

May 9, 1933.

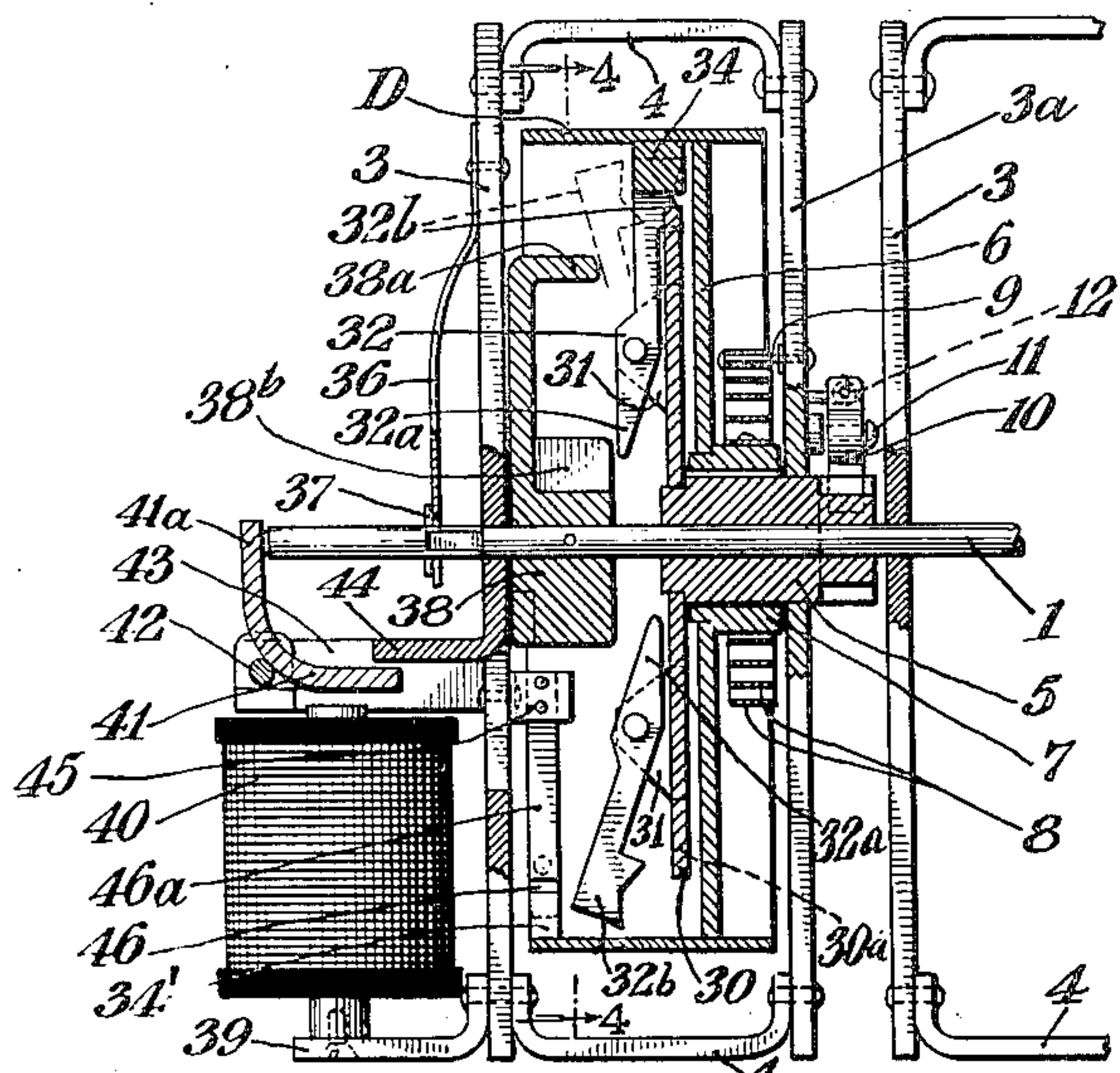
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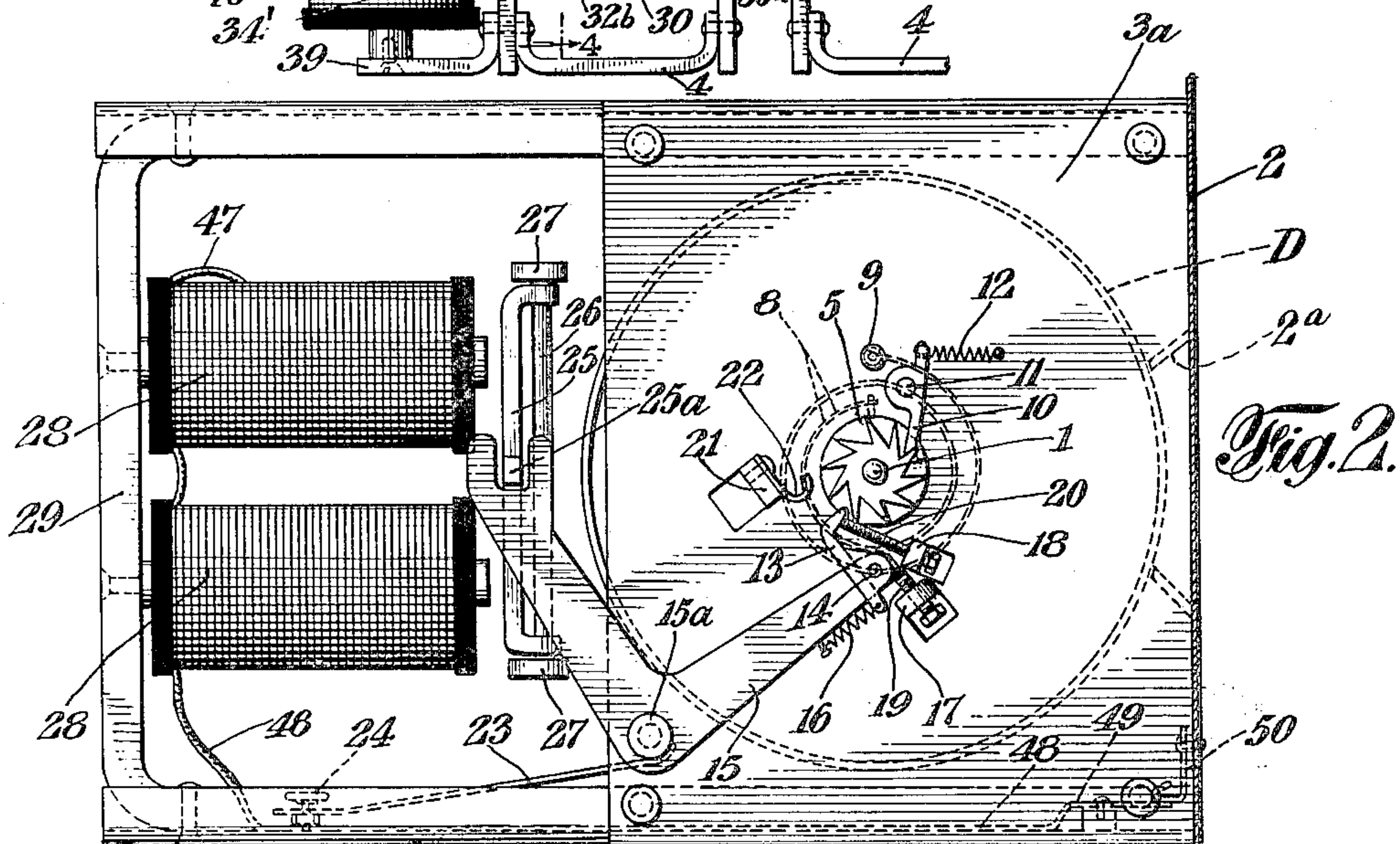
CONTROL APPARATUS AND METHOD PARTICULARLY FOR INDICATING PURPOSES

