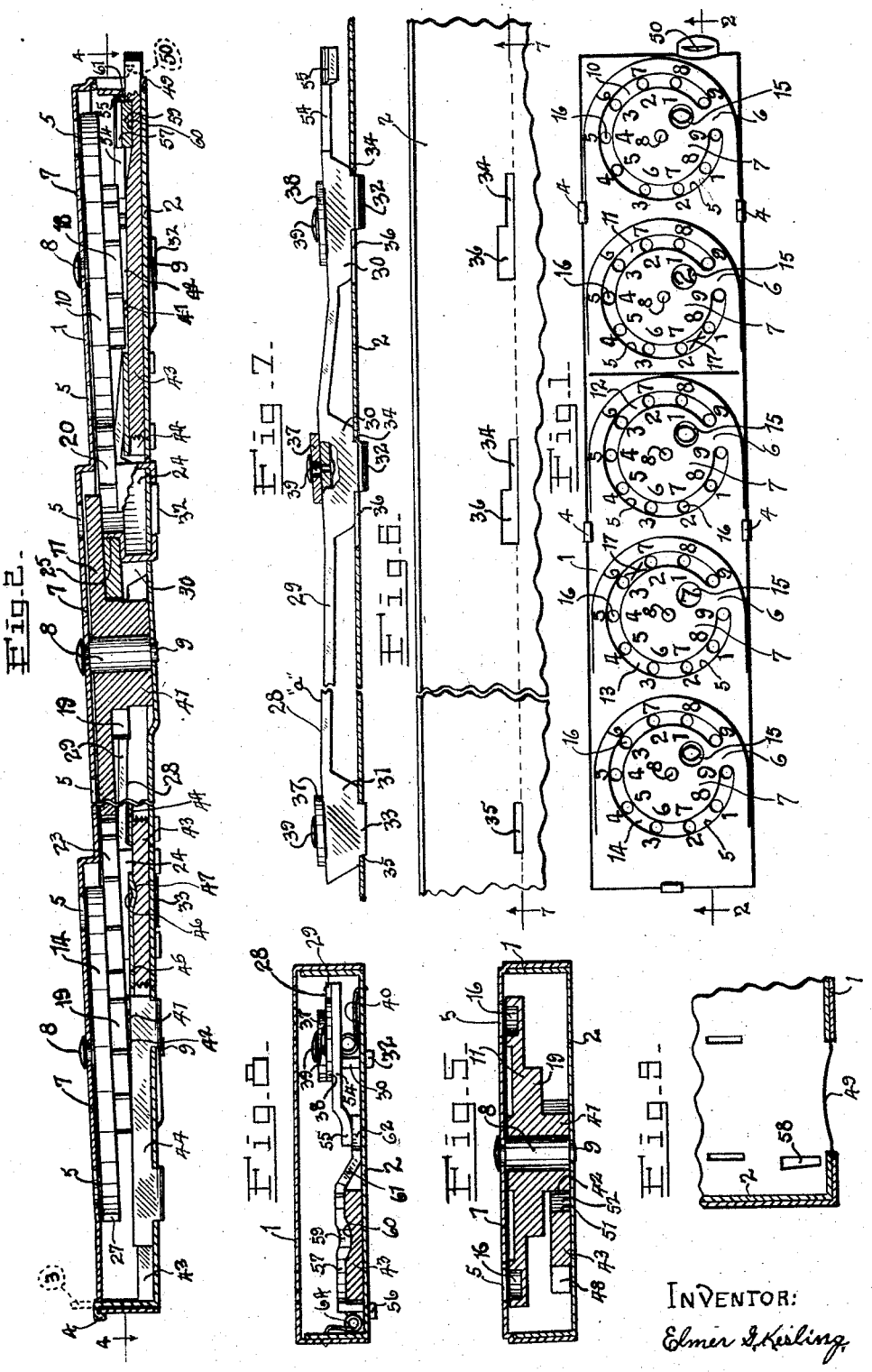
Oct. 5, 1948. E. G. KESLING 2,450,668

CALCULATOR

Filed May 22, 1944 2 Sheets-Sheet 1



INVENTOR:
Elmer G. Kesling

