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TRANSFER MECHANISM FOR ACCOUNTING MACHINES.

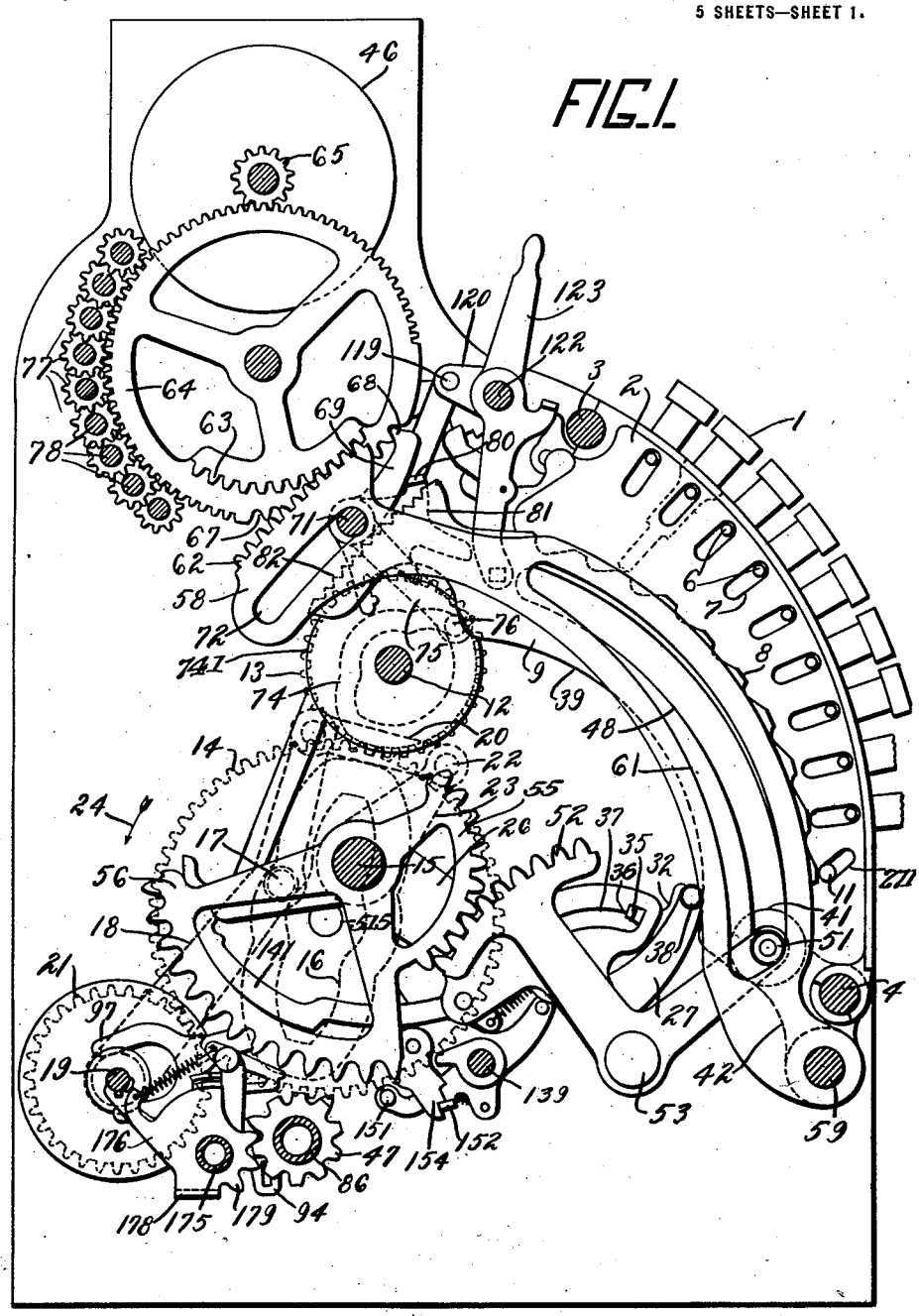
APPLICATION FILED JAN. 23, 1914.

1,253,367.

Patented Jan. 15, 1918.

5 SHEETS—SHEET 1.

FIG. 1.



Witnesses

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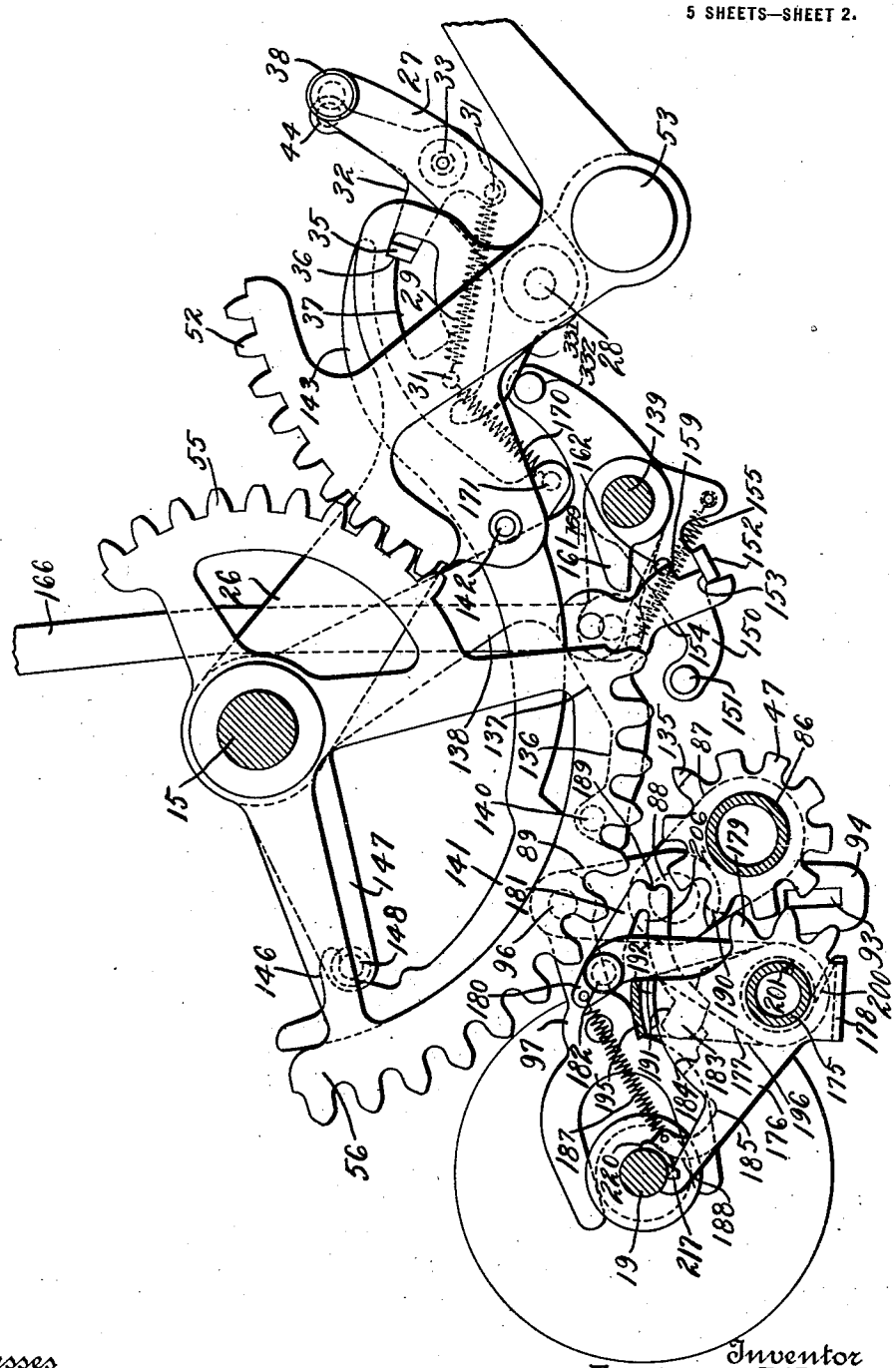
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Patented Jan. 15, 1918.

5 SHEETS—SHEET 2.

FIG. 2.



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5 SHEETS—SHEET 3.