Filed June 25, 1929

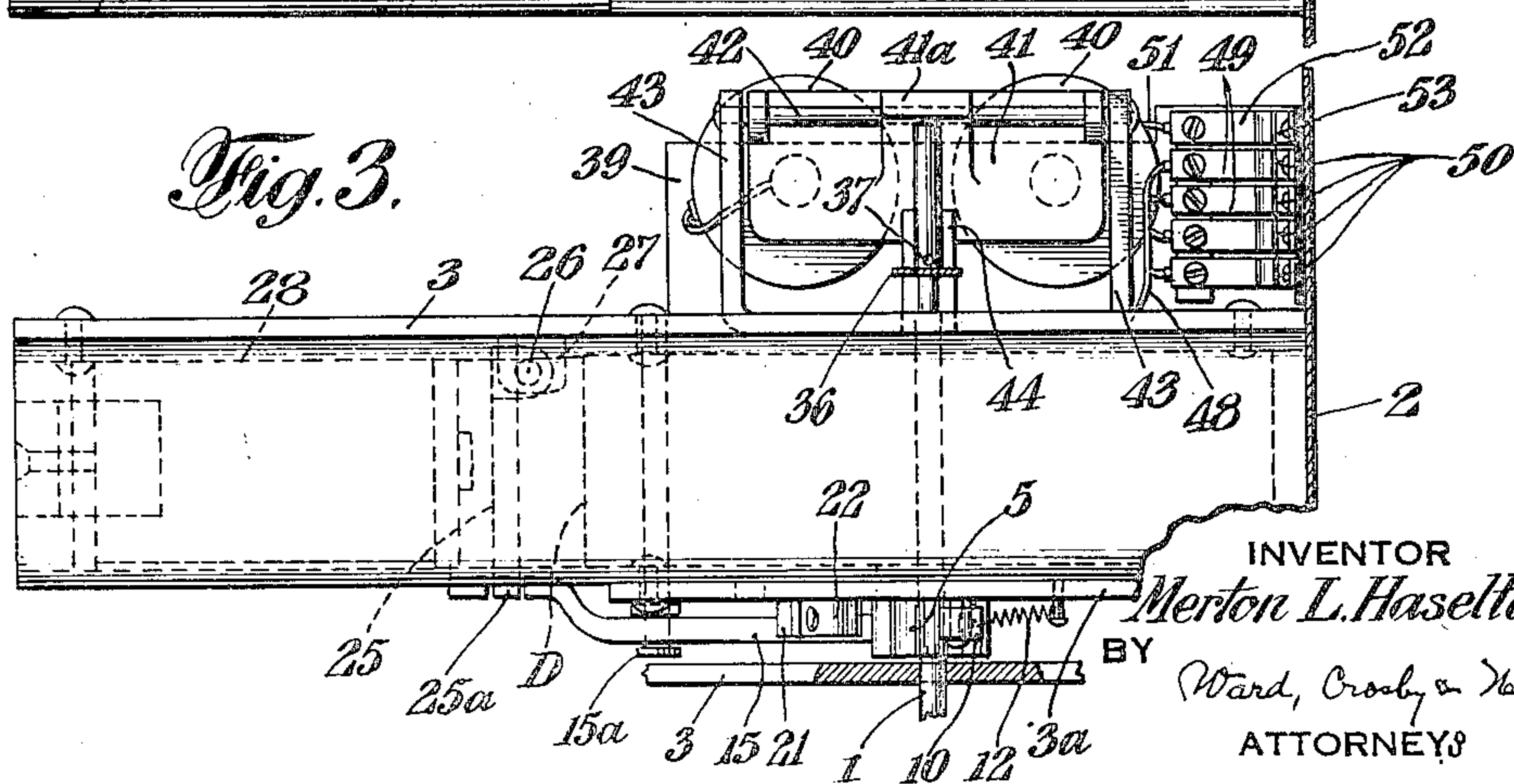
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*Fig. 1.*



