

1,358,427.

A. EKMAN.
ADDING MACHINE.
APPLICATION FILED DEC. 10, 1919.

Patented Nov. 9, 1920.

3 SHEETS—SHEET 1.

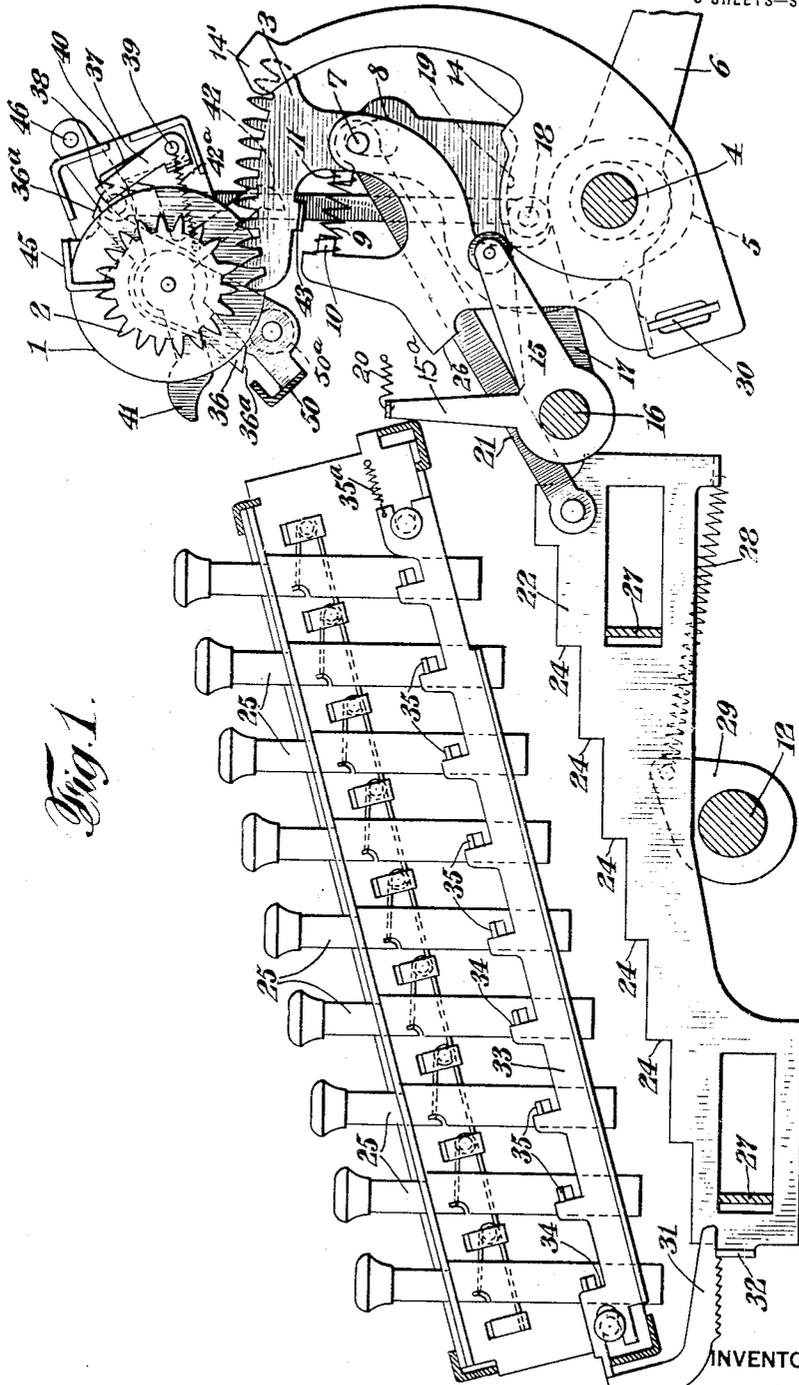


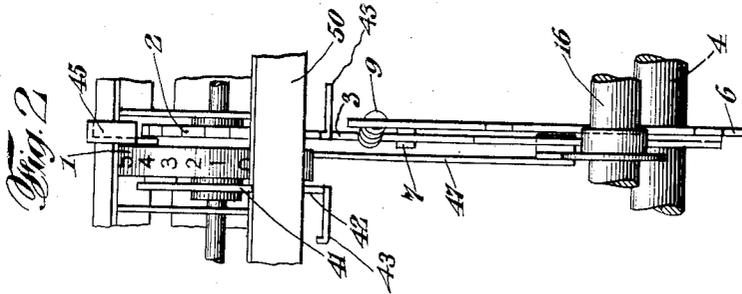
