T. CARROLL.

CASH REGISTER.

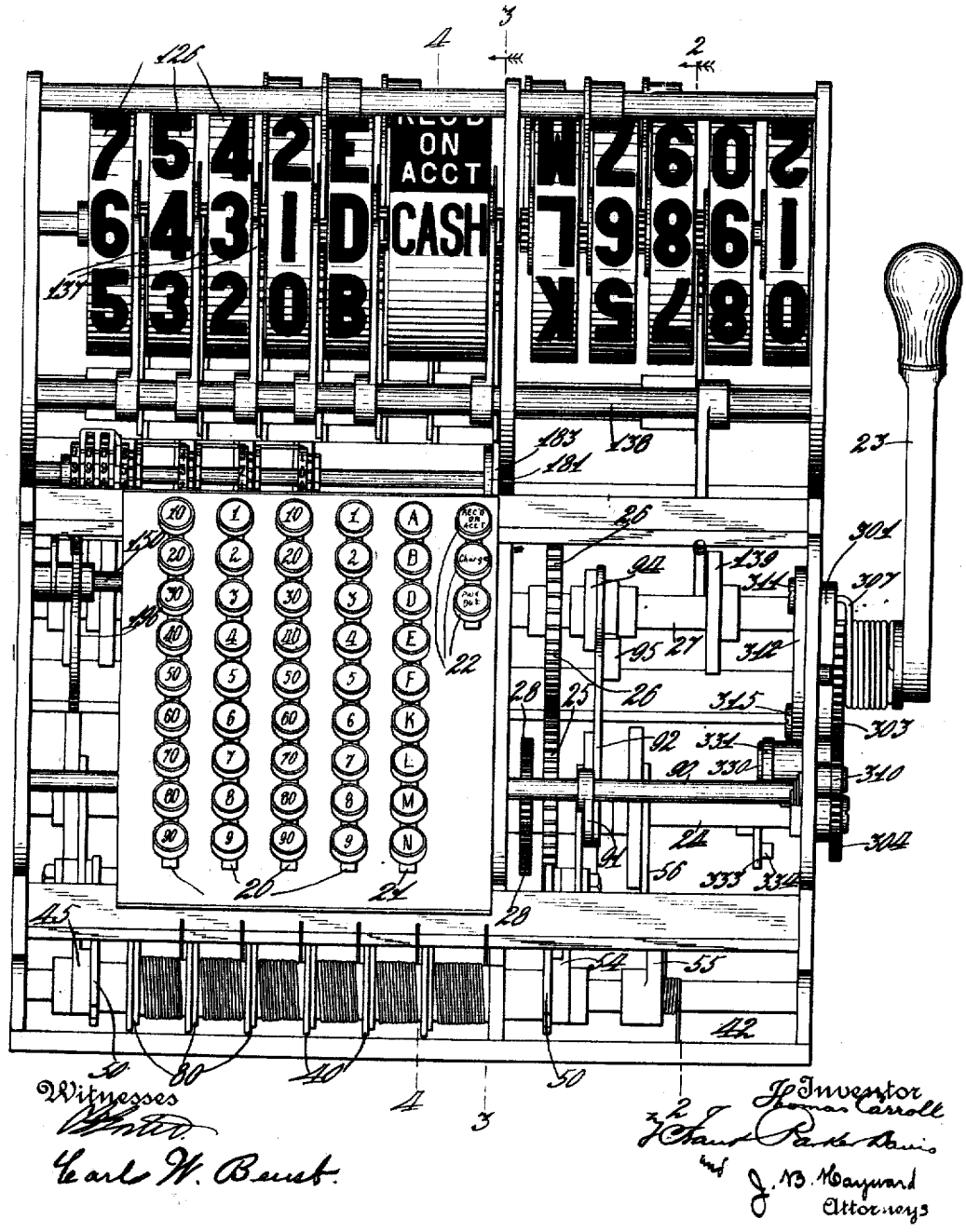
APPLICATION FILED AUG. 14, 1905.

1,017,079.

Patented Feb. 13, 1912.

8 SHEETS—SHEET 1.

Fig. 1.



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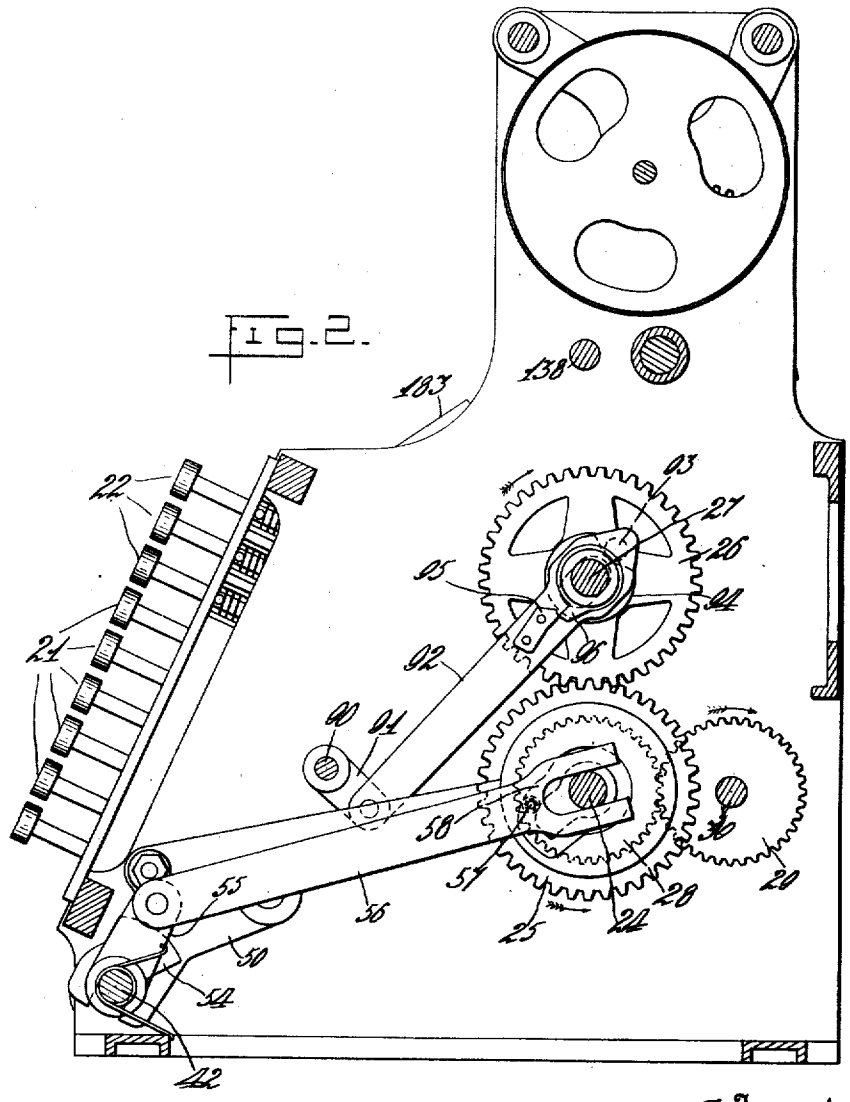
8 SHEETS—SHEET 2.

FIG. 2.