*Fig. 2.*



*Fig. 3.*

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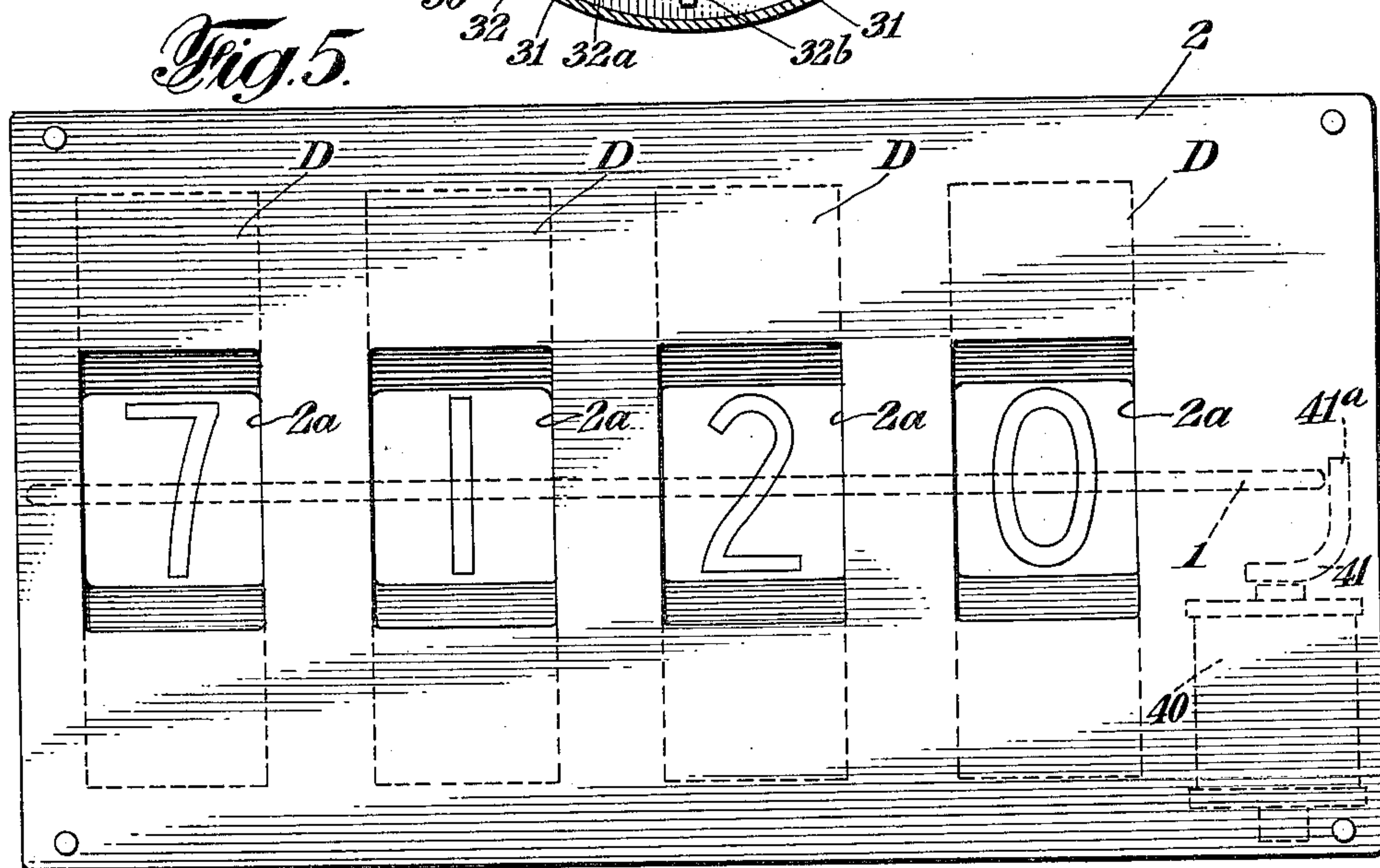
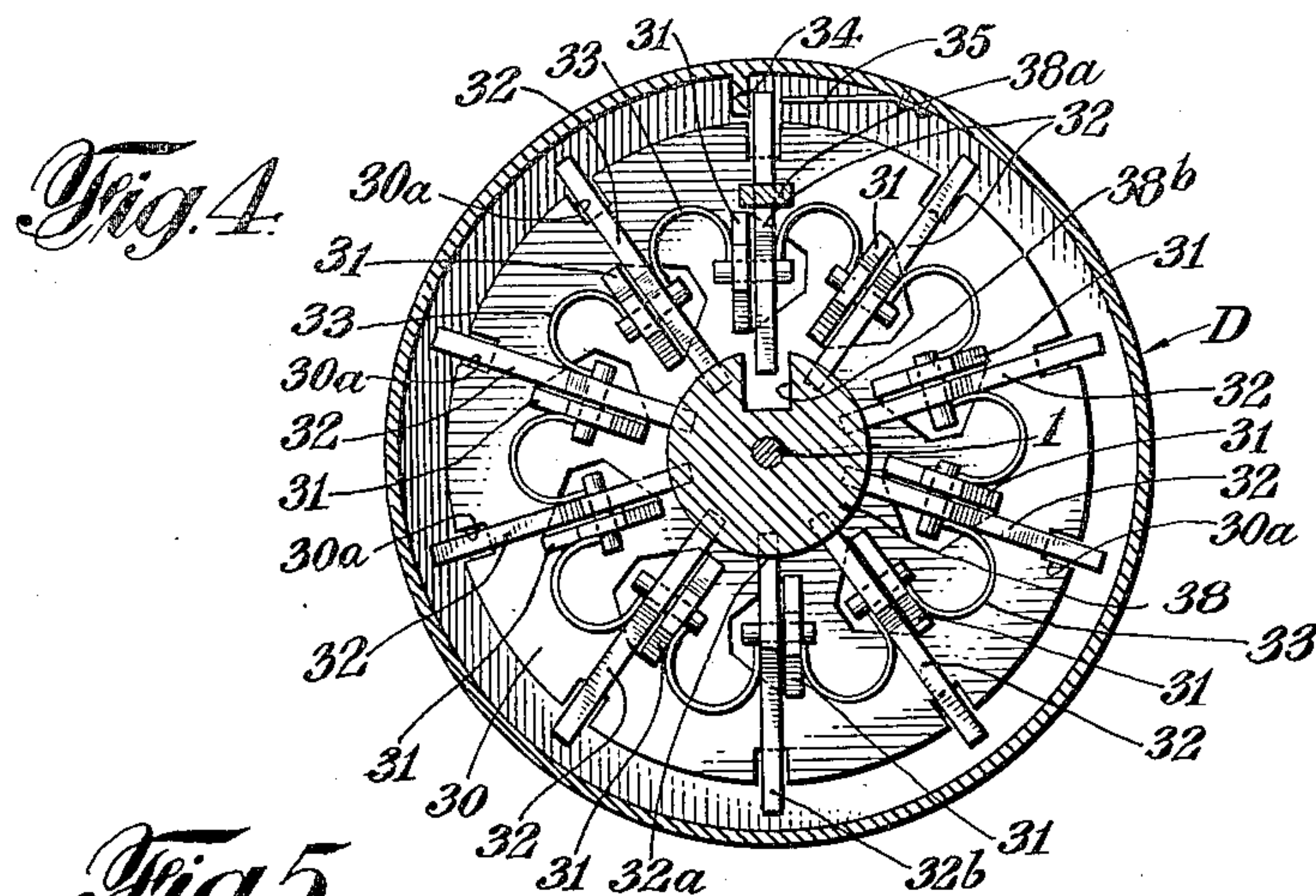
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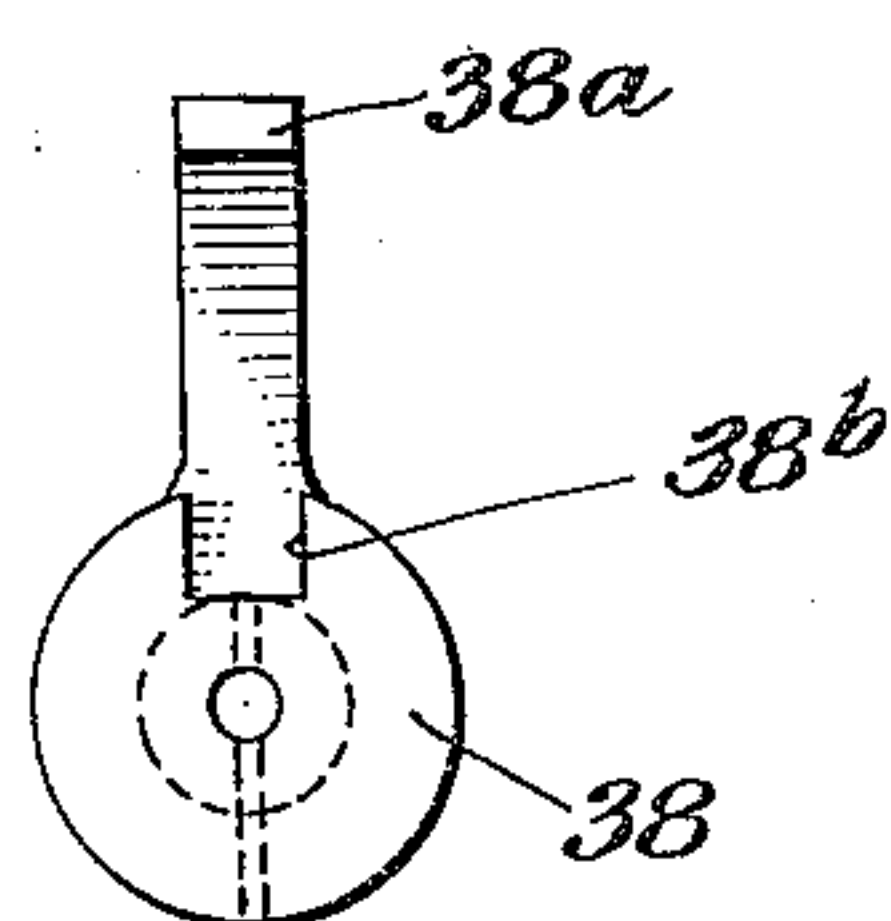
