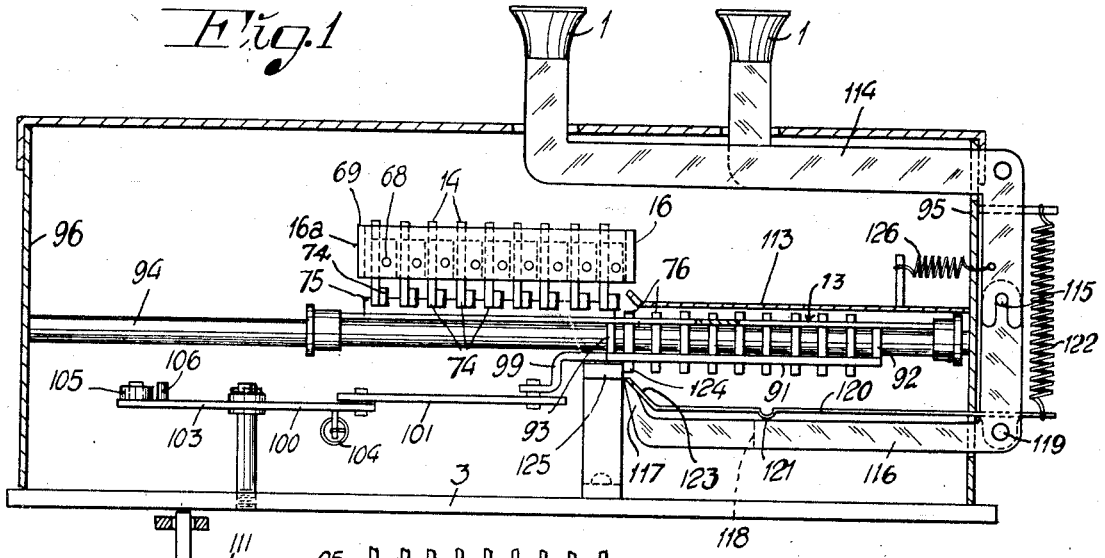
Dec. 1, 1942. G. H. HELLGREN 2,303,692

CALCULATING MACHINE

Filed Aug. 16, 1938 5 Sheets-Sheet 1

Fig. 1



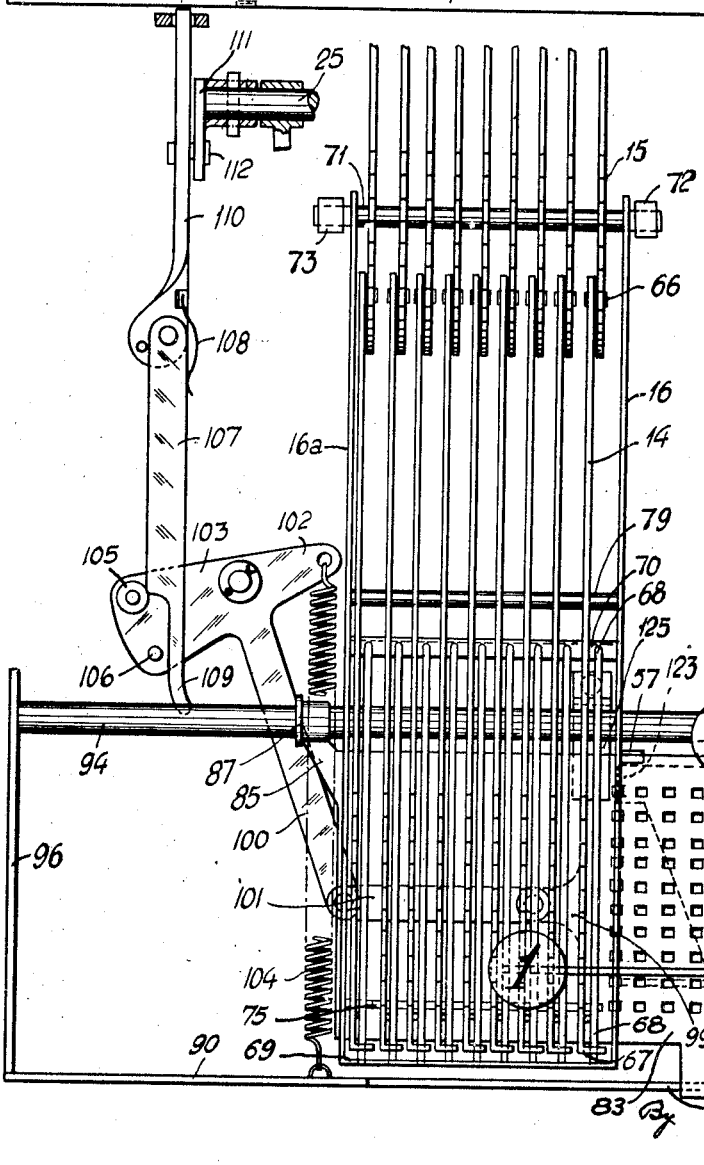


Fig. 2