Witnesses

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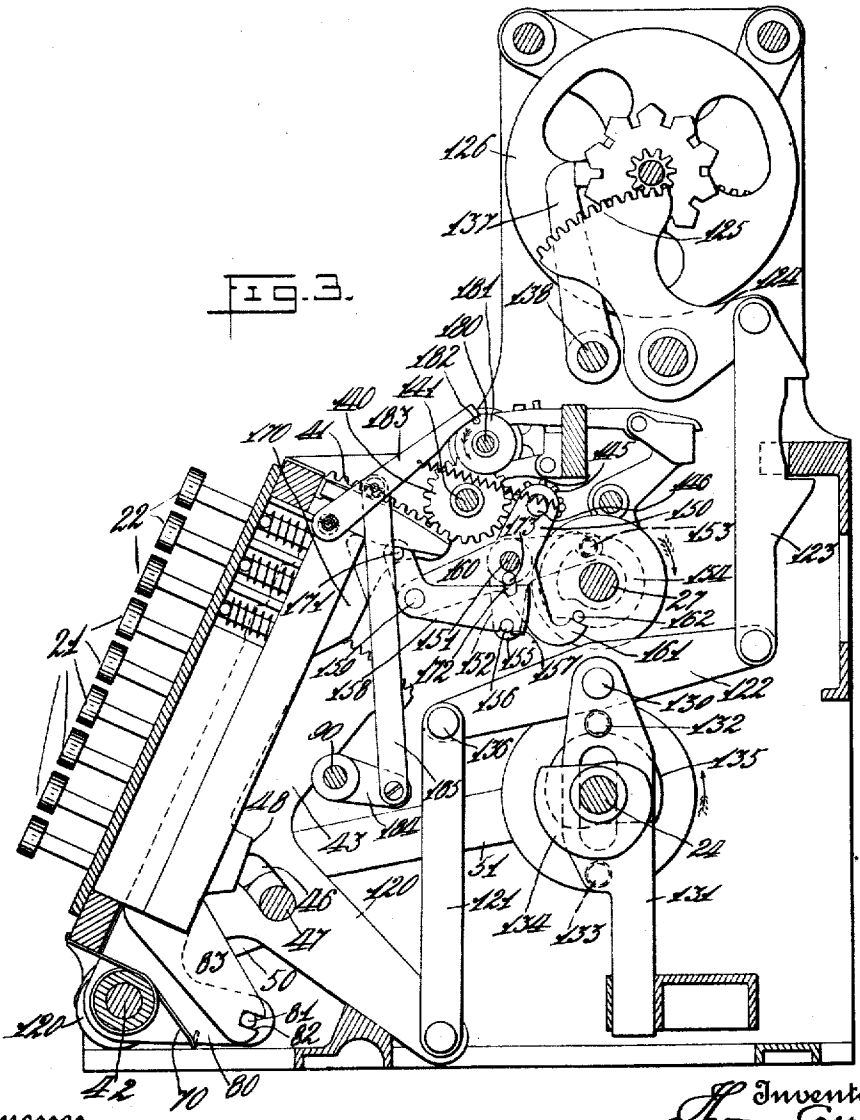
8 SHEETS—SHEET 3.

Fig. 3.



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8 SHEETS—SHEET 4.

Fig. 4a.

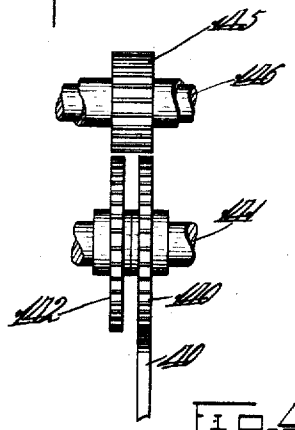

Fig. 4.

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8 SHEETS—SHEET 5.

Fig. 5b

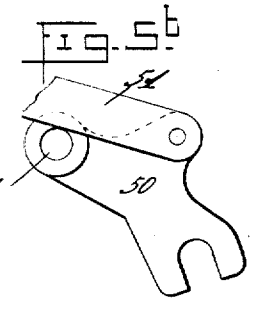

Fig. 5a

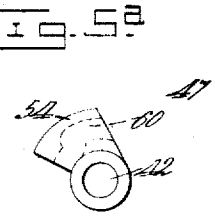

Fig. 5.

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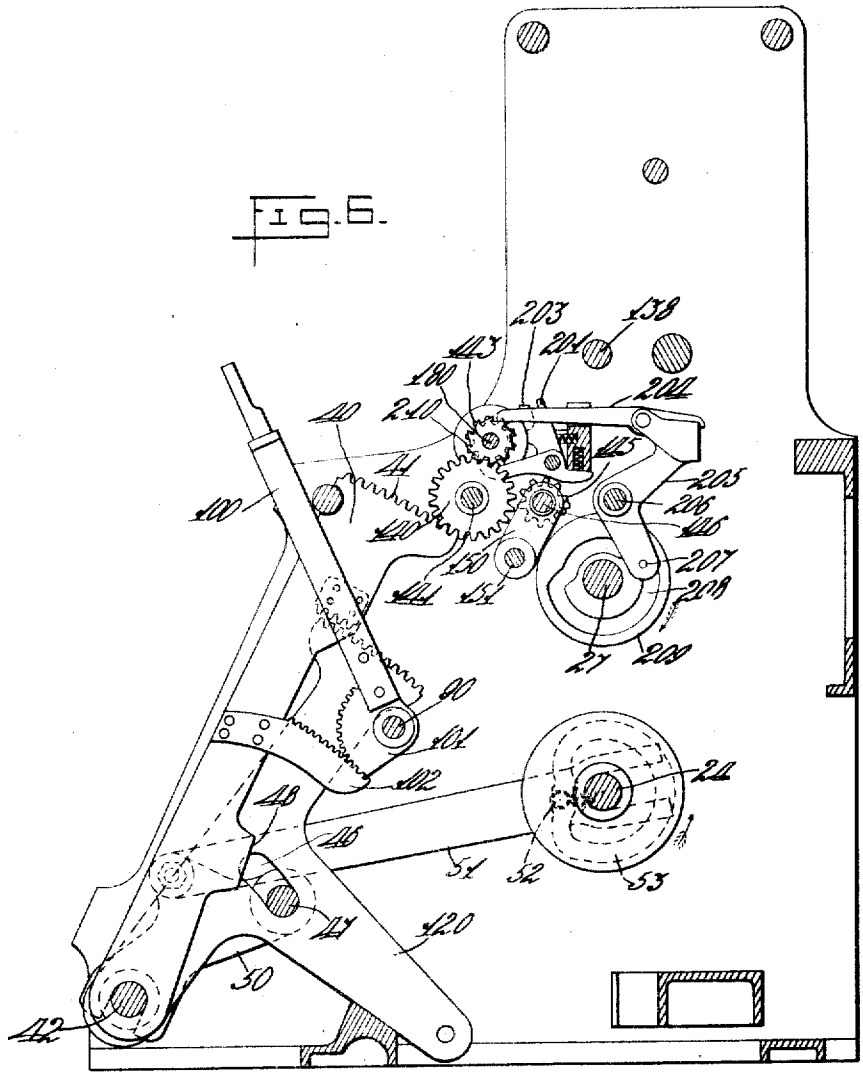
8 SHEETS—SHEET 6.

Fig. 6.



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8 SHEETS—SHEET 7.

Fig. 7a.

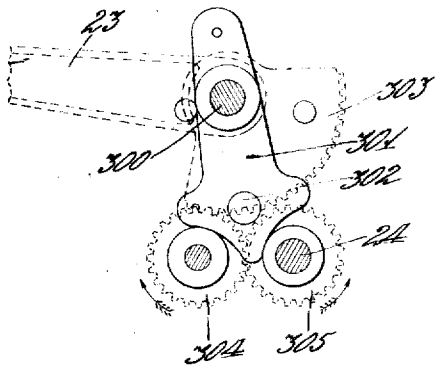

Fig. 7.

Witnesses

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8 SHEETS—SHEET 8.

Fig. 9.

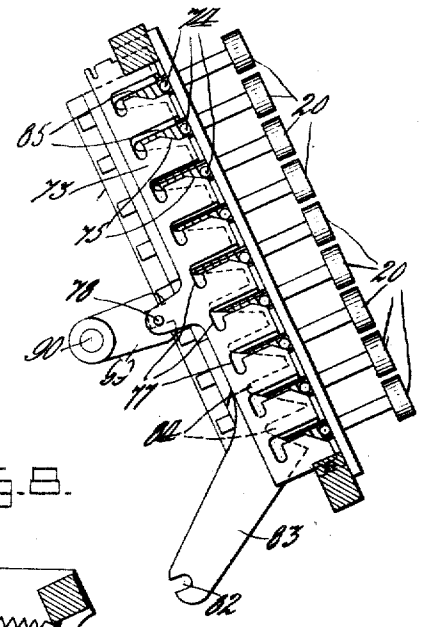

Fig. 8.

