

Sept. 6, 1932.

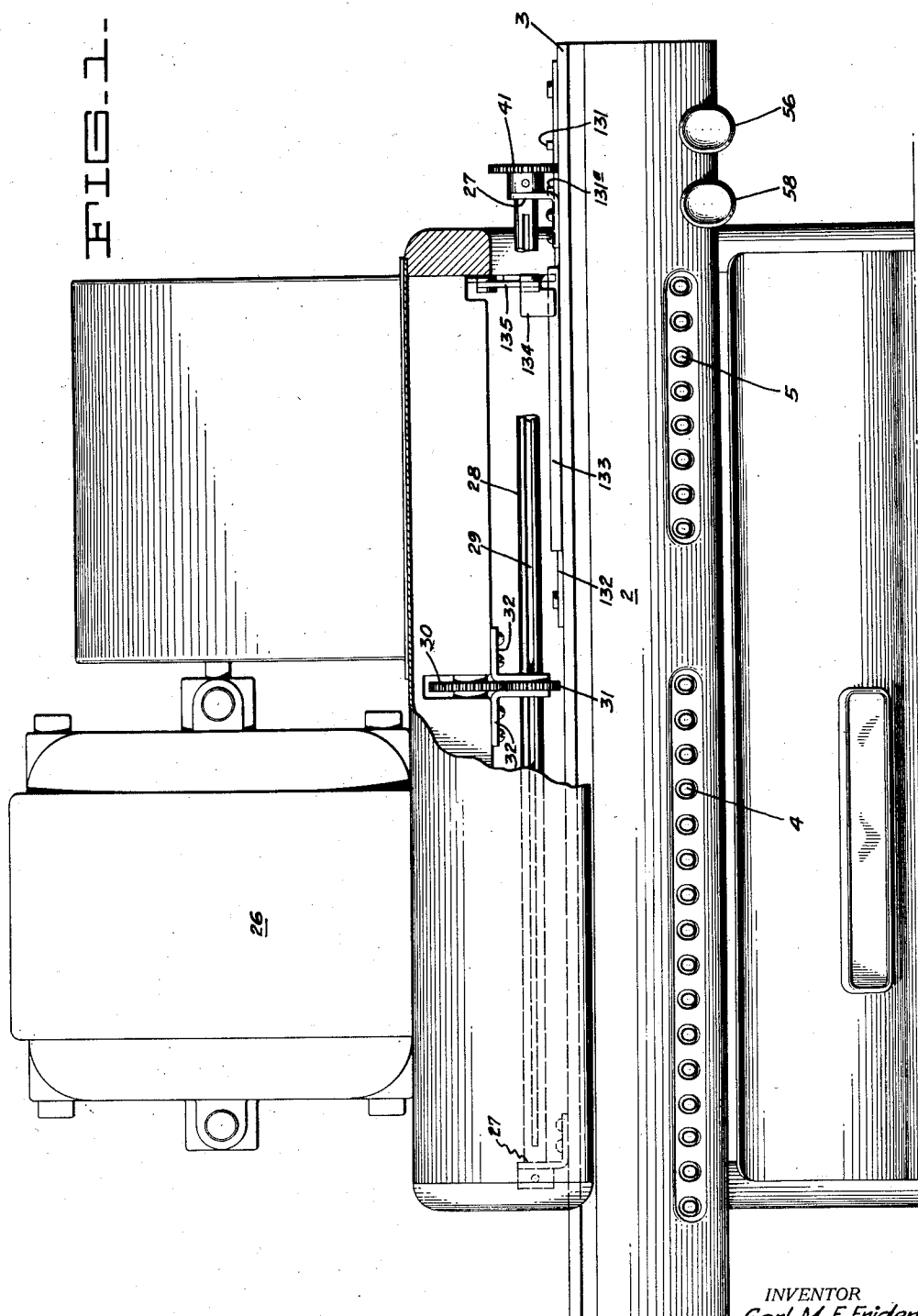
C. M. F. FRIDEN

1,875,437

CALCULATING MACHINE

Original Filed Oct. 17, 1928

3 Sheets-Sheet 1



INVENTOR
Carl M. F. Friden
BY *White Post & Taylor*
his ATTORNEYS

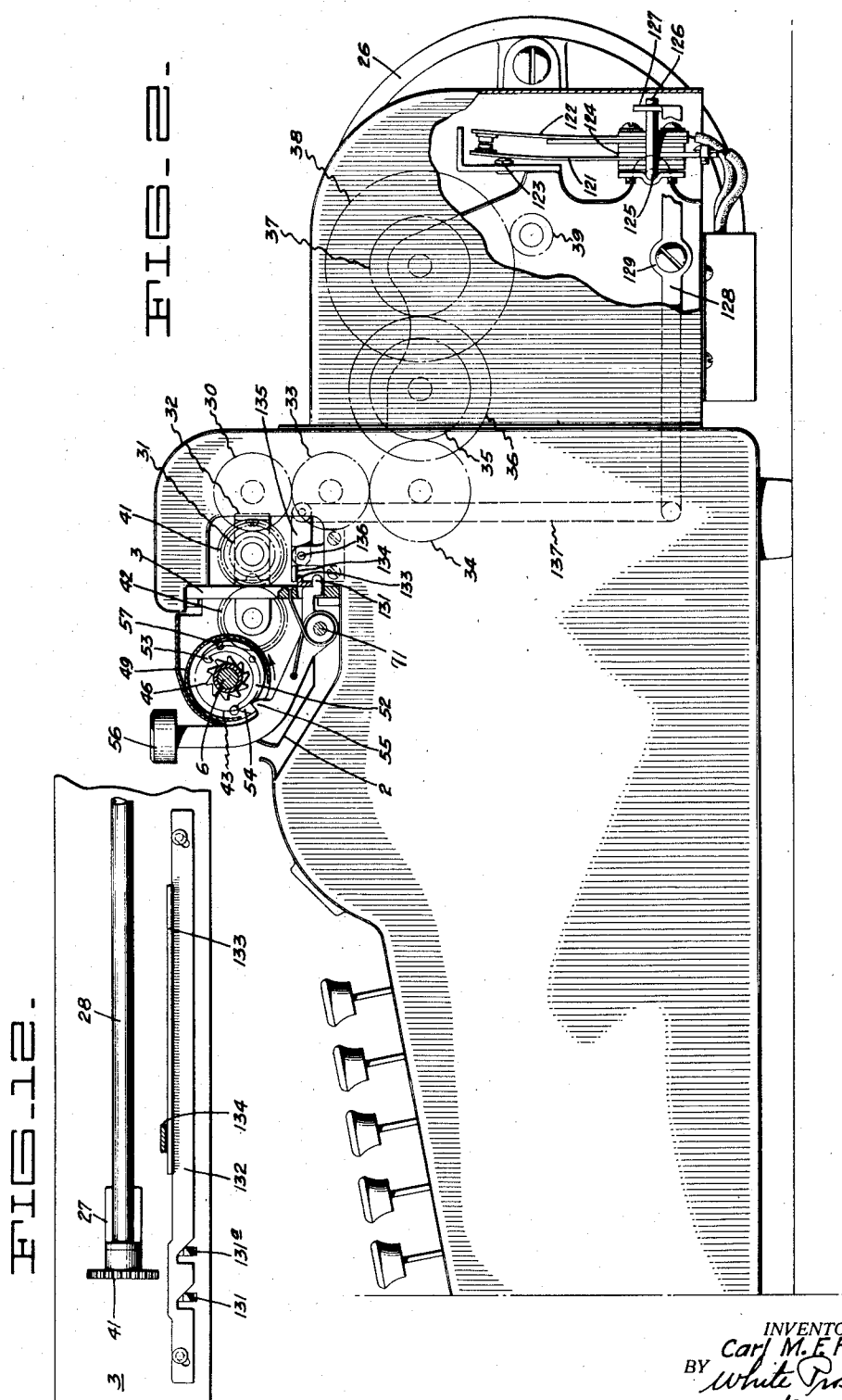
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CALCULATING MACHINE

Original Filed Oct. 17, 1928 3 Sheets-Sheet 2



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CALCULATING MACHINE

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3 Sheets-Sheet 3

FIG. 3.