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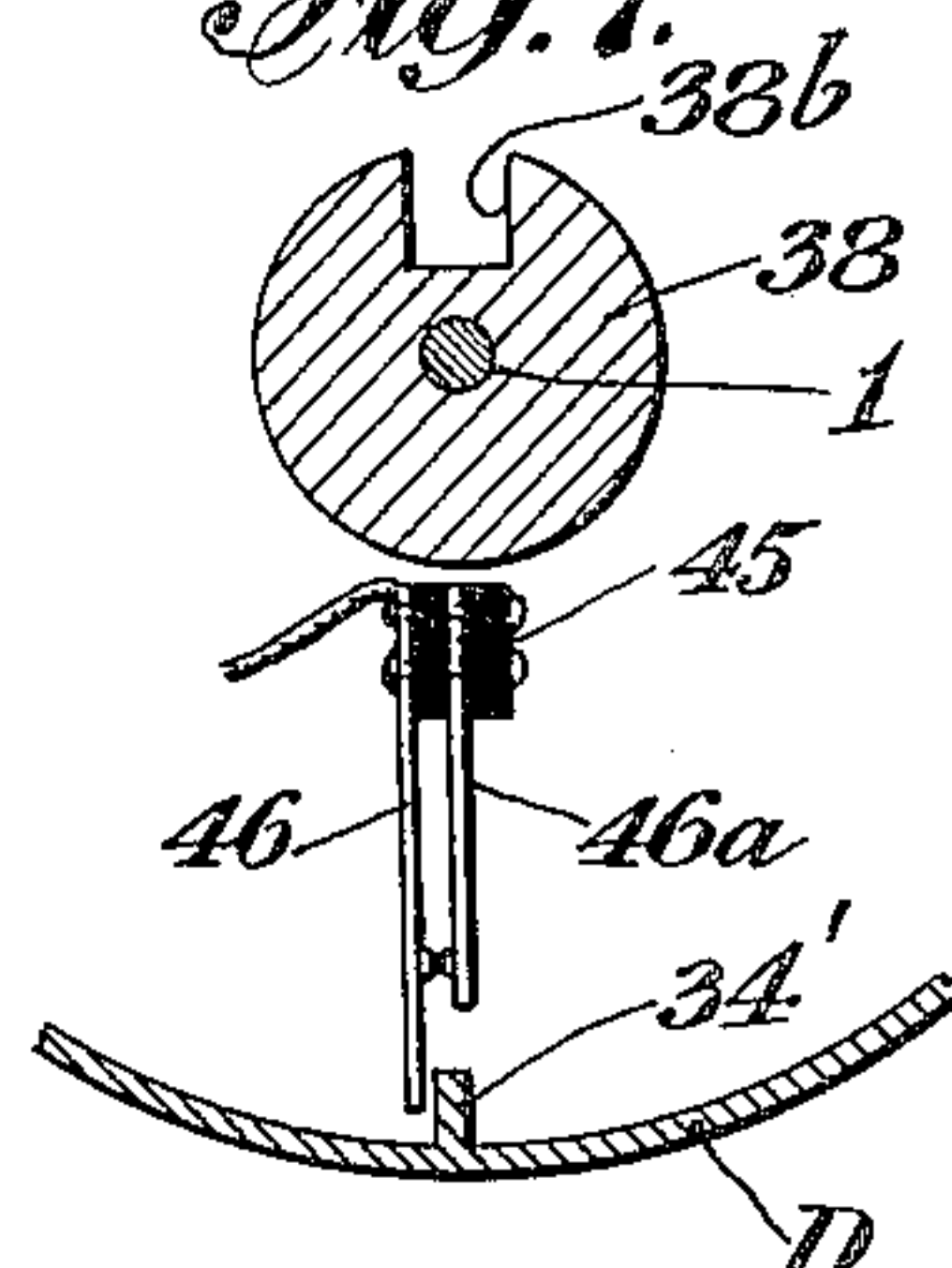
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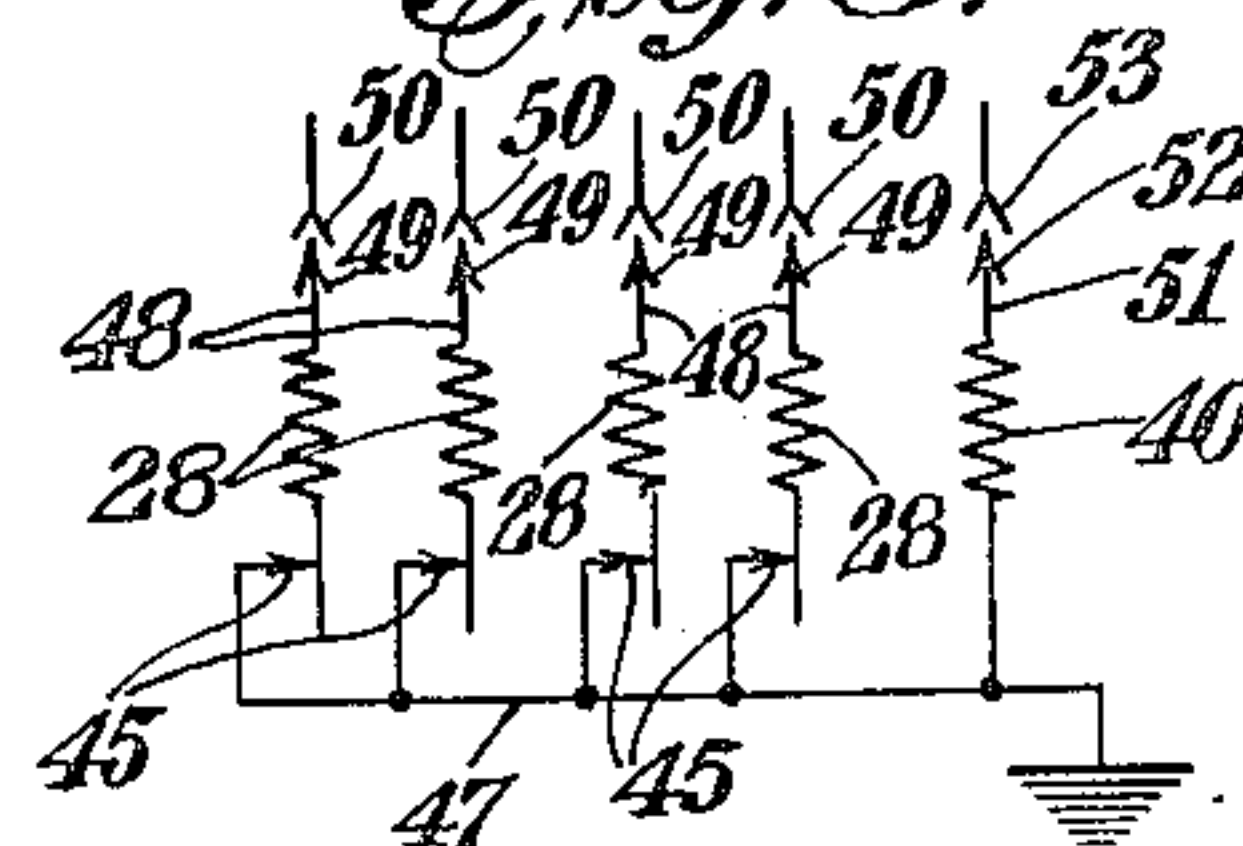
*Fig. 6.*