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UNITED STATES PATENT OFFICE.

THOMAS CARROLL, OF DAYTON, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE NATIONAL CASH REGISTER COMPANY, OF DAYTON, OHIO, A CORPORATION OF OHIO, (INCORPORATED IN 1906.)

CASH-REGISTER.

1,017,079. Specification of Letters Patent. Patented Feb. 13, 1912.

Application filed August 14, 1905. Serial No. 274,099.

To all whom it may concern:

Be it known that I, THOMAS CARROLL, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Cash-Registers, of which I declare the following to be a full, clear, and exact description.

This invention relates to improvements in cash registers more particularly to that type in which manipulative means are first adjusted according to the nature of the transaction to be entered upon the machine and the completion of the operation of the machine is effected by means of the subsequent actuation of a driving device such as a crank handle or operating lever, and it is among the various objects to provide certain improvements in connection with the setting and operation of certain elements differentially to secure the customary differential extents of movements ordinarily utilized in machines of this character for actuating accounting devices or indicating devices, and it is also one of the objects to provide a novel form of driving mechanism for the machine.

With these and incidental objects in view, the invention consists in certain novel features of construction and combinations of parts, the essential elements of which are set forth in appended claims and a preferred form of embodiment of which is hereinafter specifically described with reference to the drawings which accompany and form part of this specification.

Of said drawings: Figure 1 represents a front elevation of the cash register to which these improvements are applied. Fig. 2 represents a cross section of the machine on the line 2—2 of Fig. 1 looking in the direction of the arrow crossing said line, certain of the operating parts of the machine being hidden by an intervening supporting frame of the machine. Fig. 3 represents a vertical cross section of the machine approximately on the line 3—3 of Fig. 1 looking in the direction of the arrow crossing said line, this section being just inside the above mentioned intervening supporting frame. Fig. 4 represents a vertical section on the line 4—4 of Fig. 1, being adjacent to the bank of clerks' keys. Fig. 4ª represents a detail view of certain companion gear wheels and an idle pinion for coupling the same together, in connection with the counter actuating mechanism. Fig. 5 represents a vertical section of the machine just inside the left-hand side frame of the machine. Figs. 5ª and 5ᵇ represent detail views of mechanism connected with the restoring frame. Fig. 6 represents a modified form of manipulative device for setting the actuating elements differentially. Fig. 7 represents a side elevation of the right-hand end of the machine showing the operating lever. Fig. 7ª represents a detail view of the operating lever in the extremity of its downward operating movement. Fig. 8 represents a detail view of mechanism just inside the right-hand side frame of the machine and forming part of the driving mechanism. Fig. 9 represents a detail view of a portion of the key board and the key detents.

Referring to said drawings, in Fig. 1 it will be seen that there are four banks of amount keys 20, a bank of clerks' keys 21 and three special transaction keys 22, these keys representing the usual special transactions such as "received on account," "charge," and "paid out." After the desired keys have been depressed for the entry of any particular transaction, the operation of the machine is completed by means of an oscillating operating lever 23. The intermediate connections between this lever and the driving shafts of the machine are of a certain novel form by which the oscillatory movements of the lever are transformed into a continuous rotary movement of a driven shaft, all of which mechanism will be described in detail later, it being sufficient to state at present that upon a complete oscillation of the lever downward and backward, one complete revolution is given to a main lower operating shaft 24 (see Fig. 2) which shaft has fast upon it a gear wheel 25 meshing with a gear wheel 26 fast upon an upper operating shaft 27. There is fast upon the lower shaft 24 another gear wheel 28 (see also Fig. 1) which meshes with a gear wheel 29 fast upon an auxiliary operating shaft 30, the purpose of which shaft will be explained later. All of these shafts are driven by said operating lever and are

given one complete rotation at each operation of the machine in the direction shown by the arrows in Fig. 2.

Situated in the rear of each bank of amount keys 20 is a main actuating element 40 (see Fig. 5) in the shape of a lever having at its upper end a segmental rack 41 for the purpose of actuating the accounting devices as later to be described, this lever being pivoted loosely about a transverse shaft 42 at the lower forward part of the machine. This main actuating element 40 is adapted to be positioned differentially rearward under the control of the amount keys and then to be restored to normal forward position, during which restoration it is coupled up to an auxiliary setting segment 43 which is also pivoted loosely upon the transverse shaft 42, having a slotted connection with said shaft permitting the segment to be raised vertically. The upper end of this segment 43 is formed with a segmental rack 44 adapted to engage the teeth of a projection 45 formed on the side of the corresponding lever 40. The segment 43 is also formed at its middle portion with a slot 46 through which extends a transverse restoring bar 47. Each of the amount actuating levers 40 is formed on its rearward edge with a restoring shoulder 48 which projects in proximity to the restoring bar 47. This restoring bar is carried between the two arms 50 of a restoring frame, these arms being bifurcated at their lower ends to straddle the aforesaid shaft 42. The exact shape of one of these arms 50 is shown in detail in Fig. 5[b]. Extending from said arm is a link 51 carrying at its rearward end a pin 52 projecting into a cam groove 53 formed in a disk fast upon the lower operating shaft 24 so that upon the operation of the machine the link 51 will be reciprocated forward thereby carrying forward the restoring bar 47 which strikes upon the shoulders 48 of all of the actuating levers which have been moved rearward and of course restores said levers to normal forward position, and then the restoring frame is rocked backward to normal rearward position, but the actuating levers remain latched in normal position by means to be described. This restoring frame however is given a slight upward movement prior to its movement of restoration, for the purpose of causing the auxiliary segments 43 to be coupled to the actuating levers 40 when the latter are restored to normal. It is to be understood that there is an arm 50 and a rocking link 51 at opposite sides of the machine for rocking the restoring bar 47, and adjacent to each arm 50 is a lifting cam 54, shown in detail in Fig. 5[a]. Each of these lifting cams is fast upon the aforesaid shaft 42, and at the right-hand end of the machine as shown in Fig. 2 there extends upward from this rock shaft 42 an arm 55 to which is pivoted a link 56 having at its rearward end a pin 57 playing in a cam groove 58 formed in a disk fast upon the lower operating shaft 24, so that upon the operation of the machine the link 56 will be drawn rearward and the shaft 42 rocked so as to rock both of the lifting cams 54 rearward. These cams are formed with cam grooves 60 (see Figs. 5 and 5[a]) into which project pins 61 extending from the sides of the restoring frame arms 50, so that when the shaft 42 is rocked and the lifting cams 54 also rocked rearward, the entire restoring frame will be raised slightly and thereby the restoring rod 47 will also be raised slightly, and since the auxiliary segments 43 rest upon said restoring bar by reason of their slotted connections 46 therewith, the entire series of auxiliary segments 43 will by this means be elevated slightly so as to carry their rack teeth 44 into mesh with the projections 45 so that upon the subsequent movement of restoration of the bar 47, the restoring movement of all of the actuated levers will carry with them their respective auxiliary segments 43, of course transmitting thereto differential extents of movement exactly equal to the differential displacement of the actuating levers rearward, this differential movement of the auxiliary segments being in the present instance utilized for the setting of the indicators as will presently be explained, although of course this differential movement could be utilized for various other purposes for performing the various functions necessary in a cash register. Near the end of the operation of the machine the lifting cams 54 are again rocked forward thereby permitting the restoring frame to descend to uncouple the auxiliary segments 43 from their actuating levers and then the restoring frame is again rocked rearward to normal position and the restoring bar acts to return all of the segments 43 to normal rearward position. In Fig. 5 the 7 key of the left-hand bank of the amount keys is shown depressed and the actuating lever 40 therefore pushed rearward to a certain extent preparatory to its restoration to normal position upon the operation of the machine.