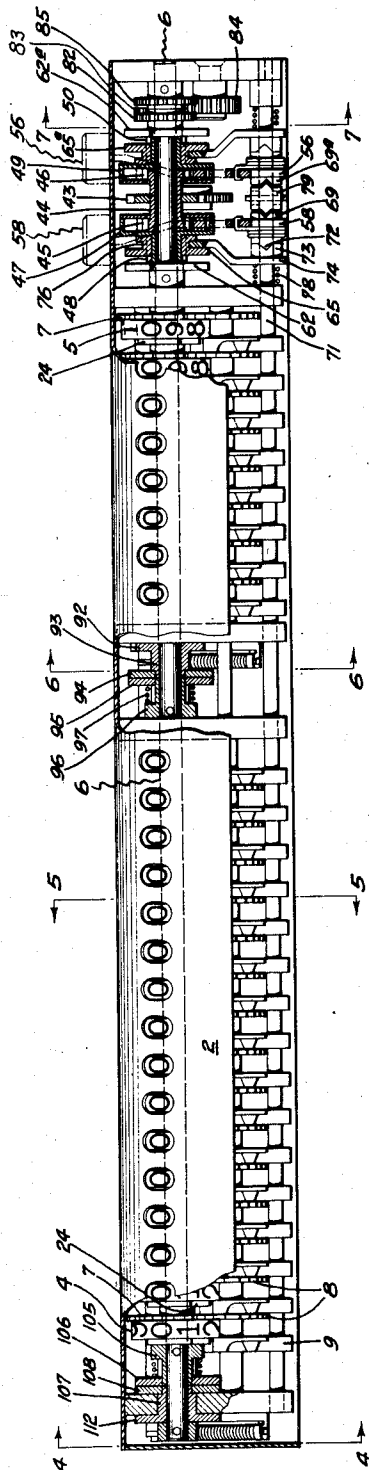


FIG. 7.

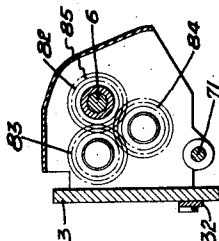


FIG. 11.

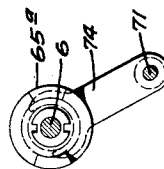


FIG. 6.

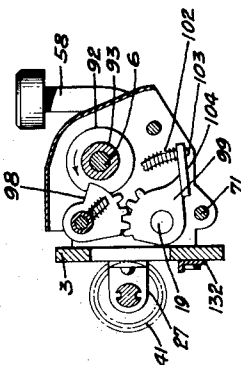


FIG. 10.

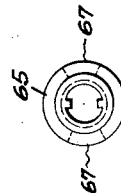


FIG. 5.

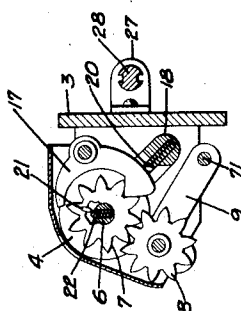


FIG. 9.

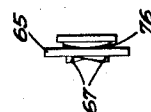


FIG. 4.

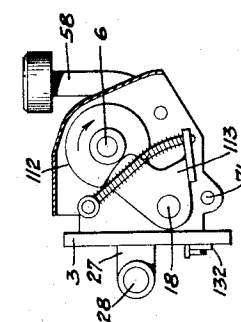
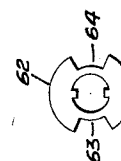


FIG. 8.



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UNITED STATES PATENT OFFICE

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CALCULATING MACHINE

Application filed October 17, 1928, Serial No. 313,026. Renewed January 26, 1931.

The invention relates to calculating machines and particularly to calculating machines having a motor driven actuating mechanism. The particular form of calculating machine in which the invention is embodied is adapted to perform the operations of addition, subtraction, multiplication and division. The machine is provided with two registers or counting mechanisms for displaying two of the factors produced by the operation of the machine. In performing problems in multiplication, one of these registers displays the multiplier and the other register displays the product. At the end of a calculating operation, the registers are usually cleared or reset to zero. In accordance with my invention, I have provided motor driven means for resetting the registers to zero. The zero resetting means are controlled by keys so that by a single manual stroke one of the registers may be reset to zero.