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CALCULATING MACHINE

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Fig. 6

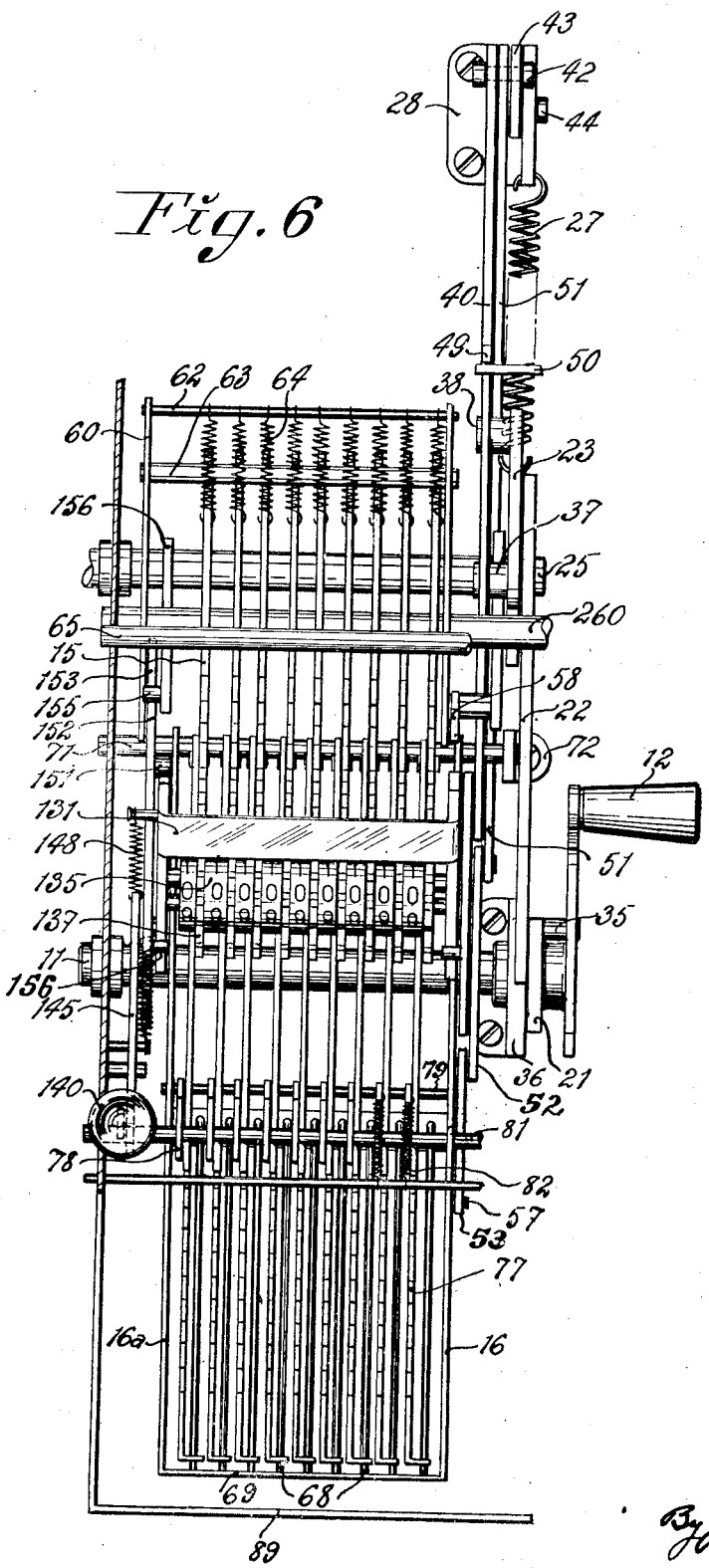
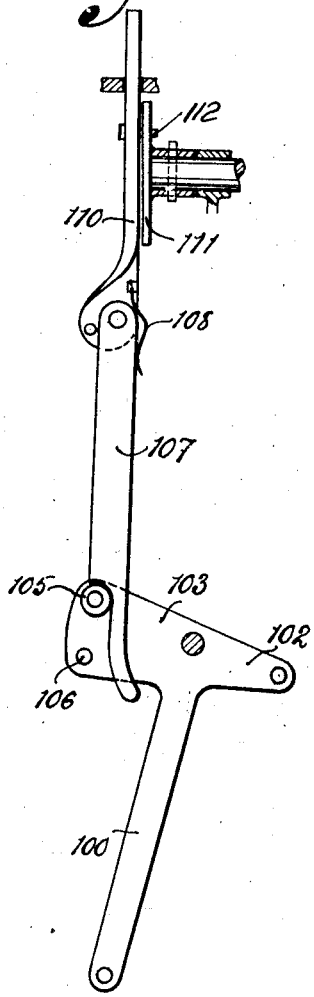