*Fig. 7.*



*Fig. 8.*



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## UNITED STATES PATENT OFFICE

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CONTROL APPARATUS AND METHOD, PARTICULARLY FOR INDICATING PURPOSES

Application filed June 25, 1929. Serial No. 373,678.

My invention relates to a member or device utilizable for various purposes, such as for effecting an indication; my invention also relates to a method of operating a member or device, as aforesaid.

More particularly, my invention relates to an indicia-bearing drum actuated electromagnetically in accordance with a series of electrical impulses for movement about its axis to a predetermined position.

My invention has particular reference to an arrangement for so controlling the operation of a drum, as aforesaid, that the generation of a succeeding series of indicating impulses need not await the return of said drum from a prior indicating position.

Further advantages, objects and characteristics of my invention will become apparent from the following detailed description taken in connection with the accompanying drawings.

My invention resides in the apparatus, mechanism, methods, features of construction and combination of parts of the character hereinafter described and claimed.

For an understanding of my method and for an illustration of one of the many forms my invention may take, reference is to be had to the accompanying drawings, in which:

Figure 1 is a vertical sectional view, partly in elevation, of apparatus constructed in accordance with my invention;

Fig. 2 is a side elevational view of the mechanism shown in Fig. 1;

Fig. 3 is a plan view, partly broken away, of the mechanism shown in Fig. 1;

Fig. 4 is a transverse, vertical sectional view, partly in elevation, of the mechanism and is taken on the line 4—4 of Fig. 1;

Fig. 5 is a front elevational view of an indicating system involving a plurality of indicia-bearing drums;

Fig. 6 is a front elevational view of a cam embodied in the device;

Fig. 7 is an elevational view, partly in section, particularly showing a limit switch mechanism; and

Fig. 8 is a circuit diagram.