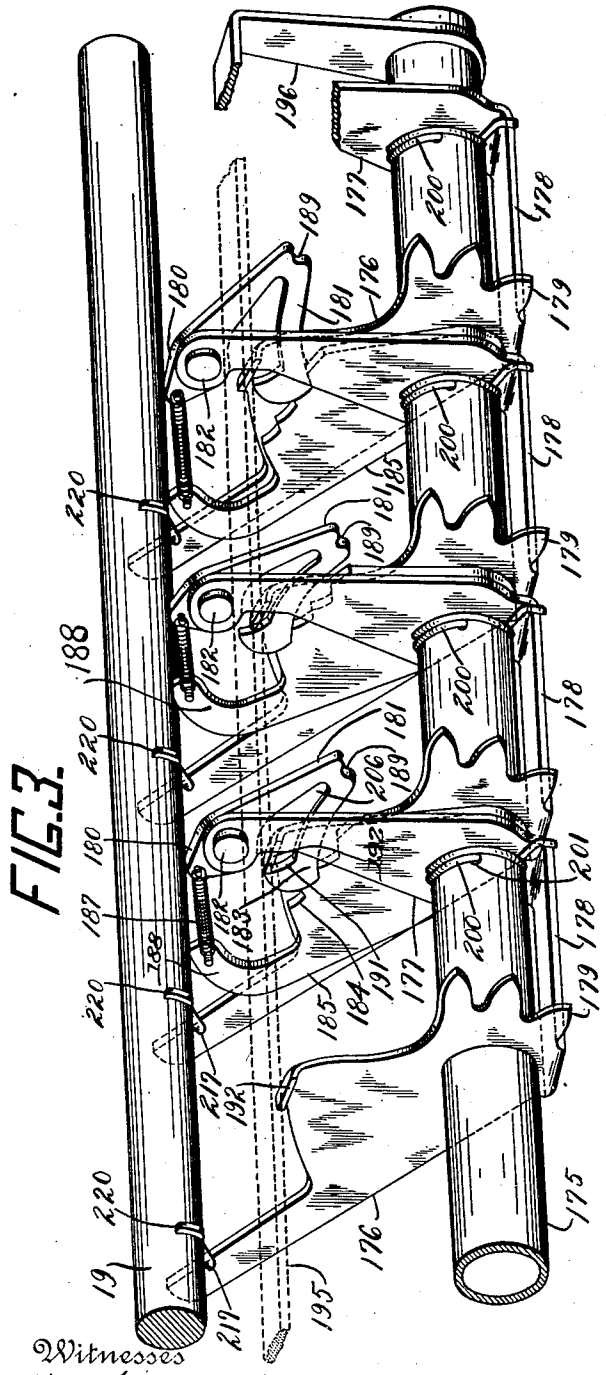


FIG. 3.

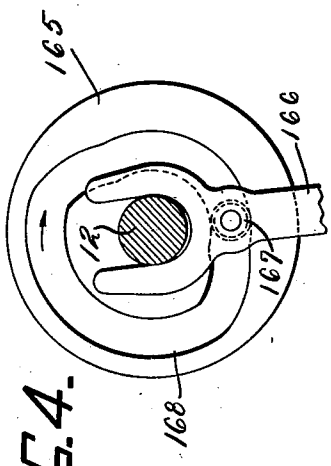


FIG. 4.

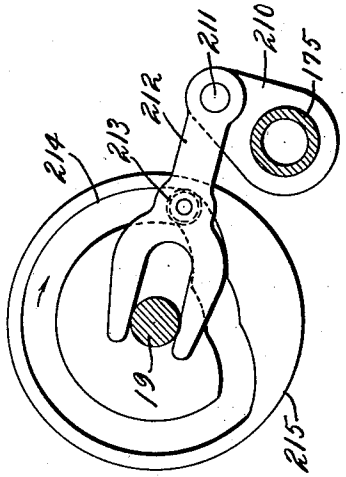


FIG. 5.

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5 SHEETS—SHEET 4.

FIG. 6.

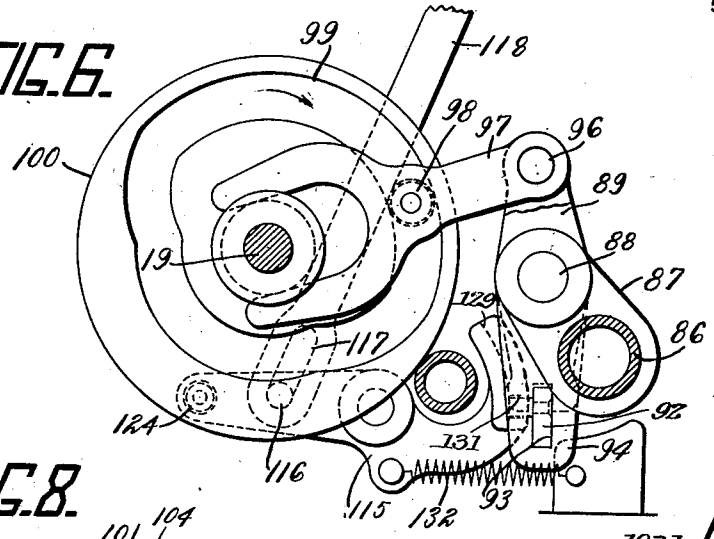


FIG. 8.

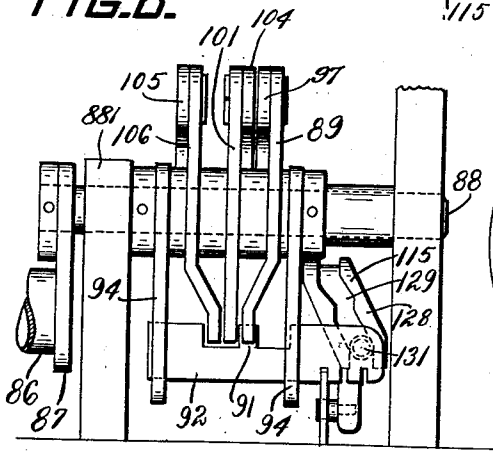


FIG. 7.

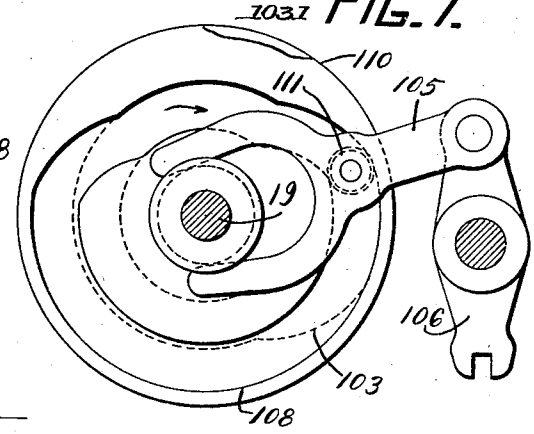
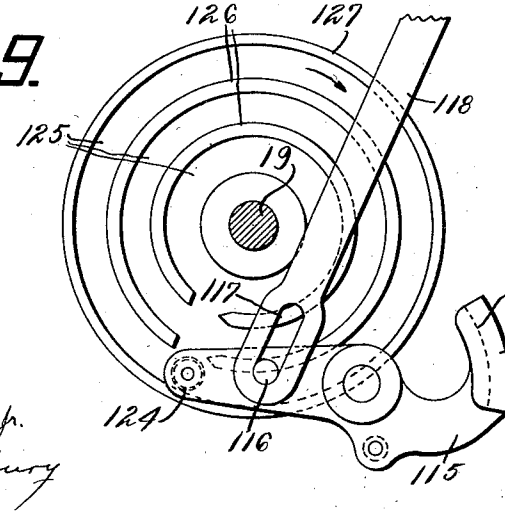


FIG. 9.



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APPLICATION FILED JAN. 23, 1914.

1,253,367. Patented Jan. 15, 1918.

5 SHEETS—SHEET 5.

FIG.10.

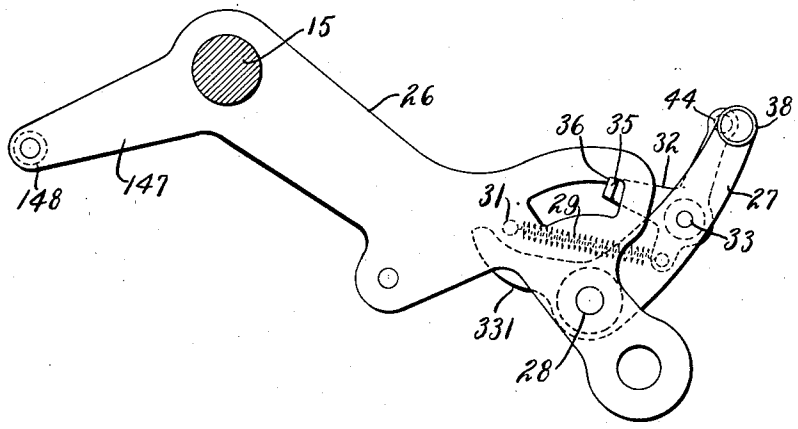
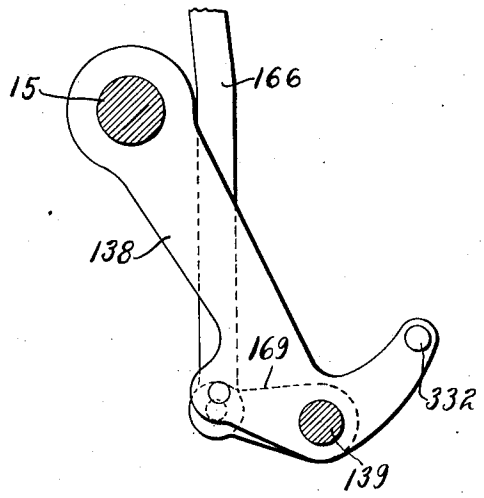


FIG.11.