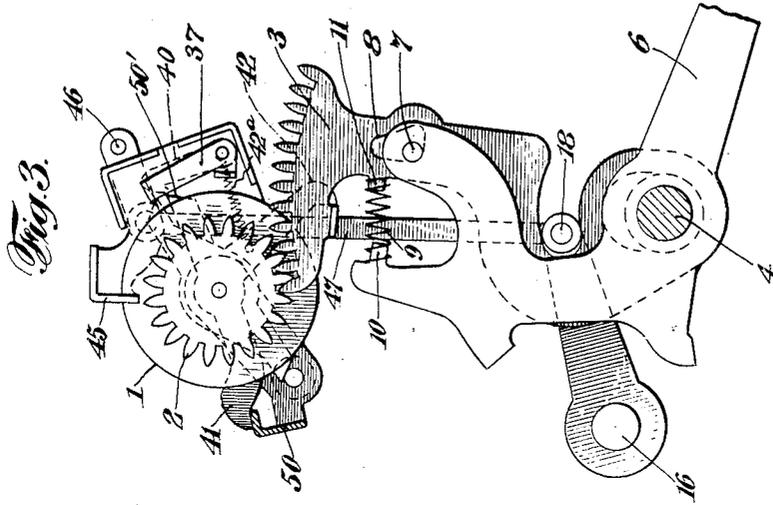
Fig. 1.

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Andrew Ekman
by
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3 SHEETS—SHEET 3.

