock selecting and indicating system," by transmitting to the selector, four groups of code signals of the Baudot code type, representative of these digits.

Upon closing of the hundreds contact number

2, a circuit is completed through the corresponding winding of the hundreds relay 53, causing the contact tongue 75 to pick up and thereby complete the operating motor and detent magnet circuit of the "last" hundreds indicator, to positive battery. Upon operation of the motor of this indicator, the brush B is caused to traverse the segments of the commutator C until segment 2 and the solid segment are bridged, at which time the winding D of the detent magnet is short circuited and the detent released to lock the indicator unit in its set position. Similarly, upon closing of the specified contacts of the tens, units and fractions selectors, the corresponding "last" indicators are operated into the proper positions.

Had the quotation just posted also been the "low" quotation of the day, it would have been necessary to operate the "low" set of indicators simultaneously with the "last" set of indicators. This is effected by closing the "low" range contact of the group 61 and thereby completing a circuit from the positive battery through conductor 76 and the operating winding 77 of the lower range relay 69, previous to the operation of the hundreds, tens, units and fractions selector contacts. The relay 69 upon picking up, completes a circuit for its locking winding 78 and prepares a circuit through its contacts for the motors and detent magnets of the "low" set of indicators, in parallel with the corresponding indicators of the "last" set, so as to operate the "low" and the "last" sets of indicators simultaneously. Similarly the "open" or "high" sets of indicators may be operated simultaneously with the "last" set of indicators.

At the conclusion of the day's business, it is often desired to post the closing quotation in readiness for the succeeding day and in order that this may be done without simultaneous operation of the "last" indicators, we have provided the range relay 70, which serves to cut-out the "last" indicators from the operating circuit upon closing of the "close" selector contact. This circuit may be traced from positive battery through the "close" selector contact, conductor 79, winding of the "close" range relay 66, conductor 80 and the winding of the "last" range relay 70, thus causing the former relay to close and the latter to open its contact. This circuit is locked up through tongue 66' of the "close" range relay 66. A circuit is thus prepared through the master relay to the "close" indicators independently of the "last" indicators.

It will be noted with reference to the indicators shown in Figure 1 that the area of the front of the quotation board occupied by the indicator is only slightly greater than the space occupied by a single character of the belt 10 and materially less than that required when employing a dial or drum character carrying element. This enables larger and more legible characters to be employed with a definite board area.

In the form of the invention illustrated in Figure 4, the characters or digits are carried upon a drum or cylinder 81 mounted on a vertical axis 82 bearing in a base plate 83 and in a bracket 84 extending across the top of the drum. The indicator may be mounted behind an aperture plate forming the front of the quotation board so that one character only on the drum is visible. The drum is provided at its lower margin with vanes 85 against which a stream of air may be directed by a nozzle 86 for rotating the character carrying drum. The sup-

ply of air to the nozzle 86 may be controlled by a suitable valve not shown, controlled by a magnet 87.

A detent wheel 88 having undulations in its periphery is secured to the top wall of the drum within the same and is engaged by a detent roller 89 to lock the drum in any set position. The detent roller is mounted upon an armature lever 90 pivoted centrally on a post 91 and having the opposite ends extending across the pole faces of magnets 92 and 93, which serve respectively to move the detent roller into locking and unlocking positions. A spring 94 is provided for holding the detent in locking position when magnet 92 is unenergized.

A commutator having a solid ring 95 and a segmented ring 96 is disposed concentrically with the shaft 82 and is adapted to be traversed by a pair of brush arms 97 and 98 carried by the shaft 82 so as to connect the solid ring with each of the segments of the ring 96 in succession as the drum 81 revolves.

The commutator is mounted upon an insulating disk 99 secured to the base 83 by a pin and slot connection 100 whereby slight adjustment of the commutator relative to the brush is permitted.

The operation of the indicator is controlled through a master relay 102, one of which is provided for the indicators of each stock and through the contacts of a receiving selector which is common to the indicators of all stocks. One contact only 103 of the receiving selector is shown in Figure 4. Associated with each contact of the receiving selector is a relay 104 having an operating winding 105 and a neutralizing winding 106. The operating winding is connected by conductor 107 to the corresponding contact of the receiving selector and by a conductor 108 to the front contact of the master relay 102. The neutralizing winding has one terminal connected to the locking magnet 92 and the other terminal connected to one of the segments of the commutator. It is understood that there is a relay 104 and a selector contact 103 corresponding to each segment of the commutator and consequently to each character on the drum 81.

In the operation of the indicator, the master relay 102 is first energized to choose the particular group of indicators to be operated. Upon closing of its contact tongue 109, a circuit is completed to the air valve magnet 87 which causes a stream of air to be directed against the vanes 85 of the drum. The drum is held against the rotation at this time by the detent 89. Subsequently one of the selector contacts 103 is closed depending upon the particular setting of the dial required. The contact 103, upon closing completes a circuit from negative potential through the operating winding 105 of the relay 104 and the contacts of the master relay 102, thus causing relay 104 to pick up and to complete a locking circuit through its tongue 110. At the same time a circuit is completed from a source of negative potential through the tongue 111 of the relay and conductor 112 to the unlocking magnet 93 and thence through the contacts of the master relay to positive potential. Thereupon detent 88 is released and the drum is permitted to move under the action of the air impinging against the vanes 85. The drum revolves, to bring the desired character into position, until the brush 98 engages the segment of the ring 96 associated with the relay 104 at which time a separate circuit is completed from the source of negative potential through conductor 113, commutator rings 75.

95 and 96, conductor 114, neutralizing winding 106 and the conductor 115 to the locking magnet 92 and thence through the contacts of the master relay to positive potential. The relay 104 releases its tongue, due to the current in the neutralizing winding, and thus interrupts the circuit to the unlocking magnet and permits the locking magnet 92 to move the detent 88 back into contact with the detent wheel and thereby to lock the drum in its set position.

It is obvious of course that various changes may be made in the construction of the indicators and in the circuit arrangement for operating the same without departing from the invention and therefore we do not desire to be limited to the exact details shown and described, except in accordance with the appended claims.

What we claim is:

1. An indicator unit comprising an endless indicator element, a rotary driving cylinder for said element, said indicator element and driving cylinder being movable through unequal portions of a revolution by a given movement of said cylinder, a segmented commutator, a brush for said commutator, a driving motor, means operated thereby for driving said brush and cylinder simultaneously at different angular speeds, whereby said brush moves through a complete revolution in the same time interval as said indicator element, means for preparing circuits selectively through the segments of said commuta-

tor, means controlled by completion of any one of said circuits for arresting the movement of said cylinder and means including said brush and the segments of said commutator for completing a selected one of said circuits.

2. An indicator unit comprising an endless indicator element, a rotary driving cylinder for said element, said indicator element and driving cylinder being movable through unequal portions of a revolution by a given movement of said cylinder, a segmented commutator, a brush for said commutator, a driving motor, means operated thereby for driving said brush and cylinder simultaneously at different angular speeds, whereby said brush moves through a complete revolution in the same time interval as said indicator element, electro-magnetic locking means for said cylinder normally deenergized to retain said cylinder against movement, means for simultaneously energizing said electro-magnetic locking means and said motor to operate said cylinder, said means including means for preparing circuits selectively through the segments of said commutator, means controlled by completion of any one of said circuits for short-circuiting said electro-magnetic locking means to arrest the rotation of said cylinder and means including said brush and the segments of said commutator for completing one of said prepared circuits.

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