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CALCULATOR

Filed May 22, 1944 2 Sheets-Sheet 2

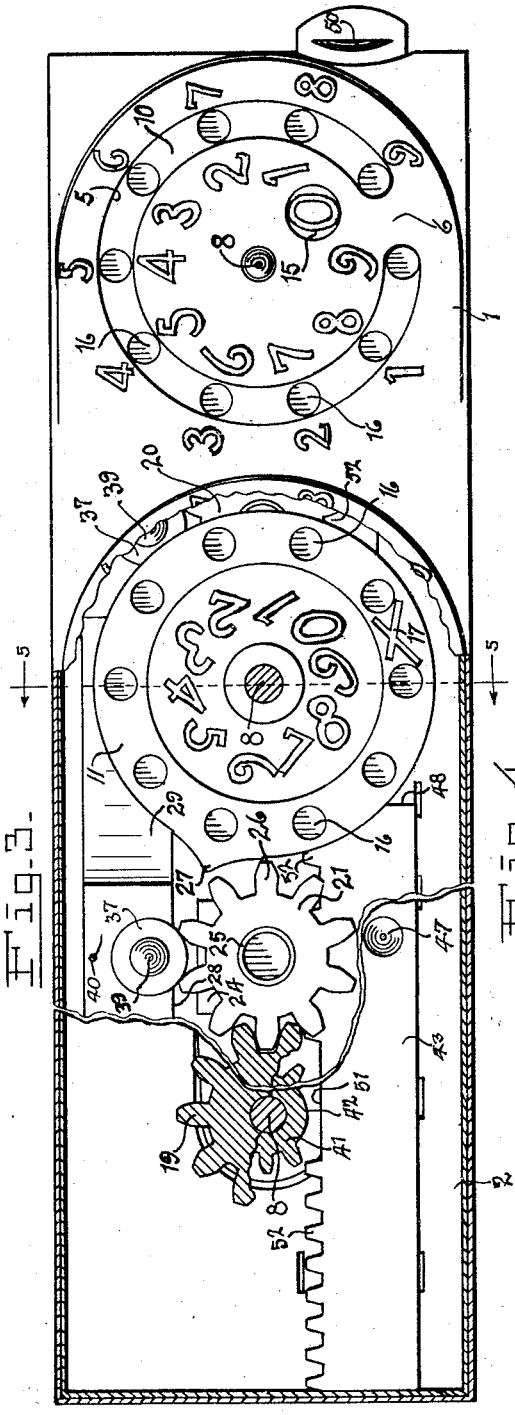

Fig. 3.

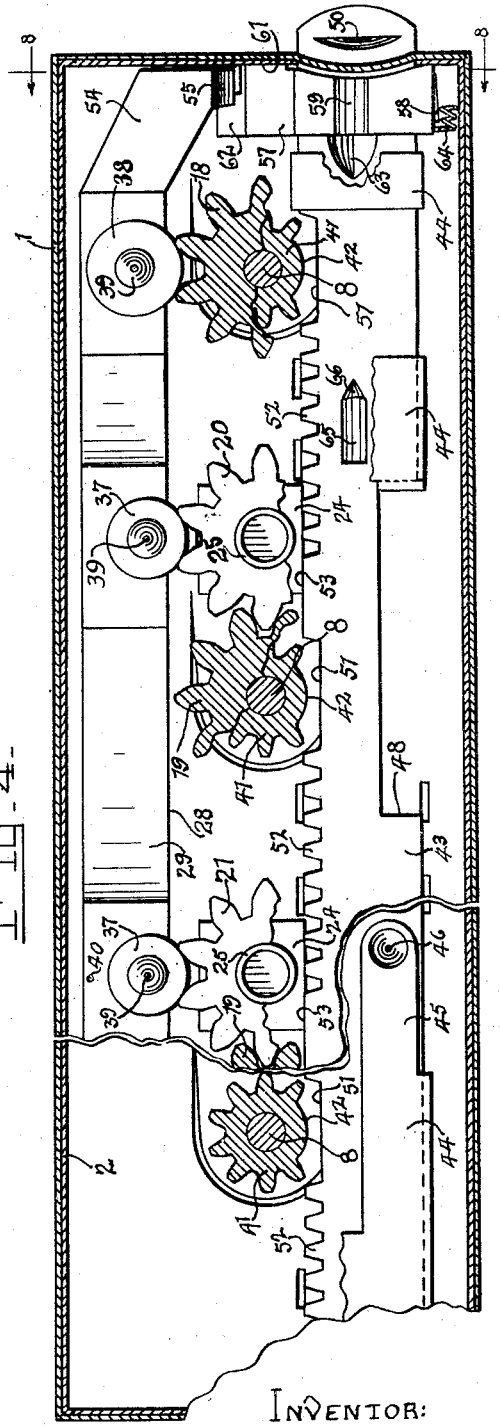

Fig. 4.