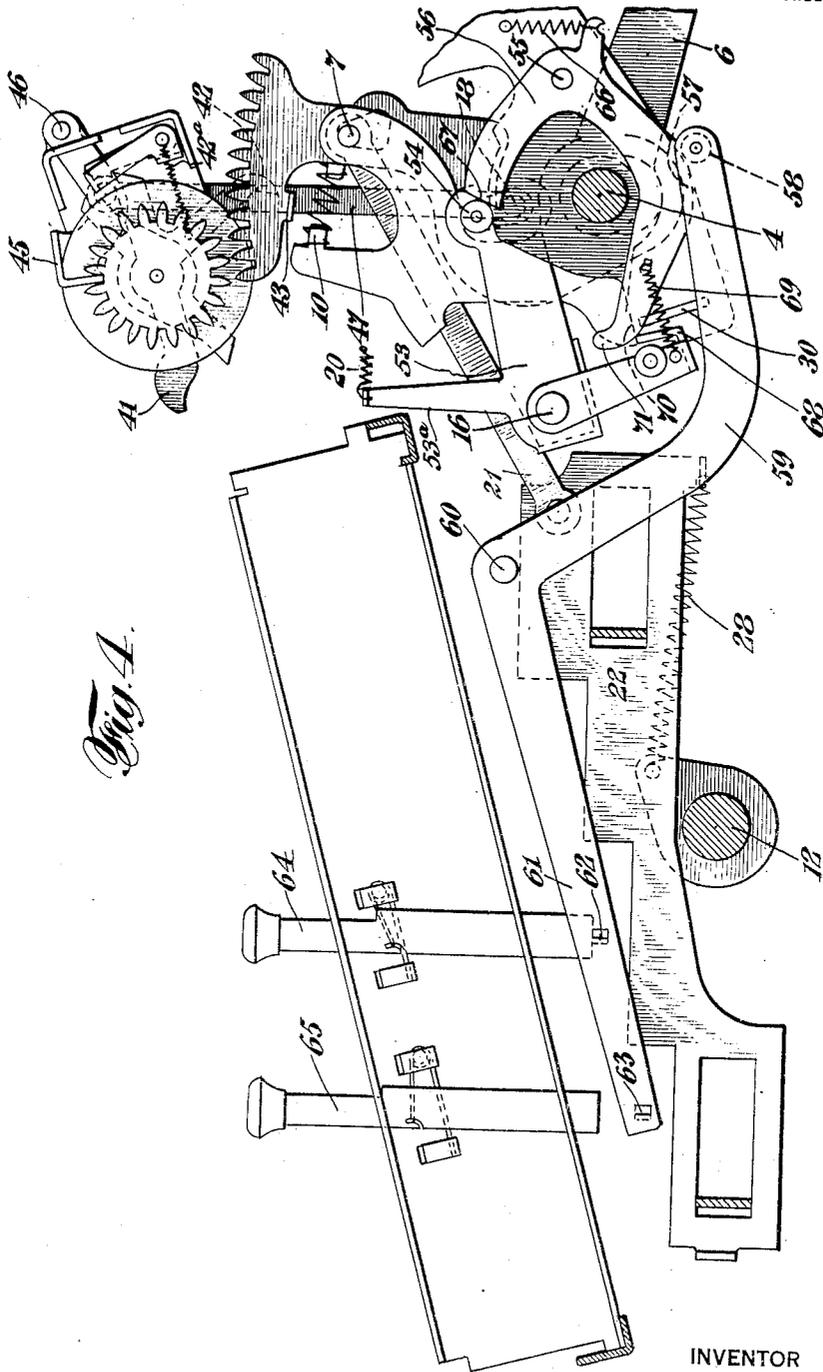


Fig. 1.

INVENTOR
Andrew Ekman
BY
Kenneth Kenyon,
his ATTORNEY

UNITED STATES PATENT OFFICE.

ANDREW EKMAN, OF NEWARK, NEW JERSEY, ASSIGNOR TO ACCOUNTING MACHINE COMPANY, INC., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

ADDING-MACHINE.

1,358,427.

Specification of Letters Patent.

Patented Nov. 9, 1920.

Application filed December 10, 1919. Serial No. 343,711.

To all whom it may concern:

Be it known that I, ANDREW EKMAN, a subject of the King of Sweden, and a resident of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Adding-Machines, of which the following is a specification.

My invention relates to adding machines and more particularly to carrying mechanism for such machines whereby whenever 10 has been accumulated in one column a zero will be indicated in that column and 1 carried automatically to the column of next higher order.

The principal object of the invention is to provide an efficient carrying mechanism which is of strong durable construction and can be manufactured at a comparatively low cost.

Other features, objects and advantages will be apparent from the following detailed description and appended claims.

The accompanying drawings forming a part of this specification illustrate two embodiments of my invention. In the drawings,

Figure 1 is a view in elevation of one embodiment of the invention.

Fig. 2 is a front elevation of a part of the same.

Fig. 3 is a side elevation of Fig. 2, and

Fig. 4 is a view in elevation of the other embodiment.

In the forms of the invention shown I employ a plurality of indicating or registering numerals or accumulator wheels 1 arranged to rotate about the same horizontal axis. Each of these numeral wheels has secured thereto a pinion 2. To actuate each of these numeral wheels I provide a sector 3 having its upper edge toothed so as to provide a rack adapted to mesh with the teeth in the corresponding pinion 2. The sectors 3 are mounted so as to be rotatable about the shaft 4 and also movable upwardly and downwardly with respect to the said shaft so as to permit the movement of the sectors into and out of mesh with the corresponding numeral or accumulator wheel pinions, the sectors in the construction shown being provided respectively with slots 5 through which the shaft 4 passes to permit such movement of the sectors. For moving the sectors about their axes suitable connections are provided