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UNITED STATES PATENT OFFICE.

FREDERICK L. FULLER, OF DAYTON, OHIO, ASSIGNOR TO THE NATIONAL CASH REGISTER COMPANY, OF DAYTON, OHIO, A CORPORATION OF OHIO, (INCORPORATED IN 1906.)

TRANSFER MECHANISM FOR ACCOUNTING-MACHINES.

1,253,367. Specification of Letters Patent. Patented Jan. 15, 1918.

Original application filed October 1, 1913, Serial No. 792,869. Divided and this application filed January 23, 1914. Serial No. 813,881.

To all whom it may concern:

Be it known that I, FREDERICK L. FULLER, 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 Transfer Mechanism for Accounting-Machines, of which I declare the following to be a full, clear, and exact description.

This invention relates to accounting machines and more particularly to the transfer mechanism for the registering devices thereof.

The mechanism shown in the accompanying drawings is also shown and described in applicant's copending application for Letters Patent of the United States, Serial No. 792,869, filed October 1st, 1913. Only so much of the machine disclosed in said copending application as is necessary to the understanding of the features of the invention claimed herein is shown and described in the present application and for a complete description of the machine reference may be had to said copending application.

The principal object of this invention is to provide a simple and efficient transfer mechanism, one so constructed as to require less time for effecting transfers than is required in the usual forms of transfer mechanism. The saving of time is of considerable importance in highly developed machines of this class which, among other functions, may be adapted to accumulate and indicate amounts and to record the items indicated and the totals accumulated on a detail strip, an inserted sales slip, and checks issued by the machine. Care must be taken to give the proper time for the accomplishment of each of these objects, all of the parts being so operated during one complete rotation of the main drive or cam shaft. To accomplish this object the transfer mechanism is designed to effect transfers simultaneously instead of successively as is commonly done in the art, these transfers in the present case being accomplished after the actuating members for the totalizer elements have imparted differential movement to the latter.

During the rotation of the totalizer elements in an item entering operation as they pass from their eight to their nine positions, projections on the elements partially set trip pawls carried on transfer frames. Each trip pawl is so constructed as to pass into contact with the transfer frame of next lower order than the transfer frame carrying the partially set or tripped pawl so that when this transfer frame of next lower order is rocked by a transfer bail to effect a transfer the transfer frame carrying the partially tripped pawl will also be rocked and thereby effect a transfer by a transfer. As the pinions pass from their nine to their zero positions the trip pawls are fully tripped and in this position they are directly in the path of movement of the above mentioned transfer bail which, when rocked by the operating mechanism, engages the fully tripped pawls to rock the transfer frames carrying the fully tripped pawls and thereby also rock as above stated the transfer frames carrying the partially tripped pawls and connected by these partially tripped pawls to the transfer frames carrying the fully tripped pawls to effect all the required transfers at the same time.

Another object of this invention is to so construct the transfer mechanism that it may be employed in machines the differential mechanism of which is designed to turn the totalizer elements in a forwardly direction in item entering operations and in the reverse direction in a total taking operation in which the total on the totalizer is recorded on record material and indicated by the indicating mechanism. To effect this object the transfer mechanism is adapted to be moved out of operative relationship with the totalizer pinions when the latter are reversely moved in a total taking operation.

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 described with reference to the drawings which accompany and form part of the specification.

Of the drawings.

Figure 1 is a transverse vertical section of a cash register having the present invention applied thereto.

Fig. 2 is a detail transverse vertical sec-

tion through the totalizing mechanism and the differential mechanism therefor.

Fig. 3 is a detail in perspective of the transfer mechanism showing the trip pawls for the same in their three different positions of adjustment.

Fig. 4 is a detail of a cam and connections for operating alining devices for the totalizer.

Fig. 5 is a detail of a cam and connections for operating the transfer bail of the transfer mechanism.

Fig. 6 is a detail of the "add" cam and connections employed to rock the totalizer into and out of engagement with its actuating members during an adding operation of the machine and also shows a side elevation of the means for selecting the "add," "read" or "reset" cams for throwing the totalizer into engagement with its actuating members at different times to enter items and take a total and a sub-total.

Fig. 7 is a detail of the "read" and "reset" cams and connections employed to rock the totalizer into and out of engagement with its actuating members during "reset" and "read" operations of the machine.

Fig. 8 is an end view of the totalizer engaging means shown in Fig. 6.

Fig. 9 is a detail of the device employed to lock the cam selecting means shown in Figs. 6 and 8 in its adjusted position during an operation of the machine.

Fig. 10 is a detail view of one of the segment gear carrying arms and shows the latch device mounted thereon.

Fig. 11 is a detail view of one of the stationary plates carrying a lever operated by the totalizer in total and sub-total operations of the machine.

The purpose of filing this application in addition to the above mentioned copending application is to claim the transfer mechanism in a separate application and only so much of the machine as is necessary to the understanding of the operation of the totalizer and its transfer mechanism will be here described. It is not intended, however, to limit the present invention to any particular form of accounting machine and the differential mechanism shown in the above drawings is used for illustrative purposes only. The particular type of differential mechanism shown in the drawings is fully disclosed in the above mentioned copending application, and for a detail description of this mechanism reference may be had thereto. A brief description of the differential mechanism will, however, be given here.

The keyboard consists of a plurality of banks of keys 1 and one of these banks is shown in Fig. 1. The keys are slidably mounted in supporting frames 2 which in turn are supported in proper position in the machine by tie bars 3 and 4. As is usual in the art springs (not shown), coiled about the key shanks, normally retain the keys in undepressed position and if the keys are operated serve to restore them to their undepressed position near the end of the operation of the machine. Each key is provided with a laterally extending pin 6 passing through an opening 7 in the supporting frame 2 and across the forward edge 8 of a determining member 9 for the same bank. The usual detents (not shown) are employed to retain the operated keys in depressed position until near the end of the operation of the machine. In addition to the usual amount keys a zero trip (not shown) below the bottom key in each bank is provided, as with the particular mechanism employed it is necessary to prevent the driving mechanism from imparting a movement to the actuating members for a totalizer pinion of a denomination when no amount key in the corresponding bank is depressed. The zero trip for each bank is normally held in operative position but is moved out of operative position when any key in the corresponding bank is operated and is restored to normal position when the depressed key is released near the end of the operation of the machine. A pin 11 in each bank is carried on a lever (not shown) supporting the zero trip and the pin passes through an opening 271 in the key frame 2. The pin is normally in engagement with the forward edge 8 of the determining member 9 and is moved out of engagement with the determining member upon depression of the key in a manner described in the above mentioned copending application.

Referring further to Fig. 1, 12 indicates the main drive shaft, and the devices operated thereby are designed to be operated during one complete rotation of the drive shaft at each operation of the machine. A motor or other driving means for the shaft is omitted from the drawings as such means forms no part of the invention. The shaft 12 carries rigid thereon a gear wheel 13 meshing with a gear wheel 14 loose on a stud 515 projecting from the right hand side frame of the machine. This latter gear wheel is provided with twice as many teeth as the gear wheel 13 so that one rotation of the shaft 12 causes one-half rotation of the gear wheel 14. The gear wheel 14 has a cam groove 16 formed in its face. A roller 17 mounted centrally on an arm 18 pivotally mounted on a shaft 19 projects into the groove 16. Rigidly mounted on the shaft 19 is a gear wheel 21 having one-half as many teeth as the gear wheel 14 with which it meshes so that upon each one-half rotation of the gear wheel 14 the shaft 19 will be given one complete rotation. The upper end of the arm 18 has a link 20 pivoted thereto, the forward end of the link being

pivoted by a pin 22 to the upper end of an arm 23 fast on a shaft 15 supported by the side frames of the machine. The cam groove 16 is so constructed that the shaft 15 is rocked about 60° in the direction of the arrow 24, retained in this position for a short time and then rocked in the opposite direction to normal position.