Fig. 3



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CALCULATING MACHINE

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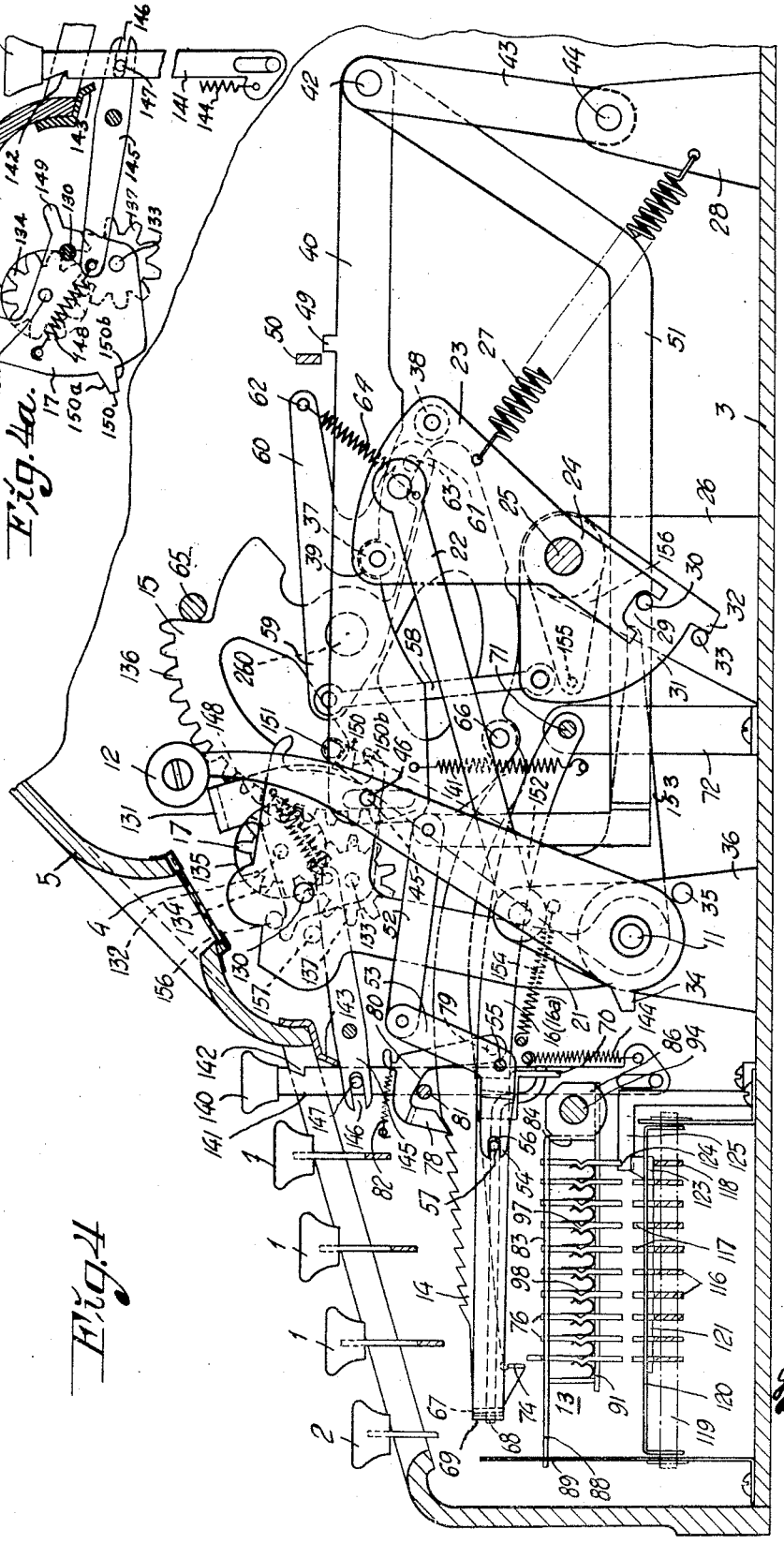

Fig. 4a.