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UNITED STATES PATENT OFFICE

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CALCULATOR

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13 Claims. (Cl. 235—74)

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This invention relates to improvements in calculating machines, and more particularly to the type having operating dials. Various forms of this type of mechanism have been provided but all such as are known to me have made use of a great number of parts resulting in a device too large for practical purposes, and the cost of manufacture is made prohibitive.

Some objects of the type of invention set forth are: to provide a mechanism that will be simple, compact and rugged in construction, positive in operation and cheap to manufacture and assemble; to provide a mechanism that is so constructed and arranged to permit the operator to add or subtract with equal effort; to provide a mechanism that has a plurality of operating dials, one for each digit, each provided with an accumulating finger which effects one-tenth of a revolution to the dial of the next higher digit; to provide a mechanism that has a plurality of operating dials which are resiliently held in normal position by a spring acting against a detent, there being one spring and one detent common to all of the dials, wherein a turning movement of any one of said dials will release the detent from all of the other of said dials and allow them to turn freely, as desired, when and as an accumulation is effected; to provide a mechanism that has a reset rack which may be pulled out and pushed in to reset all dials to zero position; and to provide mechanism that has means acted upon by the initial outward movement of said reset rack to raise said detent and free all dials for turning during the remaining outward movement of said reset rack, and acted upon by the initial inward movement of said reset rack to release said detent and hold said dials against turning movement during the continued return movement of said reset rack to starting position.

Other objects will become apparent from the following description, which is to be read in connection with the accompanying drawings forming a part thereof.

In the drawings:

Fig. 1 is a plan view of the calculator.

Fig. 2 is a vertical enlarged view partly in section substantially on line 2—2 of Fig. 1.

Fig. 3 is an enlarged plan view of the calculator partly in section.

Fig. 4 is a vertical section substantially on line 4—4 of Fig. 2.

Fig. 5 is a partial section on the line 5—5 of Fig. 3.

Fig. 6 is a partial plan view of the lower part of the casing.

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Fig. 7 is a side elevation partly in section of the detent and lower part of the casing on line 7—7 of Fig. 6.

Fig. 8 is a partial sectional view on line 8—8 of Fig. 4.

Fig. 9 is a sectional view of one corner of the lower casing.

The invention comprises an upper casing 1 and a lower casing 2 which are held together by tongues 3 on the edge of the lower casing 2, said tongues 3 extending through appropriate apertures in the upper casing 1 and are bent down as at 4.

The calculator may provide any number of digits; but five as shown is the preferred number.

The upper casing 1 has circular apertures 5 which extend substantially 324° leaving a portion 6, about 36°, solid. This solid portion 6 helps to support and hold the encircled portion 7 and acts as a stop for the operating stylus or pencil. There is one aperture 5 for each digit.

An inclined shaft 8 is secured in a hole in the center of each portion 7, and has a reduced part 9 extending through a respective hole in the lower casing 2.

Dials 10, 11, 12, 13 and 14, one for each digit of the calculator, are loosely supported for turning movements on the respective inclined shafts 8. The dials each have ten total figures, 0 to 9, printed, cut or otherwise formed on their upper faces in such position that the figure "0" can be seen, when said dial is in zero position, through a total hole 15 provided in the enclosed portion 7. The total hole 15 is appropriately placed and the total figures are positioned 36° apart so that a total figure will always be visible through the total hole 15 at any one-tenth revolution of each of said dials.

Ten stylus pockets 16 are equally spaced around each dial, and are so positioned to be visible through the aperture 5. An "X" mark or other design 17 is so positioned between certain pockets 16 so it will be positioned under the solid portion 6 when said dial is in zero position.

Addition and subtraction figures, 1 to 9, are printed, cut or otherwise formed on the top face of the upper casing 1. The addition figures are placed consecutively anticlock-wise opposite the respective pockets 16, the figure "1" being opposite the second pocket 16 to the right of the solid portion 6; and the subtraction figures continue clockwise opposite the respective pockets 16 on the outside of the aperture 5, the figure "1" being opposite the second pocket 16 to the left of the solid portion 6.

The dial 10 has an integral ten toothed gear 18 on its under side. The dials 11 to 14 each have an integral ten toothed gear 19 on their under side.