Fast to the shaft 15 are arms 26, one for each bank of keys (Figs. 2 and 10). Each arm 26 near its outer end carries an arm 27 loosely mounted on a pin 28. Springs 29 which extend between pins 31 on the arms 26 and the lower end of latches 32 mounted on the arms 27 by the pins 33 tend to urge the upper arms of the latches forward but the latches and therefore the arms 27 are normally prevented from having a movement relative to the arms 26 by the engagement of lugs 35 on the latches with the upper edges of slots 37 formed in the arms 26. When the arms 26 are rocked counter-clockwise (Figs. 1 and 2) rollers 38 carried on the upper ends of arms 27 move along the rear edges 39 (Fig. 1) of the differential determining arms 9 which are pivoted at their lower ends by sleeves 41 secured to the determining arms 9 and supported by ears 42 on the key frames 2. The edges 39 of the determining arms normally extend inclined across the path of movement of the rollers 38 and thus the rollers upon counter-clockwise movement of the driving arms 26 normally urge the determining arms 9 to rock clockwise their full nine units of movement. The arms 27 are normally prevented from rocking counter-clockwise by engagement of the lugs 35 on the latches 32 with shoulders 36 formed in the slots 37. Latches 32 carry at their upper ends pins or rollers 44 (Fig. 2) to engage in an adding operation of the machine either the zero trip (not shown) or the inner ends of the keys 1 when the latter are in depressed position. From the above construction it follows that on counter-clockwise movement of the arms 26 in an adding operation the rollers 38 on the arms 27 rock the determining arms 9 clockwise until the pins 44 on the latches 32 engage the inner ends of the depressed keys which engagement results in the latches 32 rocking counter-clockwise whereupon the lugs 35 become disengaged from the shoulders 36, after which the continued counter-clockwise movement of the arms 26 merely results in counter-clockwise rocking of the arms 27.

The determining arms 9 are provided with arcuate slots 48 (Fig. 1) which, when the arms 9 are in their "nine" positions and therefore furthest from normal, are practically but not exactly concentric with the rock shaft 15. Extending through the slot 48 in each determining arm is a roller 51 on a corresponding segment gear 52 which is bell crank in form and pivoted by a pin 53 on the forward end of the arm 26. The teeth on each segment gear 52 mesh with the teeth of a corresponding segment gear 55 loosely mounted on the rock shaft 15. Integral with each segment gear 55 but of greater radius is another segment gear 56 which is employed to actuate the corresponding totalizer pinion 47 after the pinions are thrown into engagement with these actuating segment gears.

The counter-clockwise (Figs. 1 and 2) movement of the arms 26 through the rollers 38 on the arms 27 gradually moves the determining members 9 forward until their forward edges 8 contact with the pins 6 on the depressed keys when the latches 32 forming rigid connections between the arms 26 and 27 are tripped as above described. Because of the shape of the curved rear edges 39 and the slots 48 of the determining members 9 the intermeshing segment gears 52 and 55 move nearly as a unit until the latches 32 are tripped. After the latches are tripped, however, and until the rollers 51 reach the upper ends of the slots 48 the speed of rotation of the segment gears 52 which was but slight before the latches were tripped, is increased. In this way differential movement is imparted to the segment gears 55 and therefore to the actuating segment gears 56 for the totalizer during the entire upstroke of the arms 26.

The indicators 46 (Fig. 1) are differentially rotated on the upstroke of the arms 26 in accordance with the differential setting of the determining arms 9 by segment gears 58 pivoted on a cross rod 59 below the key frames 2. The segment gears have slots 61 through which the rollers 51 on the segment gears 52 extend, there being one segment gear 58 for each denominational order represented. The slots 61 are curved at their forward edge in about the same way as slots 48 and are so shaped that upon upward movement of the rollers 51 as guided by the slots 48, the rollers engage one side or the other of the slots 61 and thus differentially position the segment gears 58 directly from one position to another. The segment gears 58 have teeth 62 meshing with segment racks 63 rigidly fastened to the sides of the indicator setting gears 64, which mesh with pinions 65 integral with the indicators 46 and consequently cause the differential movement of the segment gears 58 to be imparted to the indicators.

In order to aline the indicators 46 in their set positions at the end of the upstroke of the arms 26, the gears 64 are provided with alining notches 67 which are normally engaged by noses 68 of arms 69 rigidly mounted on a shaft 71 which extends longitudinally through the machine and passes through slots 72 in the segment gears 58, the slots be-

ing concentric with the fixed pivot 59 of the segment gears to permit movement of the latter. The shaft 71 is rocked to move the arms 69 out of and into engagement with the alining notches on the gears 64 by a cam groove 74 which operates an arm 75 fast on the shaft 71 through engagement of a roller 76 on the arm in the cam groove. The cam groove which is formed in a disk 741 fast on the shaft 12 is so constructed that the shaft 71 is rocked to lower the noses 68 on the arms 69 out of engagement with the alining teeth near the beginning of the operation of the machine and subsequently to rock the arms to normal alining position after the segment gears 58 have received their differential adjustment on the upstroke of the arms 26.

Printing wheels (not shown) are set simultaneously with and to the same extents as the indicators as they are constantly geared to the indicator setting gears 64 by the small pinions 77 on the shafts 78 in a manner described in the above mentioned copending application.

After the latches 32 are tripped and until after the return movement of the arms 26 to normal or zero position is completed, the corresponding determining members 9 are locked from backward movement by the engagement of lugs 80 on spring pressed plates 81 with notches 82 in the upper edges of the determining arms 9. These plates 81, one for each determining arm, are loosely mounted on the shaft 71 and are moved out of locking engagement with the notches 82 near the end of the operation, in the manner fully described in the above mentioned copending application. The determining arms 9 are then positively restored to normal position through the restoration of the zero trip carrying levers (not shown) to their normal position by the engagement of the pins 11 on the zero trip carrying levers with the forward edges 8 of the determining arms 9. Upon return movement of the arms 26 to normal position the extent of movement of the actuating segment gears 56 is the same as the extent of movement imparted thereto during the upstroke of the arms 26 and the entire return stroke is used for this purpose, but the speed of this movement is different than it was during the upstroke.

The arms 27 (Fig. 2) and latches 32 are restored to normal position near the end of the operation of the machine by the engagement of fingers 331 on the arms 27 with pins 332 projecting in the path of the fingers and from stationary plates 138 (Figs. 2 and 11).

The totalizer pinions 47 (Figs. 1 and 2) are mounted on a tubular shaft 86 which is supported at its ends in arms 87 only one of which is shown in the drawings. The left hand arm 87 (not shown) is pivoted on the left hand side frame of the machine and the right hand arm (Fig. 8) is fast on the shaft 88. Loosely mounted on the shaft 88 is a lever 89 which is bifurcated at its lower end (Fig. 6) and normally straddles a squared projection 91 (Fig. 8) on a selecting bar 92 slidably carried in rectangular slots 93 (Fig. 6) in two arms 94 fast on the shaft. The upper end of the lever 89 is pivotally connected at 96 to a pitman 97. The pitman 97 at its rear end is forked over the shaft 19 and also carries a roller 98 projecting into a cam groove 99 formed in the face of a disk 100 (Fig. 6). The configuration of the cam groove 99 is such as to rock the lever 89 and therefore, through the bar 92 mounted in the arms 94, the shaft 88. In an "add" operation after the arms 26 have come to rest at the end of their upstroke and before they begin their return movement, the rocking of the shaft 88 by the cam 99 moves the totalizer into engagement with the actuating segments 56 so that upon return movement of the latter the totalizer will be actuated to an extent commensurate with the amount set up on the amount keys.

To turn the totalizer to zero and print the totals originally on the totalizer, the latter is rocked into engagement with the actuating segment gears 56 before the forward movement of the gears 56 from normal position is begun, and rocked out of engagement at the end of such movement if the totalizer is to be left at zero, and held in engaging position until the segment gears are returned to normal position if the totalizer is to be restored to its original position. In a "read" operation, for the purpose of having the totalizer thrown into engagement at the proper time, the bar 92 is moved to the left so that the bifurcated end of a lever 101 (Fig. 8), constructed similarly to the lever 89, will straddle the projection 91 of the bar 92. This lever is operated by a cam groove 103 (Fig. 7) through a pitman 104 (Fig. 8) which is similar to the pitman 97. The shape of this cam groove 103 which is formed in a disk 1031 fast on the shaft 19 is such as to rock the totalizer into engagement with the actuating gears 56 at the beginning of the counter-clockwise movement of the gears and maintain such engagement until the racks have completed their return movement to normal position.

In the "reset" operations of the machine the bar 92 is slid one step further to the left so that the projection 91 (Fig. 8) is brought into engagement with the bifurcated end of a lever 106 (Figs. 7 and 8). The lever 106 is rocked to throw the totalizer into engagement with the actuating segment gears 56 by a cam groove 108 which is formed in the face of the disk 110 and engaged by a roller 111 on a pitman 105 connected to the lever 106. This cam groove 108 is designed to

rock the totalizer into engagement with the actuating segment gears before the arms 26 begin their upstroke and maintains the engagement of the totalizer element with the segment gears only until after the arms 26 have completed their upstroke.