It is an object of my invention, therefore, to provide a calculating machine with motor driven zero resetting devices for the various registers of the machine. It is a further object to provide control means for the zero resetting devices, so that these devices may be thrown into operation by a single manual stroke.

Calculating machines usually embody a carriage which is displaceable, with respect to the frame of the machine, to different ordinal positions. In accordance with the present invention, I have arranged the product register and the multiplier register on the carriage. Another object of my invention is to provide motor driven means for clearing either or both registers on the carriage, in any ordinal position of the carriage, such means being preferably thrown into operation by depression of a selected key.

The machine shown in the accompanying drawings is of the keyboard type, in which the values are introduced into the machine by the depression of keys. The depression of a key introduces a value corresponding to the numeral on the key into a rotatable actuator within the machine, rotation of the actuator being effected to accomplish the cal-

culating operation. The values introduced into the actuator are transmitted, on rotation of the actuator, to the figure discs of the product register. The machine is also provided with a multiplier register for indicating the number of rotations of the actuator. The product register and the multiplier register are mounted on a carriage, which, for the purpose of making direct action of the selected values in the actuator on the figure discs of the product register, of highest value possible, is disposed in parallel displaceable relation to the axis of the actuator. Both of the registers are therefore displaceable and each register is provided with a zero resetting device and one of the objects of the present invention is to provide means for connecting the motor to either of the two zero resetting devices, for all displaced positions of the carriage.

The invention possesses many other advantageous features, some of which, with the foregoing, will be set forth at length in the following description, where I shall outline in full, that form of the invention which I have selected for illustration in the drawings accompanying and forming part of the present specification. In said drawings, I have shown one embodiment of my invention, but it is to be understood that I do not limit myself to such form, since the invention, as set forth in the claims, may be embodied in a plurality of forms.

Referring to said drawings, in which only that portion of the calculating machine is shown which enters into cooperative relation with the present invention,

Figure 1 is a top or plan view of the rear portion of the calculating machine, showing the displaceable carriage, a portion of the casing being broken away to disclose the driving connection to the zero resetting shaft of the registers mounted in the carriage.

Figure 2 is a side elevation of the rear portion of the calculating machine, partly in section, showing the means for transmitting motion from the motor to the zero resetting shaft in the carriage, and the means for controlling the rotation of the zero resetting shaft.

Figure 3 is an elevation of the carriage, parts thereof being broken away to show the driving mechanism for the zero resetting shaft.

5 Figure 4 is a section taken on the line 4—4, Figure 3.

Figure 5 is a section taken on the line 5—5, Figure 3.

10 Figure 6 is a section taken on the line 6—6, Figure 3.

Figure 7 is a section taken on the line 7—7, Figure 3.

Figure 8 is a detail of the driven member of the selecting clutch which controls the zero resetting mechanism.

Figure 9 is a side elevation, Figure 10 is a front elevation, and Figure 11 is an opposite side elevation, of the driving member of the zero resetting mechanism clutch.

20 Figure 12 is a detail of a portion of the connection between the zero resetting control keys and the motor switch.

In the drawings, I have not shown the mechanism employed for entering values into either the product register or the multiplier register, since the present invention concerns itself with the means for resetting these registers to zero. The actuators, for introducing values into the registers, are selectively rotated by a motor, which motor also furnishes the power for resetting the two registers to zero. The numeral wheels comprising the product register, and the multiplier or quotient register, are mounted in a carriage which is movable transversely of the calculating machine to different ordinal positions, with respect to the actuators. Means are provided for shifting the carriage and for positioning it in the selected ordinal position.

40 The calculating machine is provided with a carriage 2, which is provided with a rear plate 3, which is slidable in guideways, so that the carriage may readily be shifted. The product register comprises a series of numeral wheels 4 and the multiplier or quotient register comprises a series of numeral wheels 5, the numeral wheels of both registers being independently rotatably mounted on the shaft 6. Each numeral wheel is provided on one side with a gear 7, which is in mesh with an intermediate gear 8, which latter gear is engaged by the ordinal registration members and the tens carrying members of the actuators, on rotation of the actuators. 55 The usual tens carrying levers, or transfer levers 9, are associated with each intermediate gear 8.