The control of the differential setting movements of the actuating levers 40 by means of the amount keys will now be described. Each lever 40 is normally under the tension of a spring 70 (see Fig. 5) surrounding the shaft 42 and tending to force the upper end of the lever rearward. A lug 71 formed on the upper end of the lever has a tooth adapted to engage a notch 72 formed in the upper end of a key detent plate 73. Key pins 74 extending from the sides of the shanks of the amount keys are adapted to

strike beveled projections or noses 75 formed on the detent plate 73 so as to shift said plate downward when any key is depressed, and this shifting downward of the detent plate will withdraw the notch 72 from engagement with the tooth of the projection 71 and of course release the actuating lever 40 and permit the same to spring rearward; but it will be observed that these beveled noses 75 are differentially graded so that the key pins of the different keys act upon the detent plate at different times with respect to the extent of key movement, and thereby unlatch the actuating lever 40 at different times according to the value of the key depressed, that is, since the 1 key is the uppermost key in the bank, its key pin is arranged so as to strike the projection 75 only near the extremity of the initial movement of the key and thereby the lever 40 will be released only near the end of the movement of depression of the 1 key, whereas the 2 key will release the lever somewhat sooner and the 3 key still sooner and so on. Thus since the 1 key is to effect the movement of the actuating lever 40 only to one degree rearward, it is not necessary to release the lever until near the end of the movement of the key whereas for the 9 key in this bank, the lever 40 is to have a much greater extent of rearward movement and of course must be released almost as soon as the 9 key is depressed.

The ends of the key shanks may be utilized actually to strike against the setting lever 40 to force the same positively rearward, but the springs 70 are intended to obviate the necessity of this actual contact of the keys with the levers 40 and thus remove from the keys the work of forcing the levers 40 rearward. In order to limit the rearward extent of movement of the lever differentially according to the value of the key depressed, each lever at its lower end has extending rearwardly therefrom an arm 80 carrying a pin 81 which extends into a notch 82 formed in the end of a stop plate 83 (see Fig. 9), which stop plate is situated side by side with the aforesaid detent plate 73 and is formed with differentially graded notches 84, the upper walls 85 of these differentially graded notches being parallel to the key shanks but being normally at different distances from the key pins 74. When any setting lever 40 is released in the manner just described by the depression of any amount key, the rearward movement of the lever causes the rearward arm 80 to descend and this arm shifts downward the stop plate 83 and brings the upper wall 85 of the notch 84 corresponding to the key depressed, against the key pin of the depressed key so that thereby the further rearward movement of the actuating lever 40 is prevented and in this manner the lever may be given different extents of movement according to the value of the key depressed. The key pin of any depressed key strikes the bottom of the notch 84 when the key is completely depressed and from the differential grading of these notches it will be seen that no two keys can be simultaneously depressed since the stop plate 83 is moved different extents by the different keys so that no two keys could be simultaneously seated at the extremities of their notches 84, and it requires the full depression of the keys to bring the key pin into alinement with the usual angular slot 77 formed in the detent plate 73 to latch the key in depressed position.

In order to release the depressed keys by the operation of the machine, each detent plate is formed upon its rearward side with a projecting arm carrying a pin 78 engaged by an arm 99 fast upon a rock shaft 90, from which shaft as shown in Fig. 2 there extends an arm 91 pivotally attached to a link 92 carrying at its rearward end a pin 93 acted upon by a cam 94 fast upon the upper operating shaft 27, so that at each operation of the machine the shaft 90 is rocked to release all of the depressed keys prior to the movement of restoration of the actuating levers 40. A lug 95 on the side of the link 92 coöperates with a projection 96 on the shaft 27 to lock the machine while any key is being moved from its initial to its final position.

In Fig. 6 a modified form of manipulative means is shown for positioning the actuating levers 40 differentially. This form comprises a setting lever 100 which is fast to a segment 101 pivoted loosely upon the aforesaid rock shaft 90 and meshing with a segment rack 102 attached to the side of the actuating lever 40. In this manner the setting lever 100 is positively geared to the actuating lever 40 and by being moved over a scale on the front of the machine may be set to any desired positions and thereby the lever 40 will be directly set to differential positions, and of course when the actuating levers 40 are restored to normal position in the manner above described, the setting levers 100 will also all be restored to normal upper position since they are always in gear with the actuating levers 40.

For the bank of clerks' keys 21 there is as shown in Fig. 4 a main actuating lever 110 but the upper end of this lever does not have any rack teeth formed thereon since it is not used to actuate any accounting devices, but the lever has coöperating with it the usual auxiliary segment 43 for the purpose of setting the clerks' indicator. This clerks' setting lever 110 has at its upper end a pin 111 projecting into a cam slot 112

formed in a rocking lever 113 pivoted upon the upper shaft 27 and provided with a downwardly extending arm 114 projecting into the path of a pin 115 fast upon a disk attached to the lower operating shaft 24 so that it is necessary to press one of the clerks' keys to rock this locking lever out of the path of the pin 115 before the machine can be operated.

The particular mechanism for setting the indicators will now be described. As shown in Fig. 4 each auxiliary segment 43 has extending rearwardly therefrom an arm 120 to the lower end of which is pivoted a link 121 which at its upper end is pivoted to the forward end of a setting lever 122, to the other end of which lever is pivoted a link 123 attached to a bell crank segment 124 having at its upper end as shown in Fig. 3 a segmental rack 125 for meshing with a pinion on the side of the indicator 126. Depending from the middle point 130 of the setting lever 122 is an arm 131, which swings loosely upon its pivotal point 130 and is suitably slotted to permit the extending therethrough of the shaft 24. On one face of this arm and near the pivotal point is an anti-friction roller 132 and upon the opposite face and lower down is another anti-friction roller 133. These rollers are adapted to be acted upon by duplex cams 134 and 135, the cam 134 acting upon the roller 132 and the cam 135 acting on the roller 133.

When the auxiliary setting segment 43 is carried forward and positioned differentially in the manner hitherto described, the link 121 is thereby raised to a certain extent and the point of attachment 136 of this link to the lever 122 is thus moved to a certain point. After the segment 43 has been moved forward in this manner and is held locked by engagement with its corresponding actuating lever, this of course holds the point 136 in a fixed position and this point now becomes a fixed fulcrum point for the indicator setting lever 122 and the intermediate point 130 becomes the point of application of power, the cams 134 and 135 acting upon the rollers 132 and 133 to bring the bar 131 to a constant position so that the point of application of power namely the point 130 is at each operation of the machine brought to an unchanged location of rest since of course the duplex cams always operate to position the bar 131 to the same point. Since the fulcrum point is during this time held fixed, this movement of the point of application of power effects the differential setting movement of the link 123 and thereby sets the indicator differentially to an extent exactly corresponding to the differential movement of the setting segment 43. As soon as the indicator is set it is suitably locked in position by a locking and alining pawl 137 (see Fig. 3) fast upon a rock shaft 138 which shaft is rocked by means of a cam 139 (see Fig. 8) fast upon the upper operating shaft 27 and acting upon a pin 139[a] projecting from an arm extending downward from said shaft 138. After the indicator is set in this manner and then locked in position, the aforesaid duplex cams have completed their operative movements upon their respective rollers and near the last part of the operation of the machine these cams are free from their rollers, the normal position being shown in Fig. 4 so that the bar 131 is free when the auxiliary segment 43 is restored backward to normal position, the fulcrum point 136 also returns to normal position, the lever 122 assuming a certain angle according to the height to which the link 123 has been raised for setting the indicator. Thus the indicating setting lever 122 serves as a power application bar or lever, and at each operation of the machine the fulcrum point 136 is moved differentially and then held in fixed position while the point of application of power namely the point 130 is brought to an unchanged location of rest and thereby the indicator is properly po oned. This indicator setting mechanism results in the setting of the indicator without the necessity of the indicator being restored each time to zero position, and is in general respects very similar to that described in the co-pending application filed by the same applicant on Sept. 12, 1903, Serial No. 172,970; however in said co-pending application the indicator setting duplex cams are carried upon two separate shafts above and below the point of application of power whereas in the present instance the said duplex cams are both mounted on one and the same shaft, it being intended to claim the broad subject matter common to these two cases in the aforesaid co-pending application.