For the purpose of sliding the plate 92 so that the projection 91 will be in engagement with the levers 101 or 106, actuated by the "read" and "reset" cams respectively, a lever 115 is provided (Figs. 6, 8 and 9). Projecting laterally from the lever 115 is a pin 116 passing into a slot 117 formed in the lower end of a link 118. The link (Fig. 1) at its upper end is pivoted by a pin 119 to an arm 120 rigidly mounted on a shaft 122 which is rocked by a total lever 123 also fast thereon. The rear end of the lever 115 (Fig. 9) carries a roller 124 which in each position of the lever plays in one of the three grooves 125, formed by the concentric ribs 126 on the face of a disk 127, during the rotation of the shaft 19 upon which the disk is rigidly mounted. Engagement of the roller 124 in the grooves 125 prevents displacement of the lever during the operation of the machine. The forward portion of the lever 115 is enlarged and the face of this enlarged portion 128 is concentric with the pivot of the lever and has a cam groove 129 in which a roller 131 (Figs. 6 and 8) projecting laterally from the right hand end of the slide 92 projects. From this construction it is evident that upon adjustment of the total lever from its normal "add" position to a "read" or "reset" position the selecting bar 92 will be slid to the left to render the adding cam 99 ineffective and render either the "read" or "reset" cam effective as desired. A spring 132 restores the lever 115 and therefore the bar 92 to normal position at the end of the rotation of the shaft 19.

In a total taking operation the counter-clockwise movement of the actuating segment gears 56 upon the upstroks of the arms 26 and after the totalizer has been thrown into engagement with the segment gears, effects clockwise movement of the totalizer pinions. This reverse movement of each totalizer pinion is adapted to be stopped when the latter reaches zero position by the engagement of a long tooth 135 on the pinion with the rearwardly extending arm 136 (Fig. 2) of a corresponding bell crank lever 137 adjacent each pinion and pivoted to one of the plates 138 (Fig. 11) which are loosely mounted on the rock shaft 15 and a shaft 139 to permit movement of the shafts without effecting the plates. The arm 136 adjacent each totalizer pinion carries a laterally projecting stud 140 which is in the same vertical plane as a lever 141 pivoted on the arm 26 by a pin 142. When the arm 136 of bell crank lever 137 is rocked by engagement of a long tooth 135, as the totalizer pinion passes from its nine to its zero position, the stud 140 engages the lower edge of the lever 141 and rocks the latter clockwise. The forward end 143 of the lever 141 extends over the lug 35 on the latch 32 so that when the lever 141 is rocked by the long tooth the lug 35 of the latch is thrown out of engagement with the shoulder 36 to permit rearward movement of the arm 27 during continued movement of the arm 26. The rear end of the lever 141 carries a projection 146 which prevents undue lateral displacement of the lever 141 as the lever is prevented from moving to one side by the engagement of the projection 146 with an arm 147 integral with the arm 26 and to the other side by the engagement of the projection 146 with the head of a pin 148 projecting from the free end of the arm 147.

To effect, in a total taking operation, the alinement of the actuating segment gears 56 in their set positions after the latches 32 have been tripped, arms 150 are provided with pins 151. The arms 150 are loosely mounted on the shaft 139 and carry lugs 152 normally in engagement with shoulders 153 formed on the downwardly extending arms 154 of the bell crank levers 137. Springs 155 connecting the arms 150 with the bell crank levers 137 normally maintain the engagement of the lugs 152 with the shoulders 153. When the bell crank levers 137 are rocked by the long teeth 135 on their adjacent pinions the shoulders 153 are carried out of engagement with the lugs 152 on the arms 150. Then the arms are rocked clockwise (Fig. 2) by the springs 155 and the lugs 152 are moved into engagement with the second shoulders 159 on the arms 154 so that the studs 151 on the arms 150 may pass between the teeth of the actuating segment gears and in this way lock the latter from further movement. After the arms 26 come to rest at the end of their upward stroke, the arms 150 are rocked back to normal position so that the actuated segment gears may be returned to zero position on the return movement of the arms 26. To this end arms 161 fast on the shaft 139 and beside the arms 150, are rocked counter-clockwise to engage studs 162 on the arms 150, so that when the arms are carried back to normal position the springs 155 will pull the bell crank levers 137 to normal position. The shaft 139 is rocked to lower the arms 161 at the proper time by means of a box cam 165 (Fig. 4). A pitman 166 has a roller 167 engaging in a groove 168 of the box cam 165 and the lower end of the pitman is pivotally connected to an arm 169 fast to the shaft 139 so that near the end of the rotation of the cam 165 the pitman 166 is reciprocated to rock the shaft 139. Simultaneously with the restoration of the arms 150 to normal unlocking position

the tripping levers 141 are restored to normal position by springs 170 connected by pins 171 to the levers and by pins 31 to the arms 26.

The transfer mechanism, which is shown in Figs. 2 and 3, includes a frame for each bank of keys except the bank of highest denomination. The frames, which are loosely mounted on a tubular shaft 175 suitably supported by the side frames of the machine, comprise arms 176 and 177, and these arms are connected by and integral with a horizontal bar 178. The arms 176 are provided with three teeth 179 arranged concentrically about the shaft 175 and normally in engagement with their corresponding totalizer pinions. A trip pawl 181 is pivoted on the upper end of the arm 177 of each transfer frame by a pinion 182 and this pawl is normally in the plane of the totalizer wheel of next lower denomination. Each trip pawl 181 has a nose 183 on its lower portion and the nose is normally in engagement with the foremost of three notches 184 formed on the upper edge of an arm 185 loosely mounted on the shaft 175 between the transfer frames. This arrangement is normally maintained by a spring 187 which is under tension between an extension 188 of the arm 185 and a projection 180 of the trip pawl 181. The forward end of each trip pawl is provided with a notch 189 which is engaged by a long tooth 190 on the adjacent totalizer pinion when the pinion passes from its eight to its nine position. This engagement rocks the pawl 181 clockwise without affecting the transfer frame supporting the rocked pawl but the spring 187 raises the arm 185 so that the second of the notches 184 in the arm 185 will engage the nose 183 of the pawl. The pawl on the left in Fig. 3 is shown in this position. In this position the upper inclined edge 191 on the rear end of the lower portion of the trip pawl 181 passes into engagement with the rear edge of a horizontal lug 192 projecting laterally from the left hand side of the arm 176 of the next lower order transfer frame. If the pinion passes from its nine to its zero position the trip pawl 181 is rocked still further about its pivotal center 182 by the long tooth 190 and the spring 187 raises the arm 184 so that the nose 183 of the pawl will engage the third notch in the arm 185 and this is the position that the middle trip pawl in Fig. 3 of the drawings has assumed. In this position of the pawl 181 the upper inclined edge 191 of the pawl is in engagement with the rear edge of a long horizontal bar 195 of a transfer bail.

The bail comprising the horizontal bar 195 integral with arms 196 fast on the shaft 175, is rocked counter-clockwise (Fig. 2) before the totalizer in an "add" operation of the machine is restored to its normal position in engagement with the teeth 179 of the transfer frames. When the bail is rocked the horizontal bar 195 of the bail, being in engagement with the inclined edges 191 of all of the trip pawls 181 which have been fully tripped, moves the tripped pawls and the transfer frames supporting the tripped pawls rearward without effecting relative movement between the pawls and the transfer frames. This is due to the angle at which the extensions 183 of the pawls 181 coöperate with the notches in the arms 185. The cam for rocking the transfer bail is so shaped that the bail and the operated transfer frames come to rest for a short time at the end of their clockwise movement and the "add" cam 99 then rocks the totalizer back into normal engagement with the teeth 179 of the transfer frames. As the bail is rocked back to normal position the operated transfer frames are also restored to normal position and the teeth 179 of the frames being in engagement with the corresponding totalizer pinions cause the pinions to be moved the required one step. The transfer frames are restored to normal position to effect these transfers by springs 200. There is one spring for each transfer frame and each spring passes about the tubular shaft 175 and at one end is seated in an opening 201 in the shaft, the other end being bent to engage the forward edge of the horizontal bar 178 of the transfer frame.