between the sectors and the levers 6 which are mounted for rotation on shaft 4. To this end each lever, as shown, is provided with a pin or projection 7 which extends into an opening 8 in the corresponding sectors 3, this opening being of such shape as to permit the engagement and disengagement of the sector 3 and the corresponding pinion 2 and also a limited rotation between the sector and lever corresponding to the travel of the sector sufficiently to rotate the corresponding numeral wheel one tooth. A compression spring 9 is interposed between the upper arm of the lever 6 and the corresponding sector 3. This spring, as shown, is a helical spring which is supported at its ends upon projection 10 upon the lever 6 and projection 11 on the sector 3.

The movement of the levers 6 and the up and down movement of the sectors 3 may be effected in any suitable way. In the drawings I have shown the invention as applied to the machine disclosed in the application of Edgar Maynard Camp, Ser. No. 338,600, filed Nov. 17, 1919. In said machine there is an operating shaft 12 which is arranged to oscillate the shaft 4 by suitable means (not shown). The latter shaft has secured thereto at opposite ends cams 14 arranged to lift arms 15 to rotate the shaft 16 in an anti-clockwise direction, referring to Fig. 1, the shaft 16 having secured thereto adjacent its ends arms 17 which carry a bail 18 arranged in arcuate slots 19 provided in the respective levers and shaped to permit free oscillation of the sectors about the shaft 4. When the shaft 4 is rotated in an anti-clockwise direction, referring to Fig. 1, the bail 18 is lifted and thereby lifts all of the sectors 3 into engagement with the corresponding numeral wheels. Suitable means, not shown, other than the cam 4 and its associated parts may be employed for holding the sectors in mesh with the numeral wheel pinions, as shown in the aforesaid application of Edgar Maynard Camp. While the sectors tend to move downwardly out of mesh by gravity I prefer to use spring 20 for insuring the movement of the sectors downwardly out of mesh with the numeral wheel pinions at the proper moment. As shown, one end of spring 20 is applied to an upwardly extending arm 15^a, integral with arm 15, the other end of the spring being fastened to the frame of the machine.

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For moving the sectors about the shaft 4 the desired amounts during the operation of accumulation I connect each sector 3 by a link 21 to an index slide 22 which, as shown, is stepped so as to provide vertical stop faces 24, each one of which is adapted to engage the lower rear portion of a key stem 25 when a key is depressed. There are, as shown, a number of keys 25 arranged in each column and there is a stop face 24 for each key in each column or bank except the uppermost key which corresponds to the number 9, it being understood that the keys beginning at the lower end of the column represent consecutively numerals from 1 to 9. The forward movement of the index slide 22 toward the 9 key may be limited by engagement of the projection 26 on the lever 6 with the shaft 16. The index slide 22 is mounted for forward and backward movement on supports 27 and a spring 28 connecting each index slide and an arm 29 on the shaft 12 tends to move the corresponding index slide and its sector 3 forwardly when the shaft 12 is rotated in an anti-clockwise direction. Accordingly when a numeral key 25 has been depressed and the bail 30 connected to the cams 14 adjacent opposite ends of the shaft 4 is rotated with the shaft 4 in an anti-clockwise direction following the movement of the shaft 12 in the same direction, the springs 28 move the corresponding index slides 22 forwardly until the latter are brought into engagement with their corresponding stops, depending upon which key is depressed. To prevent movement of the index slides forwardly in a manner to effect the numeral wheels 1 when no key is depressed, there is provided for each index slide an initial stop 31 contacting with the lateral projection 32 on the index slide. When a key is depressed this stop is moved upwardly out of operative relation with respect to the projection 32 by a slide 33 which is movable forwardly upon the depression of a key by the co-action of a projection 35 on a key stem with an inclined or cam surface 34 upon the slide. A spring 35^a tends to hold each of the initial stop slides in rear or inoperative position.