The numeral wheels 4 and 5 are held against rotation by the spring pressed detents 17, there being one detent associated with each gear 7. The detents are held in engagement with the gear wheels 7 by spring pressed balls 20, the balls 20 associated with the detents of the product register being seated in a rock shaft 18 and the balls 20

associated with the detents of the multiplier or quotient register being seated in the rock shaft 19, the two rock shafts being in alignment and being separately rockable.

Means are provided for independently resetting the registers to zero. Each numeral wheel 4 and 5 is provided with an inwardly extending tooth 21, spaced slightly from the shaft 6. Seated in the shaft, and partially extending therefrom, are a plurality of spring pressed balls 22, there being one ball associated with each numeral wheel. The balls extend outward sufficiently to engage the teeth 21, and the springs behind the balls are of such strength that when the numeral wheel is rotated by the ordinal registration member, or by the tens carrying member, the tooth 21 may pass over the ball by causing compression of the spring. Likewise, when the numeral wheels are restrained against rotation by the detents 17, the balls 22 will pass by the teeth 21, without causing rotation of the numeral wheels. Means are provided for releasing the detents associated with the respective registers, when it is desired to reset the registers to zero, and these releasing means are selectively operable, so that operation of the zero resetting operating device in one direction will cause the numeral wheels of one register to be reset to zero and rotation of the zero resetting operating device in the opposite direction will cause the numeral wheels of the other register to be reset to zero. If the detents associated with the numeral wheels 4 are released, rotation of the shaft 6 will return the numeral wheels 4 to zero position, without moving the numeral wheels 5, and, if the detents associated with the numeral wheels 5 are released, rotation of the shaft 6 will return the numeral wheels 5 to zero position, without rotating the numeral wheels 4. The numeral wheels of the two registers are reset to zero by rotation of the shaft 6, and means are provided whereby rotation of the shaft in one direction will release the detents associated with the numeral wheels of one register to permit the numeral wheels to be returned to zero, and rotation of the shaft in the opposite direction will release the detents associated with the other register, to permit the other register to be reset to zero. The numeral wheels are stopped in zero position, when they are being reset to zero by the rotation of the shaft, by contact of a single toothed element 24, secured to each numeral wheel, with the rear end of the transfer or tens carrying lever 9. This construction is well known in the art and requires no further description here, since numeral wheels in many calculating machines are stopped in zero position by the transfer lever.

Means are provided for causing the motor 26, which drives the actuators, to rotate the shaft 6 in either direction selectively, to clear

either of the registers. Secured to the rear face of the back plate 3 of the carriage, are a plurality of brackets 27, in which is journaled a long shaft 28, which is movable with the carriage. The shaft 28 is provided with longitudinal grooves or splines 29 and, engaging the splines is a gear 31, which is held against transverse movement by the brackets 32, secured to the frame of the machine and lying on opposite sides of the gear 31. Meshing with the gear 31 is a gear 30, journaled in the frame of the machine and the gear 30 is connected to the driving pinion 39 of the motor, by the train of gears 33, 34, 35, 36, 37 and 38. Therefore, when the motor is in rotation, the shaft 28 is also in rotation.

Secured to the end of the shaft 23 is a gear 41, which is in mesh with an intermediate gear 42, mounted in the carriage. The gear 42 is in mesh with a gear 43, which is secured to the sleeve 44 journaled on the shaft 6. The sleeve 44 is made in two parts, for the purpose of facilitating manufacture and assembly, and these two parts are secured together in the machine. Secured to the opposite ends of the sleeve 44 are two ratchet wheels 45 and 46, which ratchet wheels form the driving members of two clutches. Surrounding the ratchet wheel 45 is a clutch housing member 47, which is secured to a sleeve 48, journaled on the shaft 6, and surrounding the ratchet wheel 46 is a clutch housing member 49, which is secured to the sleeve 50, journaled on the shaft 6. The two clutches are identical in structure and one of the clutches is shown in Figure 2. Pivoted within the clutch housing 49 is a clutch dog 52, having on one end a pawl 53 adapted to engage the ratchet wheel 46. At its other end, the clutch dog is provided with a foot 54 which is disposed in an aperture in the clutch housing. The clutch dog is normally held in position disengaged from the ratchet wheel 46 by the projection 55 on the control key 56. Depression of the key 56 moves the projection 55 from contact with the foot 54 and permits the spring 57 to move the clutch dog into engagement with the ratchet wheel, thereby driving the clutch housing in the direction indicated by the arrow. The other clutch is similarly provided with a control key 58, which, when depressed, causes rotation of the clutch housing 47. The two clutch housings 47 and 49 rotate in the same direction and means are provided whereby the rotation of the clutch housing 47 causes the shaft 6 to rotate in one direction, and rotation of the clutch housing 49 causes the shaft 6 to rotate in the opposite direction. The clutch housings are normally held stationary, and means are further provided that one clutch housing may remain stationary during the time that the other clutch housing and the shaft 6 are rotating. Secured to the shaft