If one pinion, for example the units pinion, is moved from its nine to its zero position or beyond by its actuating segment gear, the associated trip pawl 181 is fully tripped and if the pinion of the next higher order, that is, the tens pinion, is at its nine position it is evident that when one is added on the tens pinion, by the carrying operation from the units pinion, a carrying operation from the tens pinion to the pinion of next higher order, that is, the hundreds pinion, is necessary. To make the method of effecting a transfer by a transfer clearer, assume that 133 stands on the totalizer and 69 is to be added. At the end of the operation the position of the totalizer pinions should, of course, represent the total 202. The units pinion during the operation will be moved nine steps by its actuator through "0" to its "2" position and, of course, "1" should be carried by the transfer mechanism, as above described, to the tens pinion. The tens pinion, however, is moved six steps by its actuator to its "9" position and the carrying of "1" from the units pinion will turn the tens pinion to the "0" position so that it will be necessary to carry "1" from the tens pinion to the hundreds pinion in order that the position of the totalizer pinions will represent the correct total. This operation of effecting a transfer by a trans-

fer is accomplished through the above described pawls 181 and the projections 192 on the transfer frames. It has been stated that when a pinion passes from its eight to its nine position the adjacent trip pawl 181 is rocked about its pivot and the spring 187 raises the arm 185 to the right of the transfer frame supporting the pawl so that the middle notch of the arm 185 engages the nose 183 of the trip pawl and the inclined edge 191 of the pawl passes to the rear of the lug 192 on the arm 176 of the next lower order. It can therefore be seen that when a transfer frame is rocked by the transfer bail 195 engaging the fully tripped pawl carried by the frame, the lug 192 on the arm 176 of the frame will engage the pawl on the transfer frame of next higher order if the pawl is only partially tripped and rock the higher order frame to effect a transfer. In this way a transfer by a transfer is effected and all the transfers are effected simultaneously. The deep notches 206 formed between the upper and lower portions of the trip pawls 181 are provided to prevent engagement of the pawls, when they are moved rearward by the rocking of the transfer frames carrying them, with the forward edges of the lugs 192 on the transfer frames of next lower denominations.

The cam and connections for rocking the transfer bail at the proper time are shown in Fig. 5. An arm 210 is fast on the hollow shaft 175 and the upper end of the arm is connected by a pin 211 to a pitman 212. The pitman at its rear end is forked over the shaft 19 and carries an anti-friction roller 213 playing in a cam groove 214 formed in the face of a disk 215 fast on the shaft 19. The cam groove is so designed that the pitman 212 is given a rearward movement to rock the shaft 175 and therefore the bail rigid therewith in a counter-clockwise direction before the totalizer is rocked out of engagement with its actuating segment gears 56. After the totalizer is thrown into engagement with the teeth 179 on the transfer frames the bail is restored by the cam 214 to normal position to permit the springs 200 above described to restore the transfer frames to normal position for the purpose of effecting transfers.

After the transfer frames have been rocked back to normal position by the springs 200 to effect transfers, lugs 217 (Figs. 2 and 3) on the shaft 19 which rotates in a clockwise direction, engage the upper ends of the projections 188 of the arms 185 and rock these arms counter-clockwise about the tubular shaft 175 without effecting the transfer frames so that the noses 183 of the trip pawls which were tripped are restored under the influence of the springs 187 to their normal position in which position they rest in the foremost notches 184 of the arms 185.

That part of the long tooth 135 which projects from the outer circle of each totalizer pinion is formed on the right side of the tooth which is in engagement with the corresponding actuating segment gear 56 when the pinion passes from its one to its zero position in a total taking operation of the machine, and that part of the long tooth 190 which projects from the outer circle of each pinion and is employed to engage the adjacent trip pawl 181 in an adding operation is formed on the left side of the tooth which is opposite the pawl as the pinion passes from its nine to its zero position in an adding operation so that the arms 136 will only be operated by the long teeth 135 and the trip pawls 181 only by the long teeth 190. The teeth of the segmental actuating gear 56 are long enough to permit the long teeth 135 and 190 of the totalizer pinion to engage between the same, the remaining teeth of the totalizer pinions being shorter than the teeth of the actuating segment.

In order to prevent the teeth 190 of the totalizer pinions from engaging the pawls 181 when the pinions are turned clockwise in a total taking operation, the shaft 19 is provided with cam projections or flanges 220 which, while the pinions are being turned to zero on the upstroke of the driving arms 26 in a total taking operation, engage the rear ends of arms 176 of the transfer frames and thereby rock the transfer frames counter-clockwise so that the trip pawls are taken out of the path of movement of the long teeth 190. The circular surfaces of these cam projections 220 are concentric with the circumference of the shaft and subtend an angle of about 60° so that they hold the transfer frames in their rocked positions during the entire upstroke of the driving arms 26 and pass out of engagement with the arms 176 of the transfer frames before the return movement of the actuating segment gears to normal position is begun. Of course in an adding operation the transfer frames are rocked by the cam projections 220 and in such an operation the totalizer pinions, being in engagement with the teeth of the transfer frames, are turned slightly in a clockwise direction but as the pinions remain in engagement with the teeth until the cam projections 220 pass out of engagement with the arms of the transfer frames the pinions are turned in a reverse direction and to the same extent so that such rocking of the transfer frames in an adding operation does not effect a change in the positions of the totalizer pinions.

As the transfer frames and therefore the trip pawls 181 are returned to normal position when the cam projections 220 pass out of engagement with the arms 176 of the

transfer frames, it is evident that the pawls are in the path of movement of the long teeth 190 when the totalizers are turned back to their original position upon return of the actuating segment gears to normal position in "read" operations. It is obvious that it is necessary to prevent the actuation of the transfer frames which have been prepared for effecting transfers during such return movement of the actuating segment gears from affecting the totalizer pinions, as otherwise the totalizer would have one added on each pinion if the trip pawl 181 adjacent the pinion of next lower denomination has been tripped while the actuating segment gears are being returned to their normal position. To this end the "read" cam 103 is so timed that the totalizer is not rocked out of mesh with the actuating segment gears until after the transfer bail is operated by its cam 214 so that when the transfer frames are rocked back to normal position by their springs 200 the teeth 179 of the transfer frames are not in engagement with the pinions and therefore the actuation of the transfer frames does not operate the pinions.

Operation.

To recapitulate, the operation of the transfer mechanism which is claimed herein may be briefly described. During the rotation of the totalizer pinions as they are moved from their eight to their nine positions by their actuating segment gears, the long teeth 190 on the pinions engage the notches 189 in the forward ends of the trip pawls 181 and rock the latter so that the second notches 184 in the pivoted arms 185 are raised by the springs 187 into engagement with the noses 183 of the partially tripped pawls. In this manner the upper inclined edges 191 on the lower portions of the partially tripped pawls 181 are moved to the rear of the lugs 192 on the arms 176 of the transfer frames which have the teeth 179 normally engaging the pinions partially tripping the pawls 181. As the totalizer pinions pass from their nine to their zero positions the trip pawls 181 are fully tripped by the engagement of the long teeth 190 and in this position of the pawls the springs 187 raise the arms 185 so that the noses 183 of the fully tripped pawls engage the rearmost notches of the arms 185 and the upper inclined edges 191 of the pawls are then in engagement with the rear edge of the bar 195 of the transfer bail.

After the driving arms 26 and the actuating segment gears 56 have been restored to normal position and before the totalizer is rocked out of engagement with the actuating segment gears and into normal engagement with the teeth 179 of the transfer frames, the transfer bail is rocked counter-clockwise (Fig. 2) by the cam 214 through the medium of the pitman 212 and the arm 210 which is fast to the tubular shaft 175 upon which the transfer frames are loosely mounted. When the bail is so rocked counter-clockwise it engages the upper inclined edges 191 of all the fully tripped pawls 181 and in this way rocks the transfer frames carrying the fully tripped pawls in a counter-clockwise direction. After the totalizer elements have been carried out of engagement with their actuating segment gears and into engagement with the teeth of the transfer frames, the transfer bail is restored to normal position by its cam 214 to permit the springs 200 to return the transfer frames to normal position and thereby actuate the pinions the required one step.

If a pinion is moved from its eight to its nine position by its actuating segment gear and the pinion of next lower order has been moved to or past its zero position by its actuating segment gear the transfer frame of the pinion of next higher order than the first mentioned pinion would be moved simultaneously with the movement of the transfer frame of the first mentioned pinion upon operation of the transfer bail through the engagement of the lug 192 on the transfer frame moving the first mentioned pinion one step with the inclined edge 191 of the trip pawl adjacent this first mentioned pinion. It can therefore be seen that when the transfer frames have been fully prepared to effect transfers by being coupled directly to the transfer bail through the trip pawls 181, the transfer frames coupled to the fully prepared transfer frames by the partially tripped pawls 181 are rocked simultaneously to effect transfers by transfers.