For effecting the carrying from a numeral wheel to the numeral wheel of the next higher order, I provide each numeral wheel with a cam 36 having a cam face for each multiple of ten numbers found around the periphery of the numeral wheel. In the device as shown two sets of ten numbers are provided around the periphery of each numeral wheel and each cam 36 is double ended, that is it is provided with a cam face 36^a at each end. These cams rotate with the numeral wheels or dials in the path of totaling dogs 37 which have ears 38 bent over into the path of the corresponding cams 36. These dogs 37 are pivoted to oscil-

late about the axis of a shaft 39 and each has connected thereto a hook 40 which is rotatable with the dog and normally engages the rear end of the carrying latch lever 41. It follows that the rotation of the numeral wheel 180° or more in an anti-clockwise or adding direction from the zero or clear position shown in Fig. 1 will cause a cam face 36^a to pass by and thus move the corresponding totaling dog 37 rearwardly, thus releasing the hook 40 from the carrying lever. Each of the carrying levers 41 is formed with a hook shaped lower portion 42 normally engaging a lug 43 on the corresponding index sector. The hook 42 acts with the sector for the numeral wheel to the left of that which carries the corresponding cam 36; so that when the cam 36 of any numeral wheel operates to effect the carrying operation the hook 42 is released for the sector of next higher order. A spring 42^a tends to move lever 41 and hook 42 in an anti-clockwise direction into inoperative position.

In operation the sectors 3 having been properly indexed by the indexing mechanism including the key stems and index slides during the anti-clockwise movement of the shafts 12 and 4 and the sectors 3 having been moved into mesh with the pinions 2, during the return movement of the shafts 12 and 4 in a clockwise direction the bail 30 picks up and moves the levers 6 back toward their normal position shown in Fig. 1, rotating the numeral wheel pinions and corresponding numeral wheels distances depending upon the indexing on the key board by key stems 25. During this movement the sectors 3 are moved by the lever 6 through the springs 9, the pins 7 being in engagement with the left hand wall of opening 8. When the sectors reach their normal positions they are held in position by the hooks 42 unless a "carry" is to take place, the springs 9 having been compressed and the projection 7 engaging the right hand edge of the opening 8. If, however, any of the hooks 42 have been released as described above to effect a carry to a particular numeral wheel, the corresponding sector 3 instead of being held by the hook 42 is permitted to rotate a distance farther, sufficient to rotate the corresponding numeral wheel one number. The additional movement of the sector to effect this carrying is limited by the engagement of the left hand wall of the opening with the pin or projection 7, as shown in Fig. 3, which shows the mechanism immediately after a "carry."

To restore the carrying levers 41 to their latched position with respect to the hooks 37, I provide a bail 50 arranged under the forward ends of the levers 41 and pivoted for movement about the same axis as the numeral wheels. This bail which is nor-

mally lowered sufficiently to permit the desired movement of the carrying lever for the carrying operation, is arranged to be elevated at its forward end by co-action of the cam surface 14', with the rollers 50^a on the forward portion of the bail. This movement of the lever causes its inclined rear edge 50' to cam the hook 37 rearwardly until the rear end of the lever has been lowered sufficiently to permit the hook to fall into latching engagement with the lever.

An alining bail 45 is pivoted at 46 and is connected intermediate its ends by links 47 to the bail 18, the arrangement being such that whenever the sectors 3 are moved into mesh with the numeral wheel pinions the alining bail is moved out of mesh with said pinions and whenever the sectors 3 are moved downwardly out of engagement with the numeral wheel pinions the alining bail 45 is moved downwardly into operative position as shown in Fig. 1 between adjacent teeth of each of the numeral wheel pinions to thereby hold the latter in alinement.

In the modification shown in Fig. 4 I have provided novel means whereby during the totaling operation the sectors may be moved directly up into mesh with the pinions of the numeral wheels without rotation of the sectors about the axis of the shaft 4. Such rotation, if it were permitted would interfere with the proper meshing of the sectors and the pinions and also with the disengagement of the alining bail 45.