My invention relates particularly to an arrangement which may comprise a plurality

of movable members or drums each bearing suitable indicia, as letters, numbers, words, abbreviations, or the like, and disposed in side-by-side relation. By controls suitably effected, the aforesaid members or drums may be moved to predetermined positions to thereby convey information to an assemblage of persons. A particularly important application of my invention involves the display of information concerning the prices of stocks, bonds or the like. However, it shall be understood that my invention is not to be so limited. Neither is it to be limited to the utilization of a plurality of movable members or drums since, from some important aspects, my invention relates to a single member or drum and the actuating mechanism therefor.

Referring to the drawings, 1 represents a suitably supported member carrying, in suitable spaced relation, a plurality of drums or wheels D which bear or exhibit indicia or characters on their peripheral surfaces. In the example illustrated, each drum D is marked with the digital numbers zero, one, two, etc. individually visible through openings or apertures 2a formed in a face plate 2, said apertures 2a being alined with the respective drums D.

As illustrated particularly in Fig. 1, each drum D is disposed within a housing or frame formed by spaced side plates 3, 3a joined at the bottom and top by members 4.

In the example shown, each drum D is a hollow cylindrical member journaled on a hub or member 5 carried by and rotatable on the member 1. For thus journaling a drum D, the latter has a circular disk 6 disposed interiorly thereof and securely fixed thereto. The disk 6 is fixed to a sleeve 7 freely rotatable on the hub 5. It follows, therefore, that drum D, disk 6 and sleeve 7 are rotatable as a unit on and with respect to the hub 5 and that the latter is freely rotatable on the member 1.

Drum D is biased for rotation in a counterclockwise direction, Fig. 2, by a helical spring 8, one end of which is fixed to a pin 9 projecting laterally from the side plate 3a



and the other end of which is secured to the aforesaid sleeve 7.

As illustrated in Figs. 1 and 2, the hub 5, at one end thereof, is formed as a ratchet. Coacting with said ratchet to limit rotation of the hub 5 to one direction is a pawl 10 pivoted on a pin 11 projecting laterally from the side plate 3a and biased in a clockwise direction, Fig. 2, by a spring 12 connected to said pawl 10 and to the aforesaid side plate 3a.

Coacting with the aforesaid ratchet to move the hub 5 step-by-step is a pawl 13 pivoted at 14 on a lever 15 and biased in a clockwise direction, Fig. 2, by a spring 16 connected to said pawl 13 and to the lever 15. Carried by the side plate 3a are brackets 17 and 18. Bracket 17 has a member 19 adjustably mounted therein to limit clockwise movement, Fig. 2, of lever 15. Bracket 18 has a member 20 adjustably mounted therein to limit clockwise movement, Fig. 2, of pawl 13. Side plate 3 also carries a bracket 21 which, in turn, carries a bowed spring 22 limiting translatable movement of pawl 13 under the influence of lever 15.

Lever 15 is pivoted at 15a to the side plate 3a and is biased in a clockwise direction, Fig. 2, by a spring 23, the biasing tendency of which is adjustable in response to movement of a screw 24 threaded into an adjacent portion of the frame of the device.

The end of lever 15 removed from the pawl 13 is bifurcated for engagement with an extension 25a of an armature 25 pivoted on a rod 26 carried by lugs 27, 27 projecting laterally from the side plate 3. Armature 25 coacts with suitable electromagnetic mechanism herein shown as a set of coils 28, 28 mounted on a permanent magnet 29, the sides of which are received by the aforesaid members 4.

Secured to and rotatable with each hub 5 at the non-ratchet end thereof is a disk 30 which, on the face thereof away from the disk 6, is provided with spaced lugs or projections 31, Figs. 1 and 4, corresponding in number with the number of characters on the drum D. Pivoted to each projection 31 is a lever 32, all of the levers 32 being frictionally controlled in any suitable manner so that they remain in a position to which moved. To this end, a bowed spring 33 may be arranged to bias each lever 32 into engagement with its supporting projection 31.

Each lever 32, at one end 32a, is adapted to be actuated by a cam or member as hereinafter described. The other end 32b of each lever 32 is adapted to coact with a lug or projection 34, Figs. 1 and 4, formed on the inner surface of drum D which also carries, if desired, a leaf spring 35 positioned, for example, as illustrated in Fig. 4, which prevents the drum D from rebounding when the projection 34 engages a lever 32.

Where the arrangement is as described above, it is desirable that the disk 30 be provided with slots 30a disposed in the paths traversed by the respective levers 32 and each adapted to receive a portion of the end 32b of the adjacent lever 32.

In accordance with my invention, the aforesaid member 1 is non-rotatably mounted and, in effect, is an axle on or with respect to which the hereinbefore described parts are rotatable. Member 1, however, is so mounted that it is freely movable in a longitudinal sense. Any suitable arrangement may be utilized for restraining member 1 for movement, as aforesaid, such, for example, as illustrated in Fig. 1 wherein that side plate 3 at the extreme left carries a leaf spring 36 having a polygonal aperture slidably receiving a shaft section of similar polygonal configuration. Where a construction such as spring 36 is utilized, the member 1 may carry a lateral pin 37 with which said spring 36 coacts, the latter tending to retain member 1 in the position illustrated in Fig. 1.

A cam or member 38 carried by and movable with the member 1 comprises a hub section for engagement with the levers 32 at their ends 32a. Member 38 also comprises an extension 38a and a hub recess 38b, Fig. 4, both utilizable as hereinafter described.

Referring to Figs. 1 and 3, that side plate 3 at the extreme left carries a member 39, in turn, carrying one or more coils or windings 40 with which an armature 41 coacts, said armature being pivoted on a rod 42 carried by a bracket 43 projecting from said last named side plate 3. Movement of armature 41 in a counter-clockwise direction, Fig. 1, may be limited by a stop member 44 likewise projecting from said last named side plate 3. Said armature 41 comprises an extension 41a coactable with the end of member 1 to move the same from left to right, Fig. 1, as hereinafter more fully described.

As illustrated in Fig. 7, lugs 34' on each drum D may be arranged to operate a limit switch 45 comprising the switch contacts 46 and 46a which are normally closed and in series circuit relation with that set of coils 28 which operate the drum controlling said contacts 46 and 46a. The limit switch 45 is thus operated should further movement of the drum D be attempted after the latter has been moved through a sufficiently large angle to bring the largest digit into view opposite an aperture 2a in face plate 2.