Idler gears 20, 21, 22 and 23 each having ten teeth are properly supported between the shafts 8 for meshing with the gears 19 of the respective dials 11 to 14. Stamped pieces 24 are fastened in any practical manner to the lower casing 2 affording support to said gears 20 to 23. Said pieces 24 are punched upward through center holes in said gears 20 to 23, thereby forming respective bearings 25 for said gears.

A line drawn through the center of said shafts 8 will pass through a tooth point 26 of said gears 20 to 23 respectively. Each dial 10 to 14 has a properly formed gear tooth 27 which is positioned 18° above said line through said shafts 8.

The dials 10 to 14 and the gears 20 to 23 are all inclined to correspond with the inclination of said shafts 18, and are so placed that the tooth 27, as shown in Fig. 3, will mesh with the tooth 26 of the gears 20 to 23 respectively. It is obvious that each time the tooth 27 effects a turning of the respective gears 20, 21, 22 or 23 the corresponding dial is turned in an opposite direction one figure, thereby effecting an addition or a subtraction accumulation.

A single detent 28 has a horizontal table like formation 29, and vertical supports 30 and 31. The supports 30 have hooked bearings 32 on their lower edges, and the support 31 has a straight bearing 33 on its lower edge. Properly positioned bearing holes 34 and 35 are provided in the lower casing 2 (Fig. 6). The holes 34 have an enlarged portion 36 extending toward the bearing hole 35. In assembling the device, the hooked bearings 32 are placed in the holes 36 which procedure springs the table 29 at *a*, Fig. 7; and, when the detent 28 is moved bodily towards the right, the hooked bearings 32 will hook under one edge of the bearing holes 34 and when completely in place the bearing 33 will have dropped into the bearing hole 35, thereby locking said detent 28 to the casing 2 for rocking movements. Properly positioned engaging rollers 37 and 38 are rotatably secured to said table 29 by bearing rivets 39.

A tooth space of gear 18 faces towards the detent 28, and the roller 38 engages therein. It is obvious that tooth spaces of said gears 20 to 23 face toward the detent 28, and the rollers 37 engage therein respectively. The detent 28 is resiliently held against the gears 18 and 19 by a single spring 40. It is to be noted that the detent 28 is common to all dials, and that the operation of any one dial will release said detent 28 from all of the other dials and allow them to turn freely as required.

A reset gear 41 is made integral with the under side of each of the gears 18 and 20 to 23. The teeth of the gears 41 are spaced 36° apart and two teeth on the side 42 are missing.

A reset rack 43 is positioned on the other side of the device from the detent 28 and slides endwise on the floor of the casing 2 and is guided by straps 44 which are secured to the lower casing 2. One of said straps 44 has a resilient projection 45 with a depression 46 adjacent its free end for engaging a depression 47 formed in said rack 43, thereby resiliently holding said rack 43 in place. A stop gap 48 is formed in one side of said rack 43 for engaging a part of one of said straps 44 and preventing said rack 43 from being pulled out too far. Said rack 43 extends

through a hole 49 in one end of the calculator, and is provided with a thumb nail notch 50 formed in the extended end. A tooth free space 51 is provided opposite each tooth free space 42 of said gears 41 to allow free turning of said gears 41. To the left of said spaces 51, gear teeth 52 are provided for meshing with the teeth of said gears 41, as desired. To the left of said gear teeth 52, a blank space 53 is provided to prevent the gears 41 from being turned too far.

At the end of the detent 28, adjacent the dial 10, an end and side projection 54 is provided which ends in a tip 55.

A hooked bearing 56 of an arm 57 is pivotally hooked into a hole 58 in the lower casing 2, and extends up and over the reset rack 43. Above said rack 43, said arm 57 has a depressed portion 59 which normally rests in a depression 60 formed in said rack 43. The arm 57 extends over said rack 43 and has a surface 61 which normally contacts the inner end wall of the lower casing 2 and ends in a tip 62 one side of which normally engages under said tip 55.