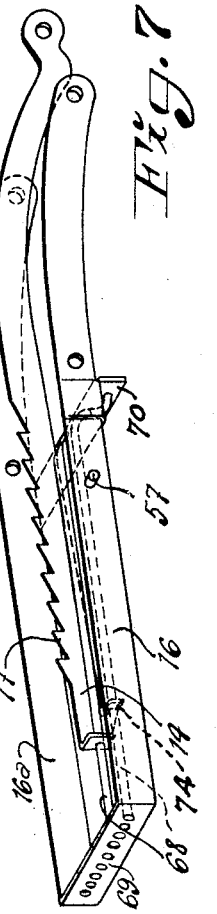

Fig. 7

Fig. 4

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CALCULATING MACHINE

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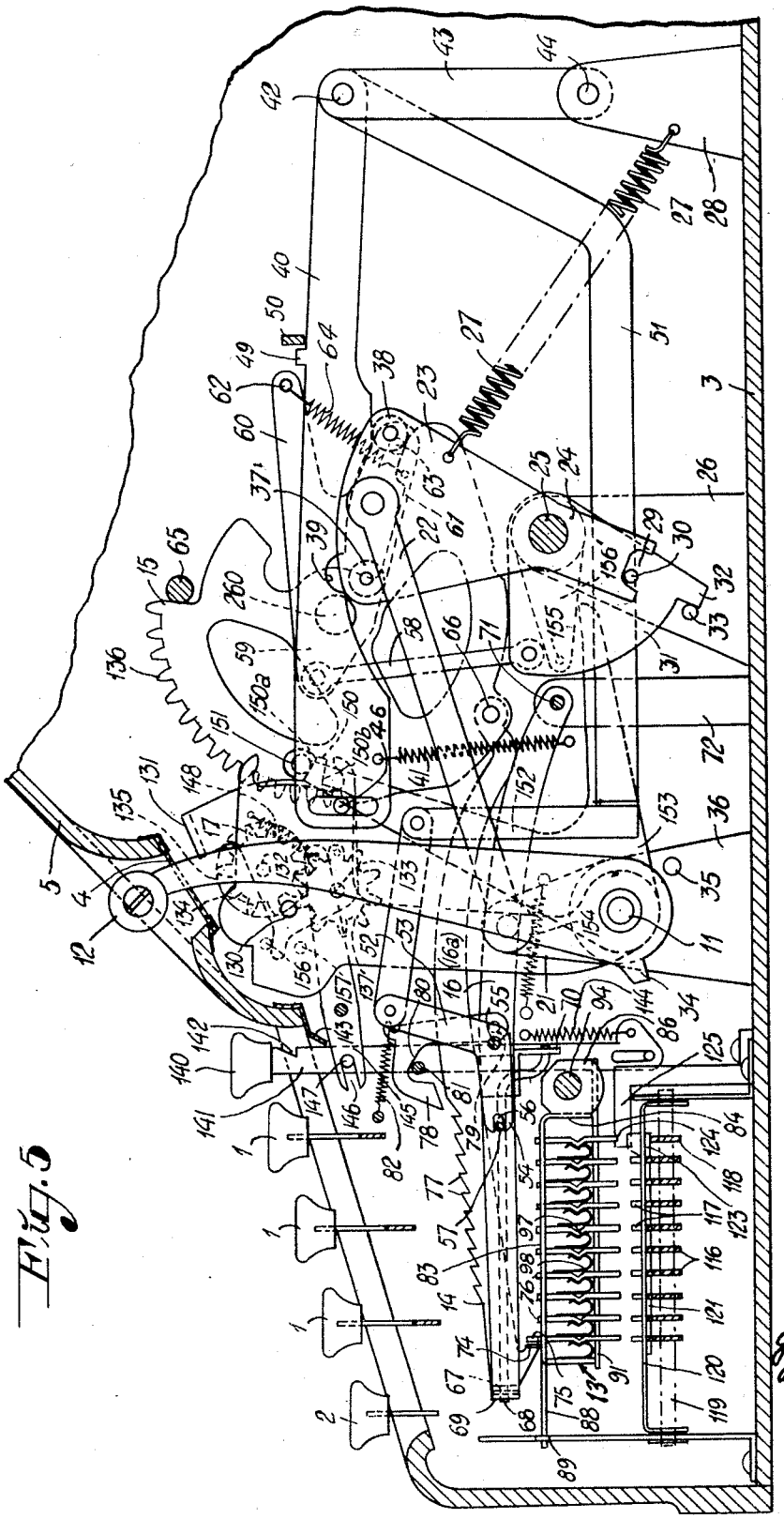