In the form of my invention herein illustrated, four drums D are provided and hence there are four of the sets of coils 28 as illustrated diagrammatically in Fig. 8. As just stated, each set of coils 28 is in series with a limit switch 45 also illustrated diagrammatically in Fig. 8. One side of all the limit switches 45 may be connected to a common conductor 47 leading to one terminal of a bat-



tery, not shown, or other suitable source of  
 electrical energy either directly or through a  
 ground connection as shown in Fig. 8. Con-  
 ductors 48 leading, respectively, from the  
 5 other terminals of the sets of coils 28 may be  
 connected to the other terminal of the afore-  
 said source of electrical energy and each may  
 extend to a suitable impulse transmitter or  
 circuit closing device whereby the drums D  
 10 are stepped or moved to a desired degree, as  
 hereinafter more fully described. Prefera-  
 bly, each conductor 48 includes separable  
 contact members 49 and 50 indicated struc-  
 turally in Figs. 2 and 3 and diagrammatically  
 15 in Fig. 8. The contact members 49 are car-  
 ried in side-by-side spaced relation for exam-  
 ple, by the aforesaid member 39 whereas the  
 contact members 50 are also carried in side-  
 by-side, spaced relation by the face plate 2.  
 20 With the latter maintained in proper posi-  
 tion, for example, as shown in Figs. 2 and 3,  
 the respective sets of contact members 49 and  
 50 are properly disposed and maintained in  
 electrical circuit relation. Where the con-  
 25 struction is as just described, the indicating  
 devices 2 may readily be removed or dis-  
 placed in respect to the face plate to permit  
 inspection or repair of some of the parts.

As illustrated diagrammatically in Fig. 8,  
 30 one terminal of the set of coils 40 may be  
 connected directly to the aforesaid common  
 conductor 47 while the conductor 51 leads to a  
 contact 52 coactable with but separable from  
 another contact 53, the contacts 52 and 53  
 35 corresponding with and being mounted the  
 same as the aforesaid contacts 49 and 50. The  
 conductor leading from contact 53 may in-  
 clude a suitable impulse transmitter or the  
 like for energizing the coils 40 when desired.

40 As shown herein and as heretofore stated,  
 four of the drums D are illustrated although  
 it shall be understood that more or less of  
 said drums may be utilized as desired. Each  
 drum D, as hereinbefore pointed out, is asso-  
 45 ciated with mechanism of the character illus-  
 trated in Fig. 1 and including the parts 5  
 through 35 inclusive, 38, 38a, 38b, 45, 46 and  
 46a. There are as many sets of the coils 28 as  
 there are drums but there is but one set of  
 50 the coils 40.

Assuming that all of the drums D have  
 come to "zero" or "blank" position in re-  
 sponse to movement of member 1 from left to  
 right, Fig. 1, as hereinafter more fully de-  
 55 scribed, a single lever 32 at its end 32b will  
 be in the path of and form a stop for the  
 projection 34 on each drum D. All other  
 levers 32 occupy and, under the influence  
 of the springs 33, retain an oscillated posi-  
 60 tion such as occupied by the bottom lever 32  
 shown in Fig. 1 where their ends 32b are out  
 of the path of projection 34. After member  
 1 has been moved from left to right as de-  
 scribed above, it is returned to the position  
 65 shown in Fig. 1 by the spring 36 so that

each cam 38 occupies the relative position shown.

To produce the number illustrated in Fig.  
 5, namely, "7120", the set of coils 28 for the  
 drum D shown at the left of Fig. 5 are en- 70  
 ergized seven times. The remaining drums  
 are similarly actuated by a number of im-  
 pulses equal to the digit to be indicated. In  
 other words, as viewed from left to right, Fig. 75  
 5, the drums D are actuated, respectively, by  
 seven, one, two, and zero impulses. Any par-  
 ticular drum D need not be moved to its final  
 position before the others are actuated. Thus,  
 the drum D shown at the left of Fig. 1 may  
 be actuated three times, after which that  
 drum D shown as second from the left may  
 be actuated whereupon said drum D shown  
 at the left may be further actuated. In other  
 words, the sequence of drum actuation may  
 be such as is suitable or desirable. 85

More specifically, with the drum D shown  
 at the left of Fig. 5 in its "zero" position, en-  
 ergization of its set of coils 28 causes arma-  
 ture 25 to be attracted whereby lever 15 is  
 swung in a counter-clockwise direction, Fig. 90  
 2. As a result, pawl 13, by engagement ef-  
 fected with the ratchet at the end of hub 5,  
 moves or advances said hub one step in which  
 it is held by the holding pawl 10. Disk 30  
 moves with hub 5 in a counter-clockwise di- 95  
 rection, Fig. 4, and, due to engagement ef-  
 fected by the upper vertical lever 32 with the  
 projection 34 of drum D, the latter is ad-  
 vanced or moved one step to bring the digit  
 "one" into view. The above described move- 100  
 ment of hub 5 stores some energy in the  
 spring 8.

The key impulse transmitter or circuit  
 control device associated with the set of coils  
 28 noted immediately above, causes energiza- 105  
 tion thereof, usually, for but a brief period  
 whereupon said coils 28 are in condition for  
 subsequent energization. When they are  
 again energized, the operation described  
 above is repeated and the drum D exhibits the  
 digit "two". 110

In a similar manner, all of the drums D are  
 actuated in response to energization of their  
 respective sets of coils 28. Finally, exhibi- 115  
 tion of the desired number is effected which,  
 in the example illustrated, is the number  
 "7120".

When a new quotation is to be exhibited  
 or when it becomes necessary to exhibit a  
 number made up of digits any one of which 120  
 is lower than is exhibited at that particular  
 time, the set of coils 40 are energized momen-  
 tarily to move the member 1 from left to  
 right, Fig. 1. In so doing, each cam 38 is  
 caused to coact with two levers of that set of 125  
 levers 32 carried by the adjacent disk 30.

If, for example, the disk 30 shown in Fig.  
 4 has been moved by seven impulses of ener-  
 gy to cause the drum D to exhibit the digit  
 "seven", the projection 34 and the adjacent 130



lever 32 will have been moved seven steps in a counter-clockwise direction, Fig. 4. Accordingly, when the adjacent cam 38 is moved as just described, the end 32a of said last named lever 32 will be engaged thereby and the end 32b thereof disengaged from the projection 34 and removed from the path thereof. Accordingly, under the influence of spring 8, drum D immediately starts to retrace its path in a clockwise direction, Fig. 4.