In the device shown in Fig. 4 the construction and mounting of the numeral wheels, the sectors, the means for rotating the sectors and the means for effecting the added increment of movement of the sectors for the carrying operation are the same as in Fig. 1. In place, however, of the means shown in the said figure for elevating the sectors, I provide at the sides of the machine arms 53 pivoted for rotation about the axis of shaft 16, the said arms carrying the lifting bail 18 and each of said arms being also provided with a roller 54 which coacts with the adjacent cam 14 whereby the cams are adapted to lift said arms 53 and the sectors. Spring 20 connected at one end to arms 53^a integral with arms 53 and at the other end to the frame of the machine tend to rotate said arms in a clockwise direction.

Pivoted to the cam 14 at 55 is an auxiliary cam 56 which has a lower portion 57 resting upon a roller 58 which is carried by a lever 59. The lever 59 is pivoted at 60 and has a forwardly extending arm 61 which is provided with projections 62 and 63 arranged respectively under the total key 64 and subtotal key 65. A spring 66 tends to rotate the cam 56 about its pivot 55 so as to force the rear end of lever 59 downwardly and the forward end of said lever 65 upwardly. The cam 56 is provided with a

cam surface 67 which is arranged to coact with the roller 54 to lift the arm 53 and its sectors upon the rotation of the cam about the shaft 4 when the forward portion of the cam 56 is elevated as shown in Fig. 4 but to permit the cam 56 to move under the roller 67 without lifting the arms 53 and the sectors when the forward portion of the cam 56 is in lower or normal position. Pivotaly mounted on the shaft 16 is a bail 68 adapted to be drawn forward by a spring 69 to engage under the surfaces 70 of the converging levers 6 to limit the anti-clockwise movement thereof, referring to Fig. 4, when the forward portion of the cam 56 is in elevated position, as shown in Fig. 4. Said cam is provided with a forwardly extending part 71 which is adapted to engage the bail 68 when the forward portion of the cam 56 is moved downwardly, forcing said bail from under the surface 70 of the converging levers.

During the ordinary operation of accumulation when no total or subtotal is taken, the forward portion of the cam 56 is in its lowered position and does not effect the operation of engaging or disengaging the sectors and numeral wheels, the cam surface 67 being below the roller 54 and the part 71 holding the bail 68 out of operation. When, however, either the total or subtotal key is depressed in taking a total or subtotal the forward end of the cam 56 is elevated and the bail 68 engages under the surface 70 of the converging levers to thereby prevent rotation of the latter and of the sectors. The rotation of the shaft 4 and of the cams 14 and 15, however, takes place in an anti-clockwise direction, the surface 67 wedging the roll 54 upwardly and causing the engagement of the sectors with the numeral wheel pinions. There is thus provided a portion of the movement of the shaft 4 and the cams carried thereby for causing the wedging action of the surface 67 upon the roller 54 without producing the objectionable rotation of the sectors during engagement of same with the numeral wheel pinions. When the said cams have rotated a predetermined extent, the part 71 of the cam 56 comes into engagement with the bail 68 and forces the latter out of engagement with the surfaces 70 of the converging levers 6 and permits the movement of the said levers in an anti-clockwise direction under the action of the springs 28 applied through index slides 22 and links 21 until the numeral wheel pinions have been rotated to bring the flat under surfaces of the rear cams 36 into engagement with the tops of the projections 38 on the dogs 37, thus clearing the machine. This operation also through printing mechanism (not shown) places the type (not shown) in position for printing a total or subtotal. The mecha-

nism for these printing operations may be the same as disclosed in the aforesaid application of Edgar Maynard Camp.

The engagement and disengagement of the sectors and numeral wheels during the movement of shafts 4 and 12 may be maintained and controlled by any suitable means (not shown), for example, as disclosed in the aforesaid application of Edgar Maynard Camp.