The mechanism for actuating the accounting devices from the actuating levers 40 will now be described. As shown in Figs. 3 and 4 the rack teeth 41 which as hitherto mentioned are formed on the upper ends of the actuating levers 40 for the amount keys, mesh with gear wheels 140. Each of these gear wheels 140 is mounted upon a collar turning loosely on the transverse shaft 141, and mounted side by side with this gear wheel 140, as shown in Fig. 4[a], is a companion gear wheel 142 also mounted upon a collar and turning loosely upon the shaft 141. This companion gear wheel 142 meshes with a pinion 143 of its corresponding counter wheel 144. Since the actuating lever 40 is thus not directly connected to its corresponding counter wheel, the rearward setting movement of said lever has no effect upon the counter wheel, but upon the move-

ment of restoration of said actuating lever, the two companion gear wheels 140 and 142 are coupled together by means of an idle pinion 145 mounted upon a collar turning loosely upon a transverse shaft 146, this idle pinion normally standing out of mesh with said companion gears while the actuating lever 40 is being set and being rocked into mesh by the operation of the machine prior to the restoring movement of said lever. Of course there is one of these idle pinions and pairs of companion gears for each counter wheel and actuating lever, and all of the idle pinions are mounted upon the same transverse shaft 146, and the means for rocking these idle pinions into mesh with their companion gear wheels is as follows. The transverse shaft 146 carrying said idle pinions is mounted between arms 150 extending upward from a rock shaft 151 (see Fig. 3). Pivoted loosely upon the aforesaid rock shaft 151 is a bell crank lever 152 having a horizontal rearwardly extending arm carrying a pin 153 projecting into a cam groove 154 formed in a disk fast upon the upper operating shaft 27, and having a vertical and downwardly extending arm 155 upon the end of which is a pin 156. This pin projects into a slot 157 formed in the lower rearward edge of another bell crank lever 158 which is pivoted at 159 to a forwardly extending arm 160 which forms one arm of a three-armed device the upper arm of which is the aforesaid arm 150 carrying the idle pinion rock shaft, and the third arm of which terminates in a curved or hooked projection 161.

When the parts are in the position shown in Fig. 3, the rotation of the shaft 27 rocks the vertical arm of the bell crank lever 152 rearward and thereby through its pin 156 pulls rearwardly on the bell crank lever 158 which is pivotally attached to the arm 160 and thereby said arm 160 is rocked downward and the rock shaft 151 is also rocked and the arms 150 are rocked forward to throw the idle pinions simultaneously into mesh with their respective companion gear wheels so as to couple said wheels together and cause the actuation of the counter. On the other side of the same disk which carries the cam groove 154, is a pin 162 which when the machine is at rest blocks the third arm 161 and prevents the downward rocking of the arm 160 to carry the idle pinions forward as would tend to occur when the counter throwout mechanism is operated by one of the special transaction keys as will now be described.

For the purpose of preventing the operation of the counter when any one of the special transaction keys is operated, the actuating lever 170 (see Fig. 3) for the bank of special transaction keys 22, is arranged to strike upon a pin 171 projecting from the upwardly extending arm of the aforesaid bell crank lever 158 so as to rock said bell crank lever upon its pivotal point 159 and withdraw the notch 157 from engagement with the pin 156 so that upon the rocking of the bell crank lever 152 in the manner above described, the pin 156 will no longer pull the bell crank lever 158 rearward and thus the idle pinions will not be rocked into mesh with their companion gear wheels since these gear wheels are no longer coupled together, and the restoring movement of the actuating lever will not be transmitted to the counter wheels. Upon such upward rocking of the rearward arm of the bell crank lever 158, a notch 172 in the other edge thereof engages a stationary pin 173 and locks the bell crank lever 158 from movement and hence locks the idle pinions from being swung forward. It is understood of course that the actuating lever 170 for the three special keys has no rack teeth formed on its upper end since this actuating lever is not utilized for actuating any accounting devices but simply throws out the counter and in addition has coöperating with it one of the auxiliary segments 43 for setting the special transaction indicator.

The various counter wheels are mounted upon a transverse counter shaft 180 (see Fig. 3), which shaft may be formed with the well known provision for resetting the counter wheels to zero, such for example as a groove in the shaft for engaging spring-pressed pawls carried in the counter wheels and picking up the counter wheels and resetting the same to zero upon the rotation of this turn-to-zero shaft. Fast upon the end of the zero resetting shaft 180 is a disk 181 carrying a pin 182. Resting upon this pin is a lever 183 suitably drawn downward and rearward by means of a spring and having a slotted pivotal point at it forward end to permit longitudinal movements of the lever. When the counter wheels are reset to zero by rotation in the direction of the arrow shown in Fig. 3, the lever 183 drops slightly as the pin 182 is withdrawn from thereunder and upon the complete rotation of the disk 181, the pin 182 strikes the butt end of said lever and forces the same forward and downward slightly, and this affords a full stop to the resetting movement and the counter wheels cannot be again reset to zero until an amount key is operated, which as above described operates its respective key detent plate 73 (see Fig. 9) and therethrough rocks the shaft 90 to which shaft is attached an arm 184 carrying a link 185 connected to the aforesaid lever 183 so that upon the operation of any key detent plate by the depression of an amount key, this link 185 will be thrown slightly upward and will raise the locking lever 183 so as to withdraw the same from the path of the pin 182 and then the spring draws the lock-

ing lever 183 upward and rearward enough to cause the same again to rest upon the pin 182 so that the pin is now free and the counter can again be reset to zero.

A locking lever 190 (see Fig. 5) pivoted at its middle point has a nose upon the upper end thereof projecting into a disk and zero resetting shaft 180, so that while said shaft is turned during the operation of resetting the counter to zero, this nose will be forced rearward, and the lower end of said locking lever will be forced into the path of a shoulder 191 formed in one of the previously described disks carried upon the lower shaft 24 so as to lock the machine during the zero resetting movement.

In connection with the operation of the counter wheel a novel form of transfer mechanism is provided. Each counter wheel has the usual tripping pin 200 on the side thereof (see Fig. 4) which pin is arranged to strike the forwardly projecting nose of a tripping pawl 201, which pawl is formed with a shoulder 202 for supporting a lug 203 projecting laterally from a transfer pawl 204 which transfer pawl is carried upon the upper end of a bell crank lever 205 pivoted upon a transverse shaft 206 and having a downwardly extending arm carrying a pin 207 projecting into the cam groove 208 formed in a transfer operating disk 209 fast upon the upper operating shaft 27. These disks are arranged with their cam grooves positioned in such manner as to cause a successive operation of the transfer pawls near the end of each operation of the machine so as to turn in any transfers successively from lower to higher orders.

In the normal position of the transfer parts, the forward end of the transfer pawl 204 rests upon the transfer ratchet 210 which is fast upon the side of the counter wheel. It will be seen that in this position the lug 203 of the transfer pawl stands free from engagement with the shoulder 202 of the tripping pawl so that when the counter is reset to zero, the transfer pawl simply moves up and down slightly as the ratchet wheel rides thereunder, and when the tripping pin 200 comes around and trips the tripping pawl 201, the transfer pawl does not drop into any transfer operative position but remains supported by the ratchet wheels 210 so that the movement of the tripping pawls with this zero resetting movement has no tripping effect upon the transfer pawls. Upon the operation of the machine however, the shape of the cam grooves 208 is such that upon the initial operation, the transfer pawls are retracted slightly so as to bring their lugs 203 into engagement with their tripping pawls, the lugs now resting upon the shoulders 202 so that upon the actuation of the counter wheels during the normal registering movement, if any tripping pin 200 is brought around in its complete revolution to trip the tripping pawl 201, the lug 203 will drop down thereby bringing the transfer pawl downward sufficiently to engage the ratchet wheel 210 when the transfer pawl is reciprocated forward near the end of the operation of the machine and thus imparts a unitary transfer movement to the counter wheel of next higher order, and the transfer pawl in riding up upon this ratchet wheel during such transfer movement lifts itself into normal position shown in Fig. 4 so that upon the next operation of the machine it is high enough to permit its lug 203 again to rest upon the shoulder 202 when the transfer pawl is given its slight retracting movement.