6, adjacent one end of the sleeve 48, is a disc 62, shown in detail in Figure 8, which disc is provided with two cutout portions, or notches, 63 and 64. Splined to the sleeve 48, adjacent the disc 62, is a driving clutch member 65, having two diametrically opposed teeth 67, on the side adjacent the disc 62, and adapted to engage in the notches in said disc. The clutch member 65 is normally spaced from the disc 62, so that they are not in driving relation, and means are provided whereby depression of the clutch control key 58 will cause engagement of the clutch member 62 and 65. The stem of the clutch control key 58 is secured to a collar 69, which is journaled on the fixed shaft 71. The collar is provided on one surface with a cam projection 72, which is disposed in a recess in a collar 73, journaled on the shaft 71, and secured to the collar 73 is a shifting arm 74, which engages in a circumferential slot 76 in the clutch member 65. When the key 58 is depressed, the projection 72 forces the collar 73 toward the left, in opposition to the spring 78, moving the clutch member 65 into engagement with the disc 62, thereby driving the shaft 6 in the desired direction. During this operation, the key 56 remains elevated, and consequently the clutch members 62a and 65a, associated therewith, remain separated, so that the disc member 62a, which is secured to the shaft 6, will not drive the clutch member 65a, which is in driving connection with the clutch housing 49.

Interposed between the collars 69 and 69a is a floating collar 79, which is held against rotation with respect to the stationary shaft 71, and this floating collar, by virtue of the projections on opposite sides thereof, which cooperate with depressions in the adjacent faces of the collars 69 and 69a serves to prevent depression of one control key during the time that the other control key is depressed.

It has been stated that rotation of the shaft 6 in one direction serves to clear the multiplier register, and rotation of the shaft 6 in the opposite direction serves to clear the product register. Depression of the control key 58 serves to cause rotation of the shaft 6 in one direction and, means are provided whereby depression of the control key 56 will cause rotation of the shaft in the opposite direction. The disc member 62a is freely rotatable on the shaft 6, and, secured to said disc member, is a gear 82. Journaled on a shaft positioned behind the shaft 6, as shown in Figure 7, is a gear 83, which is in mesh with the gear 82. The gear 83 in turn meshes with a gear 84, which is of sufficient width so that it also meshes with a gear 85, secured to the shaft 6. Through this train of gearing, the direction of rotation of the shaft 6, by the clutch housing 49, is reversed to that which is accomplished

through the clutch housing 47. Therefore, on depression of the control key 56, the shaft 6 is rotated in the opposite direction.

As has been set forth hereinbefore, the numeral wheels 4 and 5 are held against rotation by the zero resetting means, by the detents 17, which detents are held in position by the balls 20, seated respectively in the rock shafts 18 and 19, the two shafts being independently rockable. Means are provided whereby the rotation of the shaft 6 in one direction will rock the shaft 18 to release the detents 17 associated with the numeral wheels 4 of the product register, whereby such rotation of the shaft 6 will reset the numeral wheels 4 to zero. Provision is also made whereby rotation of the shaft 6 in the opposite direction will rock the rock shaft 19, thereby releasing the detents 17 associated with the numeral wheels 5 of the multiplier register, whereby rotation of the shaft 6 in such opposite direction will reset the numeral wheels 5 to zero. Journalled on the shaft 6, at the end of the multiplier register, is a cam disc 92, which is provided with a collar 93, to which is secured one member 94 of a one direction clutch. The other member 95 of the one direction clutch is splined on a collar 96, which is secured to the shaft 6, and the clutch member 95 is urged against the clutch member 94 by a spring 97. The clutch member 95 is provided on its face, adjacent the clutch member 94, with teeth facing in one direction, in substantially the same manner as the teeth 67 on the clutch member 65, shown in Figure 9. The other clutch member 94 is of substantially the same construction as the clutch washer 62, as shown in Figure 8. Therefore, rotation of the shaft 6 in one direction will cause the clutch member 95 to drive the clutch member 94 in the same direction, and thereby rotate the cam disc 92. Upon rotation of the shaft 6 in the opposite direction, the teeth 67 on the clutch member 95 will merely snap by the recesses in the clutch member 94 without rotating such clutch member 94.