While I have shown but two embodiments of my invention it is to be understood that many modifications and changes may be made without departing from the spirit of my invention.

Having thus described my invention what I claim and desire to secure by Letters Patent is:—

1. The combination of a plurality of members arranged to indicate different columns of an accumulation, actuators for said members, a shaft on which said actuators are mounted for pivotal movement and also movement into and out of operative relation to said indicating members, means including a lever pivoted for movement about the axis of said shaft for effecting the pivotal movement of each of said actuators, means for effecting the movement of said actuators into and out of operative relation to said indicating means, and automatic means for effecting the pivotal movement of one of said actuators and the corresponding movement of its indicating member a limited extent farther than normal when the indicating member of the next lower order has accumulated a predetermined amount.

2. The combination of a plurality of members arranged to indicate different columns of an accumulation, actuators for said members, a lever for moving each of said actuators to operate said members, each of said levers having a connection with the corresponding actuator permitting movement of the actuator into or out of operative relation to its indicating member, and automatic means for effecting a movement of one of said actuators and the corresponding movement of its indicating member a limited extent farther than normal when the indicating member of the next lower order has accumulated a predetermined amount.

3. The combination of a plurality of members arranged to indicate different columns of an accumulation, actuators for said members, a lever for moving each of said actuators to operate said members, each of said levers having a connection with the corresponding actuator permitting movement of the actuator into or out of operative relation to said indicating members, and also permitting a limited movement between the actuator and lever in the direction to move the corresponding indicating member, and automatic means for effecting the movement

of one of said actuators relatively to the corresponding lever to cause the movement of one of said actuators and the corresponding movement of its indicating member a limited extent farther than normal when the indicating member of the next lower order has accumulated a predetermined amount.

4. The combination of a plurality of members arranged to indicate different columns of an accumulation, actuators for said members, a lever for moving each of said actuators to operate said members, each of said levers having a connection with the corresponding actuator permitting movement of the actuator into or out of operative relation to said indicating members, and also permitting a limited movement between the actuator and lever in the direction to move the corresponding indicating member, a spring tending to hold each actuator and its lever in predetermined relative position in the direction of said limited movement, and means controlling the movement of the actuators relatively to the corresponding levers to cause the movement of one of said actuators and the corresponding movement of its indicating member a limited extent farther than normal when the indicating member of the next lower order has accumulated a predetermined amount.

5. The combination of a plurality of members arranged to indicate different columns of an accumulation, actuators for said members, a lever for moving each of said actuators to operate said members, each of said levers having a connection with the corresponding actuator permitting movement of the actuator into or out of operative relation to said indicating members, and also permitting a limited movement between the actuator and lever in the direction to move the corresponding indicating member, a compression spring tending to hold each actuator and its lever in predetermined position in the direction of said limited movement, and means controlling the movement of the actuators relatively to the corresponding levers to cause the movement of one of said actuators and the corresponding movement of its indicating member a limited extent farther than normal when the indicating member of the next lower order has accumulated a predetermined amount.

6. The combination of a plurality of members arranged to indicate different columns of an accumulation, actuators for said members, means for causing the movement of said actuators into and out of operative relation to said indicating members, means for moving said actuators to cause said indicating members to move a desired extent, means tending to automatically cause said actuators to assume a predetermined position relatively to said last named moving means, a carrying lever provided with means for

resisting such automatic means, and tending normally to move said resisting means away from operative position, means for normally holding said lever against such movement, and means for releasing said holding means.

5 7. The combination of a plurality of members arranged to indicate different columns of an accumulation, actuators for said members, means for causing the movement of said actuators into and out of operative relation to said indicating members, means for aligning said indicating members arranged to be moved into or out of operative position when said actuators are respectively moved
10 out of and into operative relation to said indicating members, means for moving said actuators to cause said indicating members to move a desired extent, means tending to automatically cause said actuators to assume a predetermined position relatively to said last named moving means, a carrying latch lever provided with means for resisting such automatic means, and tending normally to move said preventing means away from operative position, means for normally holding said lever against such movement, and means for releasing said holding means.