When the reset rack 43 is pulled out, the depressed portion 59 rides up the incline 63 formed at the end of said depression 60 and raises said arm 57 against the resilient action of the spring 64 resulting in said tip 62 raising said tip 55 and thereby rocking said detent 28 in said bearings 34 and 35 against the action of said spring 40, thus disengaging said rollers 38 and 37 from the teeth of said gears 18 and 20 to 23, respectively, and allowing said gears to turn freely as required. When the rack 43 is completely pulled out the portion 59 will have dropt into the depression 65 formed in the top of said rack 43; and immediately, when said rack 43 is pushed in, the portion 59 will lag on the incline 66 and the tip 62 will be pulled, against the action of said spring 64, from under the tip 55 and the rollers 38 and 37 will reengage the teeth of the gears 18 and 20 to 23 respectively, thus holding said dials 10 to 14 in zero position as said reset rack 43 is pushed in to starting position. The reset rack 43 having been pushed in, the first dial 10, 11, 12, 13 or 14 to be turned will rock the detent 28 and raise the tip 55 and the tip 62 will again slide under the tip 55. Such movement of the arm 57 being effected by said spring 64.

In the manipulation of the calculator, the operator uses a stylus or pencil placing the point into the desired pocket 16 of the proper dial and turning the dial in the required direction to effect addition or subtraction as desired. For addition, the addition numbers on the inside of the portion 7 are used, and the dials are turned clockwise until the stylus strikes the portion 6. For subtraction, the subtraction numbers on the frame outside the apertures are used, and the dials are turned anti-clockwise until the stylus strikes the portion 6.

When a tooth 27 meshes with any of the idler gears 20, 21, 22 or 23, an addition or a subtraction accumulation is effected and the total is always visible through the total holes 15.

To clear the mechanism or reset the dials to a zero position, the total shown may be simply subtracted; (see Fig. 1—a total of $70.20 is shown. The stylus may be inserted into pocket 16 opposite the subtraction number 7 and the dial 12 turned anti-clockwise until the stylus strikes the portion 6, and into the pocket 16 opposite the subtraction number 2 and the dial 11 turned anti-clockwise until the stylus strikes the portion 6. The calculator is now in zero position); or the stylus

may be placed into the first pocket clockwise from the cross 17 and each dial turned anticlockwise until the stylus strikes the portion 6 (also note Fig. 1); or the reset rack 43 may be pulled out and pushed in, as has heretofore been explained.

It is to be noted that if all parts numbered from 55 to 66, inclusive, were omitted or left off a complete adding and subtracting mechanism would remain; and it is also to be noted that if all parts numbered from 41 to 66, inclusive, were omitted or left off a complete adding and subtracting mechanism would remain.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims.

What I claim as new, and desire to secure by Letters Patent, is:

1. A calculating mechanism comprising a plurality of operative dials, means co-acting between said dials for effecting accumulation, a single spring operated detent mounted for resiliently holding all of said dials, a reset bar mounted for longitudinal movements for returning said dials to zero position as required, and means co-acting between said reset bar and said detent for releasing said dials during said resetting movement.

2. In a calculator, a base, a lurality of calculating members rotatably mounted thereon, transfer means between the calculating members for transferring predetermined rotation of each member into predetermined rotary movement of successively adjacent ones, detent mechanism having individual means to hold the several members yieldably against rotation, and means for operating the detent mechanism to relieve all of the members held thereby, at once, said detent mechanism including a single rigid member having means for individually acting to hold each calculating member, and means mounting the rigid member on the base for displacement of all of said engaging means to release said calculating members at once.

3. In a calculator, a base, a plurality of calculating members rotatably mounted thereon, transfer means between the calculators for transferring predetermined rotation of each member into predetermined rotary movement of successively adjacent ones, detent mechanism having individual means to hold the several members yieldably against rotation, reset means for zeroizing the members, and means connecting the reset means and detent means to release the detent means from all of the members when the reset means is operated.

4. In a calculator, a base, a plurality of calculating members rotatably mounted thereon, transfer means between the calculators for transferring predetermined rotation of each member into predetermined rotary movement of successively adjacent ones, detent mechanism having individual means to hold the several members yieldably against rotation, reset means operable in one direction and then in a return direction, said reset means being adapted to zeroize the calculating members during its movement in one direction, and means connecting the reset means and the detent means for releasing the detent means during the zeroizing movement of the reset means.

5. In a calculator, a base, a plurality of calculating members rotatably mounted thereon, transfer means between the calculators for transferring predetermined rotation of each member into predetermined rotary movement of successively adjacent ones, detent mechanism having individual means to hold the several members yieldably against rotation, reset means operable in one direction and then in a return direction, said reset means being adapted to zeroize the calculating members during its movement in one direction, means connecting the reset means and the detent means for releasing the detent means during the zeroizing movement of the reset means, and means returning the detent means to hold the calculating members on the movement of the reset means in its other direction.