Engaging the cam member 92 is a spring pressed dog 98, which prevents rotation of the cam member 92 in a clockwise direction, as shown in Figure 6. The clutch members 94 and 95 are arranged to slip when the shaft 6 is rotated in a clockwise direction. Rotation of the shaft 6 in a counterclockwise direction causes rotation of the clutch member 94 and the cam member 92. Rotation of the cam member 92 in a counterclockwise direction, rocks the dog 98, which is geared to the dog 99, secured to the shaft 19, thereby rocking the shaft 19 to release the holding detents 17 of the multiplier register. The dog 98 is normally held in engagement with the cam member 92 by a

spring 102 surrounding the curved rod 103, which passes freely through an aperture in the arm 104, secured to the rocking member 99. Depression of the key 56 causes rotation of the shaft 6 in a counterclockwise direction (Figure 6), resulting in resetting the numeral wheels 5 of the multiplier register to zero.

Secured to the shaft 6, adjacent its left end, is a collar 105, to which is splined a spring pressed clutch member 106, similar in construction to the clutch member 62. Rotatably mounted on the shaft 6 is a collar 107, to which is secured a clutch member 108, similar in construction to member 65. The teeth on the clutch member 108, however, face in the opposite direction to the teeth on the clutch member 95. Formed integral with the collar 107 is a cam member 112 (Figure 4), which is engaged by a spring pressed dog 113, which is secured to the rock shaft 18. The dog 113 permits rotation of the cam member 112 in a clockwise direction and prevents rotation thereof in a counterclockwise direction. The clutch members 106 and 108 transmit the motion in a clockwise direction and slip when the shaft 6 is rotated in a counterclockwise direction. Therefore, when the shaft 6 is rotated in a clockwise direction (Figure 4) the shaft 18 is rocked, releasing the holding detents 17 of the numeral wheels 4 of the product register. Therefore, when the key 58 is depressed the numeral wheels of the product register are reset to zero.

The mechanisms of the calculating machine are driven by an electric motor 26, which is normally deenergized, and means are provided for energizing the motor, upon the depression of either key 56 or 58. Arranged in the motor circuit is a switch, comprising two normally spaced contacts mounted on resilient conducting arms 121 and 122. The arm 121 bears against an insulating abutment 123. The two arms are mounted in a block of insulating material 124, which is secured to the shaft 125. The shaft 125 is provided at its end with an arm 126, lying at a right angle to the axis of the shaft, and this arm 126 passes through an aperture in the ear 127, formed on the end of the lever 128, which is pivoted at 129. By rocking the lever 128 in a counterclockwise direction, the insulating block 124 is rocked in the same direction, forcing the contacts into engagement and closing the electric circuit through the motor. The stem of each key 56 and 58 is provided on the rear side of the shaft 71, with a foot 131—131a (Figs. 2 and 12), which feet underlie a bar 132, mounted on the rear plate 3 of the carriage. The bar 132 is movably mounted on the plate 3, so that depression of either key causes an upward movement of the bar, the mounting of the bar being such that the