The driving mechanism will now be described, with reference to Figs. 7 and 7ª. The aforesaid operating lever 23 has for its pivotal bearing a stub shaft 300 which shaft is mounted in the upper portion of a rocking plate 301 suitably pivoted at 302 to one of the side frames of the machine so that upon the swinging of this plate 301 on its pivotal point 302, a rocking pivot is provided for the oscillating operating lever. Fast to the lever is an operating rack 303 the teeth of which are arranged to mesh with either one of the two gear wheels one of which 304 is fast upon a stub shaft suitably journaled in the side frame of the machine, and the other of which 305 is fast to the outer end of the aforesaid lower operating shaft 24. These two gear wheels are in mesh with each other and the lever rack 303 is adapted to be thrown into mesh intermittently with said gear wheels so as to transmit a continuous rotary movement to the gear wheel 305 and shaft 24 upon the oscillatory movements of the lever 23.

When the lever is in its upper normal position shown in Fig. 7 and is grasped to be pulled forward and downward, the lever would naturally tend to rock on its rocking pivot so as to throw the operating rack 303 forward into mesh with the gear wheel 304 and out of mesh with the gear wheel 305 so that as the lever is given a complete oscillation downward to an extent of 90° the gear wheel 304 will be given a half rotation in the direction of the arrow, and through this gear wheel will give a half rotation to the gear wheel 305 in the direction of the arrow, the extremity of this direction of oscillation being shown in Fig. 7ª. Now when the lever is started backward by hand the upward and backward force on the same would naturally tend to throw the operating rack 303 backward into mesh with the other gear wheel 305 so that as the lever is then restored upward to normal position, said gear wheel 305 would be rotated in the direction shown by the arrow, and this will complete

the revolution of the gear wheel 305 in the same direction in which it was moved by the downward oscillation of the lever, so that a complete revolution will thereby be transmitted to the gear wheel 305 and driven shaft 24 upon this oscillatory movement of the lever 23. A spring 307 suitably wound around the pivotal point of the lever and attached thereto normally tends to restore the lever to upper position.

A retaining pawl 310 engages the teeth of the gear wheel 304 so as to prevent backward rotation of the same. It will be seen that the effect of this retaining pawl is positively to compel the rocking of the lever upon its pivotal point upon the reversal of the oscillation of the lever. That is, for example, if the operator should while the lever is in its upper position as shown in Fig. 7 try to hold the pivotal point of the lever backward and then pull the lever downward this would tend to rotate the gear wheel 305 reversely to the direction of the arrow and thus rotate the gear wheel 304 reversely which reverse rotation is prevented by the retaining pawl 310 so that the only possible movement of the lever is the rocking movement of the same on its pivotal point to throw its operating rack forward into mesh with the gear wheel 304 so that then upon pulling forward and downward on the lever the gear wheel 304 is turned in its proper direction; and similarly if when the lever is in its lower position shown in Fig. 7ª, the operator should attempt to hold the pivotal point of the lever forward so as to maintain the rack 303 in engagement with the gear 304, and then rock the lever back to upper position, this reverse rotation of the gear wheel 304 would be prevented by the retaining pawl 310 so that no movement of the lever would be possible except the rocking movement of the pivotal point of the lever rearward so as to carry the rack 303 properly into engagement with the gear wheel 305 and thus complete the rotation of the gear wheel 304 in the proper direction, so that by this means when the lever reaches the extremities of its oscillatory excursions the reverse movement of the lever must be accompanied by the attendant rocking of the pivotal point of the lever to carry its rack into mesh with the proper gear.

Assuming now that the lever 23 has been pulled part way downward and of course in this downward movement has been rocked forward on its pivotal point so as to throw its rack 303 into engagement with the forward pinion 304 and thereby rotating said pinion partially, then if it were possible to rock the pivotal point of the lever backward again to its rearward position, this would throw the rack 303 back again into mesh with the gear wheel 305, and then if the lever 23 were restored to normal position this would turn the gear wheel 305 in the proper direction as permitted by the retaining pawl 310 but the lever 23 and gear wheels would then be out of proper time with each other for the lever 23 would then be in normal upper position while the wheel 305 would be partially operated. Therefore mechanism is provided to lock the pivotal point of the lever in either one of its shifted positions during the extent of the operative movement of the lever, that is, after the lever has once been shifted on its pivotal point and has been started on its operative oscillatory movement, this mechanism being shown in Fig. 8. Pivoted at 311 to the side frame of the machine is a pallet 312 formed with two teeth 313 and 314 projecting into proximity to the shaft 24. A pin 315 projects from the aforesaid rocking plate 301 (which carries the rocking pivot for the lever), and extends through a recess 316 formed in the side frame and engages an enlarged slot 317 formed in the middle portion of the pallet 312. Fast upon the shaft 24 is a locking flange 318 having two shoulders 319 and 320.

When the lever is in normal upper position shown in Fig. 7, the pallet 312 is in the position shown in Fig. 8 with its tooth 313 engaging under the shoulder 319 of the locking flange 318. Now as the lever 23 is pulled forward from normal upper position, this will draw the pallet 312 forward and withdraw the tooth 313 from engagement with the shoulder 319 to permit the proper continued rotation of the shaft 24 in the direction shown by the arrow in Fig. 8. Now when the lever has been pulled downward its complete extent to horizontal position, the locking shoulder 319 is rotated half way around and strikes against the underside of the pallet tooth 314 which obviously has been moved forward with the forward rocking movement of the lever pivot so that the striking of this shoulder 319 against this tooth 314 limits the downward movement of the lever 23; and when the lever is now thrown backward to normal upper position, the initial rocking movement of the pivotal point of the lever carries the pallet 312 back to normal position thereby withdrawing the pallet tooth 314 from locking position in the path of the locking shoulder 319 and permits the continued rotation of the shaft 24 and flange 318 back to normal position and of course the pallet tooth 313 has in the meantime been brought into its rearward normal position shown in Fig. 8 so that at the end of the upward movement of the lever the locking shoulder 319 strikes said tooth and limits the upward movement of said lever. From this construction it will be obvious that the outer periphery of the locking flange 318 serves as a locking surface to prevent the rocking of the pivotal

point of the lever while the lever is in an intermediate position in its excursion of oscillatory movements; that is, after the pallet 312 has been rocked forward just before the lever is started downward, then continuing the downward extent of movement of the lever, the periphery of the flange 318 stands in the rear of the pallet tooth 313 so that the pallet cannot be rocked backward because of this locking surface of the flange 318 until the lever has completed its downward excursion whereupon the flange 318 is turned so far that the shoulder 320 thereof lies just below the pallet tooth 313 so that now the pallet can be shifted rearward for the normal operation of shifting the pivotal point of the lever backward preparatory to the backward oscillatory movement of the lever itself. In order to prevent a too sudden rocking of the pivotal point of said lever between the opposite directions of movement of the lever as above set forth, a retarding device is provided shown in Fig. 8. Pivoted at 330 upon the side frame of the machine is a gravity pawl 331 carrying at its rearward end a pin 332 arranged to coöperate with the rearward edge of the aforesaid shifting pallet 312. Fast upon the previously described oscillatory shaft 30 (which it will be remembered is given a complete revolution at each operation of the machine by means of the gearing shown in Fig. 2), is an arm 333 carrying a pin 334 which is in alinement with the gravity pawl 331 so that upon the operation of the machine the pin 334, revolving in the direction shown by the arrow, strikes the end of said pawl 331 and raises the same so that it now stands in the rear of the pallet 312, this taking place upon the downward stroke of the lever when the pallet has been shifted forward to permit the pin 332 to be raised without contact with the pallet. At the end of the downward stroke of the lever the pin 334 rides out from under the gravity pawl 331 to permit said pawl to drop by its own weight, and at this point if the lever were too suddenly thrown upward for its return movement, this would at the same time start the pallet 312 rearward and if the gravity pawl 331 had not in the meantime dropped to normal lower position, the pallet 312 would strike against the pin 332 and prevent the backward shifting movement of the pallet and thus prevent the lever itself from being thrown upward into normal position. By this means, the lever cannot be made to pass its half stroke downward position too quickly since time enough must be allowed for the gravity pawl 331 to drop to carry its pin 332 out of the path of the shifting pallet, and this prevents abuse of the machine by a too rapid oscillation of the lever since when the lever has reached its horizontal position the hand pressure of the same to return the lever normally tends to rock the pivotal point of the lever backward and if this movement is executed too quickly injury to the parts or manipulation of the machine might result were it not for this retarding device.