6. A calculating mechanism including a base, a plurality of calculating members rotatably mounted on the base, means coacting between the members for effecting accumulation, detent means yieldably holding the calculating members against rotation, reset means movable for zeroizing the calculating members, means rendering the detent means ineffective during zeroizing movement of the reset means, and means rendering the detent means effective again after a zeroizing movement of the reset means is completed.

7. A calculating mechanism including a base, a plurality of calculating members rotatably mounted on the base, means coacting between the members for effecting accumulation, a supporting member movably mounted on the base, detent means on the supporting member to hold the calculating members against rotation, the supporting member being movable to permit the calculating members to move, spring means yieldably urging the supporting member toward detent engaging position, reset means movable to zeroize the calculating members, interengaging means between the reset means and the supporting member to effect movement of the detent means into position to permit movement of the calculating members, during zeroizing movement of the reset means.

8. A calculating mechanism including a base, a plurality of calculating members rotatably mounted on the base, means coacting between the members for effecting accumulation, a supporting member movably mounted on the base, detent means on the supporting member to hold the calculating members against rotation, the supporting member being movable to permit the calculating members to move, spring means yieldably urging the supporting member toward detent engaging position, reset means movable to zeroize the calculating members, interengaging means between the reset means and the supporting member to effect movement of the detent means into position to permit movement of the calculating members, during zeroizing movement of the reset means, the reset means being movable from an initial to a second position to zeroize, and then being returnable to initial position, said interengaging means including a lever rocked by the reset means and abutting the supporting member, and means to withdraw the lever from one of them after the reset means has completed its zeroizing movement but before it completes its return movement, whereby the detent is ineffective during zeroizing, but is effective during the return movement.

9. A calculator including a base, a plurality of calculating members rotatably mounted on the base, accumulating means between the calculating members, including a gear connected with

each member, a detent frame pivoted on the base for pivoting on an axis at right angles to the axes of the calculating members, detent elements on the frame movable into engagement with said gears, said frame being rockable to withdraw all of the detent elements from the gears, and spring means urging the frame toward engagement of the detent elements and the gears.

10. A calculator including a base, a plurality of calculating members rotatably mounted on the base, accumulating means between the calculating members, including a gear connected with each member, a detent frame pivoted on the base for pivoting on an axis at right angles to the axes of the calculating members, detent elements on the frame movable into engagement with said gears, said frame being rockable to withdraw all of the detent elements from the gears, spring means urging the frame toward engagement of the detent elements and the gears, a lever engageable with the frame and pivoted onto the base, and manually operable means to rock the lever and the frame to disengage the elements.

11. A calculator including a base, a plurality of calculating members rotatably mounted on the base, accumulating means between the calculating members, including a gear connected with each member, a detent frame pivoted on the base for pivoting on an axis at right angles to the axes of the calculating members, detent elements on the frame movable into engagement with said gears, said frame being rockable to withdraw all of the detent elements from the gears, spring means urging the frame toward engagement of the detent elements and the gears, a lever engageable with the frame and pivoted onto the base, a reset slide movable from an initial to a second position to zeroize the calculating members, and return, said slide having a rise engageable with the lever to free the detent elements during movement of the slide from initial to second position, and means to withdraw the lever from the frame, said means being operated by return movement of the slide, to effect reengagement of the detent elements during such return movement, and the lever being reengageable with the frame when a gear is thereafter rotated and the frame is rocked.

12. A calculator including a base, a plurality of calculating members, a plurality of shafts on the base, one for each calculating member, said shafts being angularly disposed on the base, a calculating member having a peripheral tooth, an idler gear angularly pivoted on the base, engageable with the tooth of the calculating member at the low side of the member, and the high side of the gear, the adjacent calculating member having a gear engageable on its high side with the low side of the idler gear.

13. In a calculator, a base, a plurality of calculating members rotatably mounted thereon, a plurality of toothed elements, one fixedly connected with each calculating member, each toothed member having a peripheral gap, a slidable reset bar mounted on the base and disposed adjacent said toothed elements for cooperation therewith, the bar having recesses spaced apart the distance between adjacent toothed elements to permit rotation of the elements, the bar having toothed portions on its edge adjacent the recesses, and then having untoothed blank spaces beyond the toothed portions, said toothed portions being engageable with the toothed elements when the bar is slid, to return them to positions wherein their peripheral gaps face the bar, and the blank spaces being slidable across the toothed elements when their gaps face the bar, to prevent further rotation of the elements.

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