bar moves upwardly as a whole, maintaining parallelism with its original position. The bar is provided at its upper end with a rearwardly extending lip 133, which corresponds in length to the total movement of the carriage. Overlying the lip 133 is the toe 134 of the lever 135, which is pivoted at 136. The lever 135 is connected by the link 137, with the lever 128. Depression of either key 56 or 58 will raise the bar 132, rocking the lever 135, and consequently the lever 138, resulting in the closing of the switch. Due to the construction of the clutch housing 49, the lever 56 will be held depressed by engagement of the projection 55 with the exterior surface of the housing during the time that the housing is out of neutral or full cycle position and, with the key so held, the switch will be held closed. Upon the completion of a revolution of the clutch housing, provided the key has been released, the projection 55 will enter the aperture in the clutch housing, engage the clutch pawl 52, and disengage and stop the clutch. The depressed key will then return to elevated position, causing the opening of the switch. It is seen, therefore, that, regardless of the displaced position of the carriage, that depression of key 56 will reset to zero the numeral wheels of the multiplier register without resetting the numeral wheels of the product register, and that depression of the key 58 will reset to zero the numeral wheels of the product register, without resetting to zero the numeral wheels of the multiplier register.

I claim:

1. In a calculating machine, a frame, a displaceable carriage mounted on the frame, a register mounted on said carriage, zero resetting means associated with the register, a motor mounted on the frame and control means on the carriage arranged to connect the motor to the zero resetting device.

2. In a calculating machine, a frame, a displaceable carriage on said frame, a register mounted on said carriage, zero resetting means associated with the register, a motor mounted on the frame of the machine and controllably connected to the zero resetting means for a plurality of displaced positions of the carriage, means on the carriage for connecting the motor in driving relation with the zero resetting means and manually operable means on the carriage for controlling the connecting means.

3. In a calculating machine, a frame, a register displaceably mounted thereon, a second register, zero-resetting means associated with each of said registers, a driving mechanism mounted in said frame, and means comprising permanently juxtaposed control elements displaceable with said displaceably mounted register and operable by a single manual stroke to connect said driving mechanism

with said zero-resetting means selectively, in any displaced position of said register.

4. In a calculating machine, a frame, a register displaceably mounted thereon, a second register, zero-resetting means associated with each of said registers, a driving mechanism mounted in said frame, and means comprising permanently juxtaposed control elements displaceable with said displaceably mounted register and each operable by a single manual stroke to connect said driving mechanism with one of said zero-resetting means selectively in any displaced position of said register.

5. In a calculating machine, a frame, a displaceable carriage mounted on said frame, a plurality of registers mounted on said carriage, zero resetting mechanism associated with said registers including a reversely rotatable shaft, a motor mounted on said frame, and selectively operable control means for connecting said motor and said shaft to effect resetting of either of said registers.

6. In a calculating machine, a frame, a displaceable carriage mounted on said frame, a plurality of registers mounted on said carriage, zero resetting mechanism associated with said registers including a reversely rotatable shaft adapted to selectively operate said zero resetting mechanisms upon rotation in one direction to reset one of said registers and in the opposite direction to reset another of said registers, a motor mounted on said frame, and manually operable means for connecting said motor to said shaft and selecting the direction of rotation thereof.

7. In a calculating machine, a plurality of registers mounted in a displaceable carriage, a clearing shaft rotatable in one direction for clearing one of said registers and in the reverse direction for clearing another of said registers, a motor, and means for effecting connection of said motor to said shaft to drive said shaft in either direction.

8. In a calculating machine, a plurality of registers mounted in a displaceable carriage, a clearing shaft rotatable in one direction for clearing one of said registers and in the reverse direction for clearing another of said registers, a motor, and a plurality of selectively operable clutches for connecting said motor to drive said shaft in either direction.

9. In a calculating machine, a plurality of registers mounted in a displaceable carriage, a clearing shaft rotatable in one direction for clearing one of said registers and in the reverse direction for clearing another of said registers, a motor, and reversing mechanism intermediate said motor and said shaft including a plurality of manually controllable clutches.

10. In a calculating machine, a plurality of registers mounted in a displaceable carriage,

a clearing shaft rotatable in one direction for clearing one of said registers and in the reverse direction for clearing another of said registers, a motor, reversing mechanism intermediate said motor and said shaft including a plurality of selectively operable clutches adapted to determine rotation of said shaft in either direction, and manually operable control means for said clutches.

10 In testimony whereof, I have hereunto set my hand.

CARL M. F. FRIDEN.

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