For example, if the totalizer pinions are all standing at 8 and one is added in each denominational order, as the pinions are advanced to their 9 positions the long teeth 190 of the pinions will engage the transfer trip pawls 181 and move them one step to engage their extensions 183 with the second notches in the arms 185. This movement of the transfer trip pawls will carry the inclined edges 191 of the extensions of the trip pawls into the path of the lugs 192 on the arms 176 of the next lower order transfer frames. The first pawl from the left in Fig. 3 is shown in this position. If one be now added on the units totalizer pinion the pinion will be advanced from 9 to 0 and its long tooth will give a second step of movement to its transfer trip pawl 181 and move the pawl rearward to engage the third notch in the arm 185. This position is occupied by the second pawl from the left in Fig. 3. When in engagement with the third notch of the arm 185 the inclined edge 191 of the units trip pawl 181 will be held up in the path of the invariably moved transfer operating bar

195. It is clear that this movement of the parts connects the units trip pawl 181 with the invariably moved transfer bar 195 and that the higher order transfer rock frames will all be connected for operation because of the fact that the inclined edges 191 of their pawls 181 will be in the paths of the lugs 192 of the next lower order transfer frames. Then when the invariably moved bar 195 is swung rearward it will act upon the inclined edge 191 of the units pawl 181 to rock the transfer frame intermediate the units and tens pinions ready to turn the tens pinion one division and at the same time the lugs 192 on the higher order transfer frames will act upon the edges 191 of the pawls 181 and rock said frames one step ready to add one on their totalizer pinions when the transfer bar 195 is swung back to its first position and the frames operated by the transfer springs 200. In other words, movement of the totalizer pinions from their 8 to their 9 positions adjusts the pawls 181 to form a positive bond between the adjacent transfer rock frames and if the lowest order frame is then rocked by means of the transfer bail 195 all of the transfer frames will on account of said bond be simultaneously rocked. The latching arms 185 are so shaped and coöperate with the transfer trip pawls 181 in such a way that the transfer rock frames will have substantially the same extent of movement regardless of whether they are rocked directly by the operating bail 195 or through the connection afforded by the pawls 181 and lugs 192 on the arms 176 of said frames.

It is, of course, clear that if a totalizer pinion is not at the 9 position no bond is formed at that point between the adjacent transfer rock frames so that the frames either above or below that point may be rocked without one affecting the other. On the other hand, a bond can have been formed between two adjacent rock frames but if the higher order frame of the two is rocked by means of the transfer operating bail 195 the lower order frame of the two will not be rocked or in any way affected. For example, if the units and tens pinions both stand at 8 and 1 is added on each of them, as they reach the 9 position the transfer trip pawls 181 will be given a single step of movement and carrying the inclined portion 181 of the extension on the pawl actuated by the tens pinion into the path of the lug 192 on the arm 176 of the next lower order frame. If, now, one be added on the tens pinion the tens-hundreds transfer trip pawl 181 will be given an additional step of movement to carry the inclined portion 191 of its extension in the path of the operating bail 195. Then when the bail is rocked the tens-hundreds transfer frame will be rocked, but the units-tens frame will remain stationary because of the clearance 206 in the pawl 181 associated with the tens wheel. That is to say, when the tens-hundreds transfer frame is rocked the tens trip pawl 181 will merely move idly past the lug 192 on the units-tens transfer frame. At the end of the operation the tens pawl 181 will, of course, be fully restored to its untripped position but when the units pawl 181 is released it will only return to its half tripped position, being stopped in the half tripped position by coming in contact with the long tooth 190 on the units wheel which, it should be remembered, still remains at the 9 position. If the units pinion should at the next operation be carried to or through 0, the units-tens transfer frame will then be operatively connected to the invariably moved transfer operating bail 195 ready to turn in the transfer.

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

What is claimed is:

1. In a machine of the class described, the combination with a plurality of totalizing elements of higher and lower order each having ten degrees of movement; of transfer devices therefor; tripping means carried by the transfer devices and arranged to be set fully by the totalizing elements when the latter receive their tenth degree of movement, and to be set partially and connected to the transfer devices carrying the fully set tripping means, by the totalizing elements when the latter receive their ninth degree of movement; and an operating frame for directly actuating the transfer devices carrying fully set tripping means and through these latter devices, the transfer devices carrying the partially set tripping means whereby transfers by transfers are effected.

2. In a machine of the class described, the combination with a plurality of registering elements; of transfer devices therefor; pivoted members connected to the transfer devices and adapted to be moved to different positions by the registering elements; a bar having an invariable movement for directly engaging the pivoted members and thereby effecting transfers when said members are moved to one of their positions; and projections on said transfer devices connecting the pivoted members to the transfer devices of next higher orders when the pivoted members are adjusted to another one of their positions for the purpose described.

3. In a machine with a plurality of registering elements; of transfer devices therefor; piv-

oted members carried by the transfer devices, adapted to be moved to different positions by the registering elements and constructed to connect the transfer devices when moved to one of their positions; and a bar having an invariable movement for directly engaging the pivoted members and thereby effecting transfers when said members are moved to another of their positions, and effecting transfers by transfers if the transfer devices are connected by the pivoted members.

4. In a machine of the class described, the combination with a plurality of totalizing elements; of transfer devices therefor; means controlled by the totalizer elements for partially and completely preparing said devices for the subsequent effecting of transfers and constructed to connect the partially prepared devices with the completely prepared devices; and a device for actuating the completely prepared devices and through said means actuating the partially prepared devices for the purpose of effecting transfers.

5. In a machine of the class described, the combination with a plurality of totalizing elements; of pivoted transfer frames one for each element; plates between said frames; pawls carried by said frames and adapted to be moved to different positions by the totalizing elements; springs connecting said plates and said pawls for operating said plates to hold the pawls in their moved positions; projections on said transfer frames adapted to be engaged by the pawls on the transfer frames of next higher order when the pawls are in one of their moved positions; a bar adapted to be engaged by the pawls when the latter are in another of their moved positions; and means for moving said bar for the purpose of moving the frames carrying the pawls in the last mentioned position, and through the pawls in the first mentioned position rock the frames carrying these pawls to effect transfers.

6. In a machine of the class described, the combination with a plurality of totalizing elements; of pivoted transfer frames, one for each element, and having teeth normally engaging said elements; means for moving the elements out of and into engagement with said teeth; means connected to said transfer frames and controlled by the totalizer elements for preparing the transfer frames to effect transfers; means for rocking the prepared transfer frames before said elements are returned into normal engagement with the teeth on the frames; and means for returning the rocked transfer frames to normal position after the totalizer elements are returned to normal position to effect transfers.

7. In a machine of the class described, the combination with a plurality of totalizing elements; of pivoted transfer frames, one for each element and having teeth normally engaging said elements; means for moving the elements out of and into engagement with said teeth; means connected to said transfer frames and controlled by the totalizer elements for preparing the transfer frames to effect transfers; a bar having an invariable extent of movement and common to all of the transfer frames for rocking the prepared transfer frames before the totalizing elements are returned to normal engagement with the teeth on the transfer frames; and springs, one for each transfer frame for returning the rocked transfer frames to normal position after the totalizer elements are returned to normal engagement with the teeth on the transfer frames to effect transfers.

8. In a machine of the class described, the combination with a plurality of totalizing elements; of pivoted transfer frames, one for each element; plates between said frames; pawls carried by said frames and adapted to be moved to different positions by the totalizing elements; springs connecting said plates and said pawls for operating said plates to hold the pawls in their moved positions; projections on the transfer frames adapted to be engaged by the pawls on the transfer frames of next higher order when the pawls are in one of their moved positions; a bar adapted to be engaged by the pawls when the latter are in another of their moved positions; means for moving said bar for the purpose of moving the transfer frames carrying the pawls in the last mentioned position, and through the pawls in the first mentioned position rock the transfer frames carrying these pawls to effect transfers; and means for again operating said plates to cause said springs to restore the pawls to normal position.

9. In a machine of the class described, the combination with a plurality of totalizing elements; of pivoted transfer frames, one for each element and having teeth normally engaging said element; means for moving the elements out of and into engagement with said teeth; means connected to said transfer frames and controlled by the totalizer elements for preparing the transfer frames to effect transfers; means for rocking the prepared transfer frames before said elements are returned into normal engagement with the teeth on the frames; means for returning the rocked transfer frames to normal position after the totalizer elements are returned to normal position to effect transfers; and means controlling the restoration of the prepared transfer frames to unprepared positions.

10. In a machine of the class described, the combination with a plurality of totalizing elements of higher and lower orders each having ten degrees of movement; of transfer

devices therefor; trip devices carried by the transfer devices and arranged to be set fully by the totalizing elements when the latter receive their tenth degree of movement, and to be set partially and connected to the transfer devices carrying the fully set devices, by the totalizing elements when the latter receive their ninth degree of movement; an operating frame for directly actuating the transfer devices fully set and through these latter devices, the transfer devices carrying the partially set trip devices whereby transfers by transfers are effected; and means controlling the restoration of the set transfer devices to their unset condition.