While the forms of mechanism here shown and described are admirably adapted to fulfil the objects primarily stated, it is to be understood that it is not intended to confine the invention to the forms of embodiment herein disclosed, for they are susceptible of embodiment in various forms all coming within the scope of the claims which follow.

Having thus described the invention, what is claimed as new is as follows:

1. In a cash register, the combination with an actuating element and means for positioning the same differentially, of a setting element; means for moving said setting element into engagement with said actuating element; and means for restoring said actuating element to normal position after the setting element is moved into engagement therewith, whereby to transmit differential movements to the setting element.

2. In a cash register, the combination with an actuating element and means for positioning the same differentially, of a setting element; means for moving said setting element into engagement with said actuating element; means for restoring said actuating element to normal position after the setting element is moved into engagement therewith, whereby to transmit differential movements to the setting element; and differential indicating devices controlled by said setting element.

3. In a cash register, the combination with an actuating element and means for positioning the same differentially, of a pivoted setting element; and means for shifting said element radially to couple the same to said actuating element.

4. In a cash register, the combination with an actuating element, and manipulative amount determining means for positioning the same differentially, of a setting lever; means for shifting said lever radially to couple the same to said actuating element; and means for restoring said actuating element to normal position when such coupling is effected.

5. In a cash register, the combination with a segmental actuating lever and manipulative amount determining means for positioning the same differentially, of a setting lever mounted by the side of said actuating lever and provided with rack teeth for coupling to a projection on said actuating lever; means for shifting said setting lever radially on its pivotal point to couple said rack teeth to the projection on the actuating lever; and means for restoring said actuat-

ing lever to normal position when such coupling is effected whereby to position the setting lever differentially.

6. In a cash register, the combination with an actuating element, and means for positioning the same differentially, of a restoring frame for restoring said actuating element to normal position; a setting element mounted upon said restoring frame in such manner as to be moved thereby into engagement with said actuating element; and means for raising said frame to effect such engagement prior to the restoring movement of said frame.

7. In a cash register, the combination with an actuating element, and means for positioning the same differentially, of a setting element, a restoring frame; and means for moving said restoring frame in two directions, first to couple the setting element to the actuating element and then to restore the actuating element to normal position.

8. In a cash register, the combination with a totalizer an actuating element therefor, means for positioning the same differentially, and a main operating mechanism; of a restoring frame including a restoring bar for returning the actuating element to normal position; means connected with the operating mechanism for operating said frame to effect registration on said totalizer; a setting element having a slotted connection with said restoring bar and formed with provisions for coupling to said actuating element; and means also connected with said operating mechanism for raising said restoring bar prior to its movement of restoration whereby to couple the setting element to said actuating element.

9. In a cash register, the combination with an actuating element, and manipulative devices having connections for positioning the actuating element differentially, of a setting element; means for moving said setting element into engagement with said actuating element; and means for restoring said actuating element, and the manipulative devices to normal position after the setting element is moved into engagement therewith.

10. In a cash register, the combination with an actuating element, and manipulative devices having connections for positioning the actuating element differentially, of a setting element; means for moving said setting element into engagement with said actuating element; and means for acting upon said actuating element to restore the same to normal position after the setting element is moved into engagement therewith where by to transmit differential movements to the setting element and also to restore the manipulative devices to normal position.

11. In a cash register, the combination with an actuating segment, and manipulative means having connections to position the same differentially, of a gear wheel meshing with said segment; a companion gear wheel adjacent the first mentioned gear wheel but movable independently thereof; accounting devices connected with said companion gear wheel; an idle pinion adjacent to said two gear wheels; and means for operating said idle pinion to carry the same into and out of mesh with said two gear wheels for the purpose of transmitting the movements of said actuating segment to said accounting devices.

12. In a cash register, the combination with an actuating segment, and manipulative means having connections to position the same differentially, of a gear wheel meshing with said segment; a companion gear wheel adjacent the first mentioned gear wheel but movable independently thereof; accounting devices connected with said companion gear wheel; an idle pinion adjacent to said two gear wheels; means for operating said idle pinion to carry the same into and out of mesh with said two gear wheels for the purpose of transmitting the movements of said actuating segment to said accounting devices; a special setting element, and means connected with the latter for preventing said idle pinion from being thrown into mesh with said two gear wheels whereby to prevent the actuation of said accounting devices by the actuating segment.

13. In a cash register, the combination with an indicator and manipulative means for controlling the position of the same, of a main operating shaft, a power application lever for setting said indicator, means controlled by said manipulative means for changing the position of the fulcrum of said lever, and duplex cams carried by said operating shaft and cooperating with respective duplex projections carried by said lever for bringing to an unchanged location of rest the point on said lever representing the point of application of power.

14. In a cash register, the combination with an indicator, and manipulative means for controlling the same of a main operating shaft; a lever for setting said indicator, said lever being connected at one end to said indicator; means controlled by said manipulative means for differentially positioning the other end of said lever; operating projections connected with an intermediate point on said lever; and duplex operating cams carried by said main operating shaft and acting respectively upon the aforesaid projections to bring said intermediate point on the lever to an unchanged location of rest at each operation of the machine.

15. In a cash register, the combination with a differentially movable actuating element and a series of keys for controlling

the differential positions of the same, of means for latching said element in normal position; and means connected with said keys for unlatching said element at different points of time with respect to the extent of the key movement, according to the value of the key depressed.

16. In a cash register, the combination with an actuating element, and a series of keys for controlling the differential movements of the same, of a key detent plate having provisions for latching said element in normal position; with provisions existing between said keys and said detent plate whereby the keys operate said detent plate to unlatch said element at different points in the key movement.

17. In a cash register, the combination with an actuating element, a series of keys, and means connected with said keys for positioning said element differentially, of a detent plate coöperating with said keys and having provisions for latching said element in normal position; projections carried by said keys for operating said detent plate; and beveled projections formed on said detent plate one for each key projection, said beveled projections being differentially graded to cause the key projections to give the unlatching movement to said detent plate at different times according to the key depressed.

18. In a cash register, the combination with a counter and a main operating mechanism; of transfer elements for said counter including a tripping pin, a tripping pawl, and a transfer pawl; and means for normally holding said transfer pawl out of cooperative relation with said tripping pawl.

19. In a cash register, the combination with a counter, and a main operating mechanism; of transfer elements for said counter including a tripping pin, a tripping pawl, and a transfer pawl; means for normally holding said transfer pawl out of engagement with said tripping pawl; and means connected with the main operating mechanism for carrying said transfer pawl into engagement with said tripping pawl.

20. In a cash register, the combination with a counter and a main operating mechanism, of transfer elements for said counter including a tripping pin, a tripping pawl, and a transfer pawl; and ratchet wheels carried by said counter for normally supporting the transfer pawls free from engagement with their respective tripping pawls.

21. In a cash register, the combination with a counter and a main operating mechanism, of transfer elements for said counter including a tripping pin, a tripping pawl, and a transfer pawl; ratchet wheels carried by said counter for normally supporting the transfer pawls free from engagement with their respective tripping pawls; and means connected with said operating mechanism for bringing said transfer pawls into contact with their respective tripping pawls upon the initial operation of the operating mechanism.

22. In a cash register, the combination with an operating element differentially movable, of manipulative devices controlling same, and devices controlled by said manipulative devices normally locking said element and arranged to release said element at different times, depending on the value of the manipulative device operated.

23. In an accounting machine, the combination with an actuating element and means for positioning the same differentially, of an element, means for connecting the actuating and setting elements after the former has been positioned, and means for restoring said actuating element to normal position after it and the setting element have been connected and for then disconnecting said elements and restoring the setting element to its normal position.