When said last named lever 32 was operated as just described, the extension 38a of cam 38 engages that lever 32 which is now occupying the vertical upper position, Fig. 4. As a result, the end 32b of said last named lever 32 is moved into the path of the projection 34 of drum D, this action being permitted because the end 32a of said last named lever 32 moves with the passage 38b of cam 38. Said last named lever 32 is releasably held in the position to which moved as last described, by the adjacent spring 33.

Said last named lever 32 may remain in the position to which moved as last described until engaged by the lug 34 of drum D at which time, said drum D is in its "zero" position. However, and this is a distinct feature of my invention, energizations of the set of coils 28 may be initiated as soon as said last named lever 32 has been positioned as last described; when this is done, the end 32b of the latter, instead of remaining stationary, may be moved step-by-step by the succeeding impulses, toward the moving lug 34 of drum D. Under such circumstances, the drum D is not always permitted to fully return to its "zero" position but is engaged, at its projection 34, somewhere along the returning path of the latter by the end 32b of said last named lever 32. When engagement is thus effected, said last named lever 32 may already have been moved to position effecting a desired indication by the drum D or, movement of said last named lever 32 may not have been completed. If the latter is the case, drum D is again moved in a counter-clockwise direction, Fig. 4, until it comes to its proper position as determined by the number of electrical impulses applied to the aforesaid set of coils 28.

All of the drums D operate in a manner similar to that just described. As a result, the system is highly efficient and rapid, particularly because in the restoration operation, the performance of a very simple act, namely, momentary energization of the set of coils 40 places the system in condition for a succeeding series of impulses. Therefore, in accordance with my invention, it is unnecessary to await return of the drums D to their "zero" positions before initiation of the succeeding impulses.

The limit switches 45, when provided, are arranged to open the circuit of any set of coils 28 of the drum D associated therewith should

an attempt be made to move the latter beyond the last indicating position. Improper displacements of the dials and over-tensioning of the return springs are thereby avoided.

While the invention has been described with respect to a certain particular preferred example which gives satisfactory results, it will be understood by those skilled in the art after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention and it is intended therefore in the appended claims to cover all such changes and modifications.

What is claimed as new and desired to be secured by Letters Patent is:

1. In combination, an indicia-bearing drum biased for movement in one direction about its axis, ratchet means for operating said drum, a member restraining said ratchet means for rotation in but one direction, a disk rotatable with said ratchet means, a plurality of levers radially disposed on one face of said disk for individually disengageably connecting said drum and said ratchet means, and means for simultaneously moving any lever connecting said drum and ratchet means into inoperative position and for moving the one of the remaining levers that is located in a position corresponding to the home position of the drum into connecting position.

2. In combination, an indicia-bearing drum, means for biasing said drum for movement in one direction about its axis, ratchet means for operating said drum, a member restraining said ratchet means for rotation in but one direction, a disk rotatable with said ratchet means, a plurality of levers of the first class radially disposed on one face of said disk for individually disengageably connecting said drum and ratchet means, and a member movably axially with respect to said disk, provided with means for engaging one end of a lever located in the home position of the drum for moving said lever into connecting position and with means engaging the opposite ends of the other levers for moving any one of said other levers into disconnecting position.

3. In combination, a rotatable indicator biased for rotational movement in one direction, rotatable driving means rotatable in a direction to move the indicator in the opposite direction from normal home position to a set-up position, cooperating means on said indicator and driving means for connecting said driving means to said indicator in any rotated position of said driving means and the home position of said indicator, and means for controlling said cooperating means to release said indicator to permit it to move into home position and to connect the indi-



cator in its home position and the driving means in its moved position.

4. In combination, a rotatable indicator biased for rotational movement in one direction to home position, a forwardly operable rotatable driving means, a disk driven from said driving means, a plurality of levers on said disk corresponding in number to the indicia positions on said indicator, a cooperating stop member on said indicator cooperating with an operated lever to arrest the indicator in home position and to move the disk forwardly to a new set-up position, means for operating said levers to break the cooperative relation between any lever and said indicator and to establish a cooperative relation between another lever and said indicator to arrest the indicator in home position and to move it forwardly on the next operation of the driving means.

5. In combination, a plurality of indicators biased for movement from a set-up position into home position, a forwardly operating driving means for each indicator, a plurality of connecting means between each driving means and its indicator for driving the indicator forwardly to a set-up position, means for simultaneously releasing operated connecting means to release said indicators and for simultaneously operating other of said connecting means to arrest the respective indicators in home position and drive the indicators forwardly during a new setting-up operation.

6. The combination of a plurality of rotatable indicators biased for movement in one direction, a common supporting rod for said indicators, a ratchet for each indicator, means for connecting each ratchet to its indicator in any rotated position of said operated means, and means for moving said rod for simultaneously releasing all of said connecting means between said operating means and said indicators, and for establishing new connections which limit the movement of the indicators in their home position and constitute connections for a subsequent operation of the indicators.

7. In combination, a rotatable indicator biased for rotation in one direction, a ratchet driving means for the indicator movable in one direction, a plurality of means associated with said ratchet means and indicator for establishing a driving connection between said driving means and said indicator, means for operating the connecting means corresponding to the zero position of the drum and the position of the ratchet opposite thereto, and means for releasing said connection in the operated position of the indicator and for establishing a new connection for limiting the movement of the indicator to its home position.

8. In combination, an indicator supporting frame, a rotatable indicator within said

frame, a rod slidably mounted in said frame, a ratchet slidably mounted on said rod and rotatably supporting said indicator, a hub on said ratchet extending through said indicator, a disk member supported on said hub on the opposite side of said indicator with respect to said ratchet, a series of connecting devices carried by said disk, a projection on said indicator adapted to be engaged by any one of said connecting devices, and means on said rod adapted upon movement of said rod to control said connections to disengage the indicator from said disk when the indicator is in moved position and to prepare a connection between the indicator and disk effective after the disk has moved into its home position.

In testimony whereof I have signed my name to this specification.

MERTON L. HASELTON.

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