11. In a machine of the class described, the combination with a plurality of totalizing elements; of transfer frames therefor each comprising two connected pivoted arms; teeth on one arm of each frame engaging one of the totalizing elements; a pawl pivoted to the other arm of each transfer frame; pivoted plates between the transfer frames and provided with three notches, the first of which is normally engaged by said pawls; springs between said plates and said pawls; projections on the totalizing elements for engaging, as the elements pass from their eight to their nine positions, said pawls and rocking them about their pivots to permit said springs to move said plates so that the second notches in the plates will engage the pawls, and for rocking the pawls still further about their pivots as the pinions pass from their nine to their zero positions to permit the springs to move the plates so that the third notches in the plates will engage the pawls; projections on transfer frames adapted to be engaged by said pawls when the pawls are engaged by the second notches in the plates; a movable bar adapted to be engaged by the pawls when the third notches in the plates engage the pawls; means for moving said bar to rock the transfer frames connected to the bar by the pawls and also to rock the transfer frames connected by the pawls to the transfer frames connected to the bar for the purpose of effecting transfers.

12. In a machine of the class described, the combination with a plurality of totalizing elements; of transfer frames therefor each comprising two connected pivoted arms; teeth on one arm of each frame engaging one of the totalizing elements; a pawl pivoted to the other arm of each transfer frame; pivoted plates between the transfer frames and provided with three notches, the first of which is normally engaged by said pawls; springs between said plates and said pawls; projections on the totalizing elements for engaging, as the pinions pass from their eight to their nine positions, said pawls and rocking them about their pivots to permit said springs to move said plates so that the second notches in the plates will engage the pawls, and for rocking the pawls still further about their pivots as the pinions pass from their nine to their zero positions to permit the springs to move the plates so that the third notches in the plates will engage the pawls; projections on the arms of the transfer frames bearing the teeth adapted to be engaged by said pawls when the pawls are engaged by the second notches in plates; a movable bar adapted to be connected to the pawls when the third notches in the plates engage the pawls; means for moving said bar to rock the transfer frames connected to the bar by the pawls and also to rock the transfer frames connected by the pawls to the transfer frames connected to the bar for the purpose of effecting transfers; and a shaft bearing projections for engaging said plates and thereby causing said springs to return said pawls to normal position.

13. In a machine of the class described, the combination with a plurality of totalizing elements; of transfer frames therefor; operating mechanism for the transfer frames; and means controlled by the totalizer elements for coupling the transfer frames together when the elements are moved to their nine positions and for directly coupling the transfer frames to the operating mechanism when the elements are moved to their zero positions whereby when the operating mechanism is operated the transfer frames directly coupled thereto are operated to effect transfers and also the transfer frames coupled to the transfer frames directly coupled to the operating mechanism are operated to effect transfers by transfers.

14. In a machine of the class described, the combination with a plurality of totalizer elements; of transfer devices therefor; a bar common to all of the transfer devices for operating the same; means controlled by the totalizer elements for coupling the transfer devices together when the pinions are moved to a certain position, and for coupling the transfer devices to said operating bar when the elements are moved to a position requiring a transfer; and means for operating said bar to operate the transfer devices coupled to the bar, and also the transfer devices coupled to the transfer devices which are coupled to the bar for the purpose of effecting simultaneous transfers.

15. In a machine of the class described, the combination with a plurality of totalizing elements; of transfer frames therefor; operating mechanism for the transfer frames; means controlled by the totalizer elements for coupling the transfer frames together when the elements are moved to their nine positions and for directly coupling the transfer frames to the operating mechanism when the elements are moved to their zero positions whereby when the

operating mechanism is operated the transfer frames directly coupled thereto are operated to effect transfers and also the transfer frames coupled to the transfer frames which are directly coupled to the operating mechanism are operated to effect transfers by transfers; and means for causing the uncoupling of the transfer frames and the operating mechanism by the coupling means.

16. In a machine of the class described, the combination with a plurality of totalizer elements; of transfer devices therefor; a bar common to all of the transfer devices for operating the same; means controlled by the totalizer elements for coupling the transfer devices together when the elements are moved to a certain position, and for coupling the transfer devices to said operating bar when the elements are moved to a position requiring a transfer; and means for operating said bar to operate the transfer devices coupled to the bar, and also the transfer devices coupled to the transfer devices which are coupled to the bar for the purpose of effecting simultaneous transfers; and means for causing the uncoupling of the transfer frames and the operating mechanism by the coupling means.

17. In a machine of the class described, the combination with a plurality of totalizer elements; of actuating means therefor adapted to drive the elements in a forwardly or backwardly direction; projections on said totalizer elements; transfer frames for the totalizer elements; trip devices carried by the transfer frames and adapted to be engaged by the totalizer elements when the latter are forwardly rotated to prepare the transfer frames for effecting transfers; and a shaft bearing projections for engaging said transfer frames to move the same and thereby carry the trip devices out of the path of movement of the projections on the totalizer elements for the purpose described.

18. In a machine of the class described, the combination with a plurality of totalizer pinions; of indicating mechanism adapted to indicate items entered on the totalizer pinions and also the totals thereof; differential mechanism for actuating the totalizer pinions in both item entering and total taking operations; transfer devices for the totalizer pinions; two projections on each totalizer pinion and in different planes of movement, one projection being adapted to prepare the transfer mechanism for effecting a transfer in an adding operation, while the other projection is constructed to control the extent of movement of the differential mechanism in a total taking operation.

19. In a machine of the class described, the combination with a plurality of totalizing elements; of actuating means therefor adapted to drive the elements in a backwardly or forwardly direction; projections on the totalizer elements; transfer devices for the totalizing elements adapted to be engaged by the projections on the totalizer elements when the latter are forwardly rotated; and means for moving the devices out of the path of movement of said projections when the elements are backwardly rotated for the purpose described.

20. In a machine of the class described, the combination with a totalizer comprising a plurality of totalizing elements; of indicators for indicating the items entered on the totalizer and also the totals thereof; means for actuating the elements in an adding operation in which an item is entered on the totalizer and in a total taking operation in which the totalizing elements are first turned to zero and then turned in the reverse direction to the same extent; differently timed cams for engaging the totalizer elements with the actuating means; transfer devices for the totalizer elements; projections on the totalizer elements for engaging and thereby preparing the transfer devices for operation; a device for operating the prepared devices; and means for moving the transfer devices while the elements are being turned to zero in a total taking operation to prevent engagement of elements with the transfer devices, the cam for engaging the elements with the actuating means in a total taking operation being constructed to maintain the engagement of the elements with the actuating means until after the transfer devices are operated to prevent the devices from effecting transfers in total taking operations.

21. In a machine of the class described, the combination with a totalizer, comprising a plurality of registering elements, of transfer devices for said elements, means controlled by the registering elements for positioning said devices to different positions for the purpose of effecting transfers, and means comprising a bar common to all of the transfer devices and also individual means for said devices for operating the positioned devices.

22. In a machine of the class described, the combination with a main operating mechanism, of a plurality of totalizer pinions, actuating means adapted to enter items on the totalizer pinions and also to turn the totalizer pinions to zero during operations of the machine, transfer mechanism for the totalizer elements, means for controlling the extent of movement of the actuating means during turn to zero operations, and a projection on each of two teeth of each pinion the projections being in different planes of movement so that one tooth controls the transfer mechanism and the other controls said controlling means.

23. In a machine of the class described, the combination with a set of totalizer wheels and means for actuating them, of a set of members for operating said pinions to effect transfers, an invariably moved bar common to said members, and a device differentially actuated by the totalizer wheels either to establish a connection between adjacent transfer members or to connect the members to the invariably moved bar.

24. In a machine of the class described, the combination with a set of totalizer pinions and means for actuating them, of a plurality of members for turning said pinions to effect transfers, an invariably moved bar common to said members, and a pawl for each member differentially adjusted by the next lower order totalizer pinion either to establish a connection between the member and the next lower order member or to connect its member to the invariably moved bar.

25. In a machine of the class described, the combination with a set of totalizer pinions and means for actuating them, of a plurality of members for turning said pinions to effect transfers, an invariably moved bar, a differentially movable pawl for each of said members, said pawls being given one step of movement as their pinions pass from 8 to 9 and two steps of movement as their pinions pass from 8 to 0, one step of movement establishing a bond between adjacent transfer members and the two steps of movement establishing a connection between the transfer member and the invariably moved bar.

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

FREDERICK L. FULLER.

Witnesses:
R. C. GLASS,
CARL BENST.