24. In an accounting machine, the combination with an actuating element and means for positioning the same differentially, of a setting element, means for moving said setting element into engagement with said actuating element, and means for restoring said actuating element to normal position after the setting element is moved into engagement therewith then disconnecting said elements and restoring the setting element to its normal position.

25. In an accounting machine, the combination with an actuating element and means for positioning the same differentially, of a setting element, and means for first, connecting the said elements after the former has been positioned, second, restoring the actuating element to normal position, third, disconnecting said elements and finally restoring the setting element to its normal position.

26. In an accounting machine, the combination with an actuating element and means for positioning the same differentially, of a setting element, means for connecting the said elements after the former has been positioned, means for restoring said actuating element to normal position after it and the setting element have been connected, then disconnecting said elements, and restoring the setting element to its normal position, and an indicator controlled by said setting element.

27. In an accounting machine, the combination with an actuating element and means for positioning the same differentially, of a setting element, means for moving said setting element into engagement with said actuating element, means for restoring said actuating element to normal position after the setting element is moved

into engagement therewith then disconnecting said elements and restoring the setting element to its normal position, and an indicator controlled by said setting element.

28. In an accounting machine, the combination with an actuating device and a latch for locking same in normal position, of a series of keys for operating the latch and controlling the positioning of the actuating device differentially, a registering element, a pinion for connecting the actuating device and registering element but which is normally out of operative condition, means for restoring the actuating device to normal position, and means for moving the pinion to connect the actuating device to the registering element previous to the restoration of said actuating device so that the return movement of the latter will actuate the registering element.

29. In an accounting machine, the combination with an actuating device and a series of keys for positively positioning the same differentially, of a gear wheel meshing with said device, a companion gear wheel adjacent the first mentioned gear wheel but movable independently thereon, a registering element connected with said companion gear wheel, an idle pinion adjacent to said two gear wheels, means for restoring the actuating device to normal position, and means for moving the pinion to connect the gear wheels previous to the restoration of said actuating device so that the return movement of the latter will actuate the registering element.

30. In an accounting machine, the combination with an actuating device and means for positioning the same differentially, of a gear wheel meshing with said device, a companion gear wheel adjacent the first mentioned gear wheel but movable independently thereof, a registering element connected with said companion gear wheel, an idle pinion adjacent to said gear wheels, means for restoring the actuating device to normal position, means for moving the pinion to connect the gear wheels previous to the restoration of said actuating device so that the return movement of the latter will actuate the registering element, and means preventing the movement of the pinion to connect the gear wheels and thereby preventing the actuating of the registering element by the return movement of the actuating device.

31. In an accounting machine, the combination with an actuating device and means for positioning the same differentially, of a registering element normally disconnected from said actuating device, means for connecting the said device and registering element after the former has been positioned and then returning said device to normal position to actuate the registering element, a special setting element, and means positively actuated thereby for preventing the operation of the connecting means and thereby preventing the actuation of the registering device by the return movement of the actuating device.

32. In a cash register, the combination with an indicator bearing a plurality of characters which are arranged to be brought singly to a reading point by movement of the indicator from one position to another, of manipulative devices for determining the character to be brought to the reading point, a shaft and cams carried thereby for moving the indicator directly from one position to another to exhibit the character determined by the operated manipulative device.

33. In a cash register, the combination with an indicator bearing a plurality of characters which are arranged to be brought singly to a reading point by movement of the indicator from one position to another, of manipulative devices, a lever and means for differentially adjusting one end thereof under the control of the manipulative devices, the other end of said lever being connected to the indicator, a shaft, and cams carried thereby for moving the end of the lever connected to the indicator a distance determined by the previous adjustment of the end of said lever under the control of the manipulative devices so as to bring one of said characters on the indicator to the reading point.

34. In a cash register, the combination with an indicator constructed to be moved directly from one position to another, of a lever one end of which is connected to the indicator, means for differentially adjusting the other end of said lever, a link connected to the center of said lever and having a pair of pins projecting therefrom, a shaft, and cams carried thereby and coöperating with said pins to carry the center of said lever to a constant point at each operation of the cash register to adjust the indicator from one point to another.

35. In a cash register, the combination with a differentially movable actuating element, of means for latching said element in its normal position, a graduated plate connected to the actuating element and a series of keys for disabling the latching means and controlling the movement of the actuating element through the graduated plate.

36. In a cash register, the combination with a differentially movable actuating element, of a spring for operating said element, means for latching said element in its normal position, a graduated plate connected to the actuating element, and a series of keys for disabling the latching means and arresting through the graduated plate, the movement imparted to the actuating element by its spring.

37. In a cash register, the combination with an indicator bearing a plurality of characters and constructed to be moved directly from one position to any other position so as to display any desired character, of a shaft and manipulative devices controlling the movement of said indicator, and an oscillatory operating lever mounted upon a movable pivot for rotating said shaft.

38. In a cash register, the combination with an indicator bearing a plurality of characters constructed to be moved directly from one position to any other position so as to display any desired character, of manipula tive devices and a shaft controlling the movement of said indicator, and an oscillatory operating lever for imparting a continuous rotary movement to the shaft during movement of said lever in both directions.

39. In a cash register, the combination with a counter comprising a plurality of movable elements and actuating devices therefor, of transfer pawls for said elements, trip pawls for said transfer pawls, the said transfer and trip pawls being normally out of coöperative relation, and means for positively establishing such coöperative relation.

40. In a cash register, the combination with a counter comprising a plurality of movable elements and actuating devices therefor, of transfer pawls for said elements, trip pawls for said transfer pawls, the said transfer and trip pawls being normally out of coöperative relation, means for positively establishing such coöperative relation, and pins carried by the counter elements for operating the trip pawls.

41. In a cash register, the combination with a totalizer, of an actuator therefor, means for positioning the said actuator differentially, a setting element, means for connecting the actuator and setting element after the former has been positioned and then restoring said actuator to normal position for the purpose of actuating the totalizer, and an indicator controlled by the setting element for indicating the extent of movement imparted to the totalizer by the actuator.

42. In a cash register, the combination with a totalizer, of an actuator therefor, means for positioning said actuator differentially, a setting element, means for moving the setting element into engagement with the actuator after the latter has been positioned and then restoring said actuator to normal position for the purpose of actuating the totalizer, and an indicator controlled by the setting element for indicating the extent of movement imparted to the totalizer by the actuator.

43. In a cash register, the combination with a totalizer, of an actuator therefor normally disconnected therefrom, means for positioning said actuator differentially, a setting element, means for connecting the setting element and the actuator and the latter and the totalizer after the actuator has been positioned, means for restoring the actuator to normal position while connected to the totalizer thereby actuating the latter, and an indicator controlled by the setting element for indicating the extent of movement imparted to the totalizer by the actuator.

44. In a cash register, the combination with a totalizer, of an actuator therefor normally disconnected therefrom, means for positioning said actuator differentially, a rotary shaft and connections for connecting the actuator and totalizer and then restoring said actuator to normal position thereby actuating said totalizer, and an oscillatory operating lever mounted upon a movable pivot for rotating said shaft.

45. In a cash register, the combination with a totalizer, of an actuator therefor normally disconnected therefrom, means for positioning said actuator differentially, a rotary shaft and connections for connecting the actuator and totalizer and then restoring said actuator to normal position thereby actuating said totalizer, and an oscillatory operating lever for imparting a continuous rotary movement to the shaft during movement of said lever in both directions.

In testimony whereof I affix my signature in the presence of two witnesses.

THOMAS CARROLL.

Witnesses:
WM. O. HENDERSON,
CARL W. BEUST.

Corrections in Letters Patent No. 1,017,079.

It is hereby certified that in Letters Patent No. 1,017,079, granted February 13, 1912, upon the application of Thomas Carroll, of Dayton, Ohio, for an improvement in "Cash-Registers," errors appear in the printed specification requiring correction as follows: Page 10, line 82, for the article "an" read *a setting;* page 11, line 45, after the word "said," insert the word *two;* and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 5th day of March, A. D., 1912.

[SEAL.]

C. C. BILLINGS,
Acting Commissioner of Patents.