8. The combination of a plurality of members arranged to indicate different columns of an accumulation, actuators for said members, means for causing the movement of said actuators into and out of operative relation to said indicating members, during accumulation, other means for causing said actuators to move into and out of operative relation to said indicating members during the taking of a total or subtotal, common operating means for both of the aforementioned means, means for preventing movement of said actuators in a direction to operate said indicating members during the movement of said actuators into and out of operative relation to said members in the taking of a total, and means for rendering said preventing means inoperative.

9. The combination of a plurality of members arranged to indicate different columns of an accumulation, actuators for said members, means for causing the movement of said actuators into and out of operative relation to said indicating members, during accumulation, other means comprising a cam for causing said actuators to move into and out of operative relation to said indicating member during the taking of a total or subtotal, common operating means for both of the aforementioned means, means preventing movement of said actuators in a direction to operate said indicating members during the movement of said actuators into and out of operative relation to said members during the taking of a total or subtotal, and means for rendering said preventing means inoperative.

10. The combination of a plurality of

members arranged to indicate different columns of an accumulation, actuators for said members, means for causing the movement of said actuators into and out of operative relation to said indicating members, during accumulation, other means comprising a cam for causing said actuators to move into and out of operative relation to said indicating member during the taking of a total or subtotal, said cam being mounted for movement into and out of operative position, means preventing movement of said actuators in a direction to operate said indicating members during the movement of said actuators into and out of operative relation to said members, and means for rendering said preventing means inoperative.

11. The combination of a plurality of members arranged to indicate different columns of an accumulation, actuators for said members, means for causing the movement of said actuators into and out of operative relation to said indicating members, during accumulation, other means including a cam for causing said actuators to move into and out of operative relation to said indicating members during the taking of a total or subtotal, means preventing movement of said actuators in a direction to operate said indicating members during the movement of said actuators into and out of operative relation to said members, and means connected to said cam for rendering said preventing means inoperative.

12. The combination of a plurality of members arranged to indicate different columns of an accumulation, actuators for said members, a total key means for causing said actuators to move into and out of operative relation to said indicating members during the taking of a total, means rendered operative by the operation of said key for preventing movement of said actuators in a direction to operate said indicating members during the movement of said actuators into and out of operative relation to said members, and automatic means for rendering said preventing means inoperative.

13. The combination of a plurality of members arranged to indicate different columns of an accumulation, actuators for said members, means comprising a cam for causing said actuators to move into and out of operative relation to said indicating member during the taking of a total or subtotal, said cam being mounted for movement into and out of operative position, means preventing movement of said actuators in a direction to operate said indicating members during the movement of said actuators into and out of operative relation to said members, and automatic means for rendering said preventing means inoperative.

14. The combination of a plurality of

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members arranged to indicate different columns of an accumulation, actuators for said members, a shaft on which said actuators are mounted for pivotal movement and for movement into and out of engagement with said indicating members, means including a lever pivoted for movement about the axis of said shaft for effecting the pivotal movement of each of said actuators, and automatic means for effecting the pivotal movement of one of said actuators and the corresponding movement of its indicating member a limited extent farther than normal when the indicating member of the next lower order has accumulated a predetermined amount.

15. The combination of a plurality of members arranged to indicate different columns of an accumulation, actuators for said members, an operating member for moving each of said actuators to operate said members, each of said operating members

having a connection with the corresponding actuator permitting movement of the actuator into or out of operative relation to said indicating members, and also permitting a limited movement between the actuator and operating member in the direction to move the corresponding indicating member, means tending to hold each actuator and its operating member in predetermined relative position in the direction of said limited movement, and means controlling the movement of the actuators relatively to the corresponding operating members to cause the movement of one of said actuators and the corresponding movement of its indicating member a limited extent farther than normal when the indicating member of the next lower order has accumulated a predetermined amount.

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

ANDREW EKMAN.