Fig. 5

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CALCULATING MACHINE

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Fig. 11

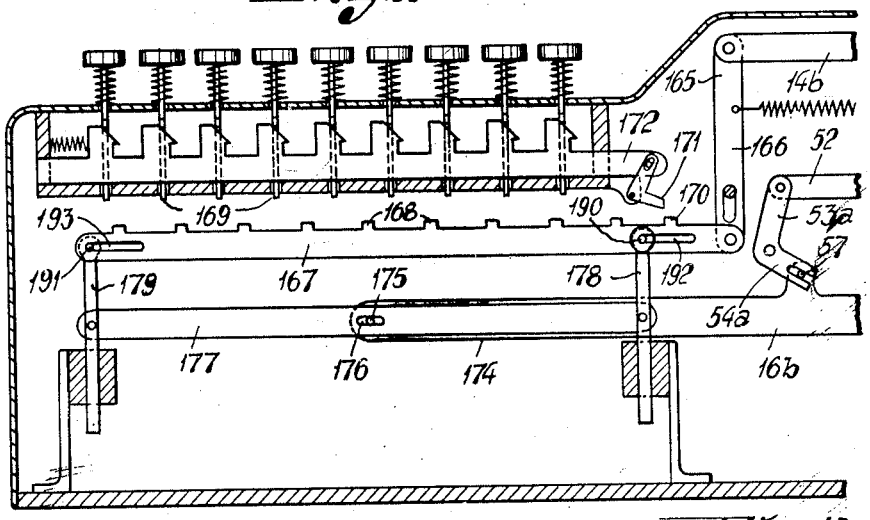


Fig. 8

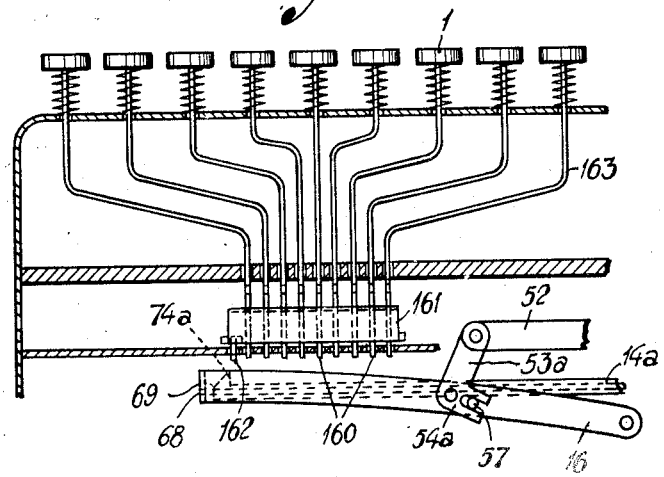


Fig. 10

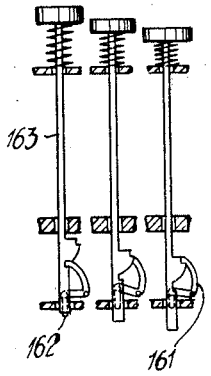
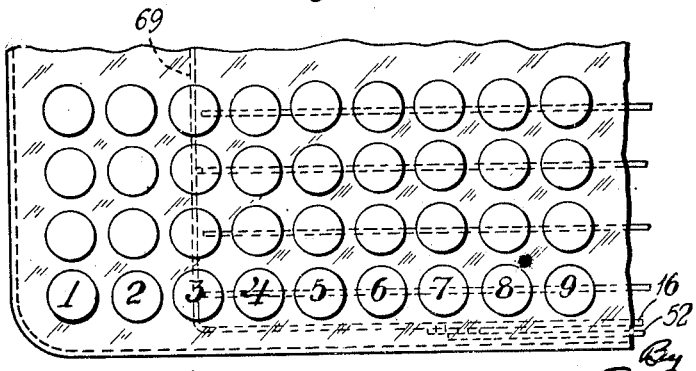


Fig. 9



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Patented Dec. 1, 1942 2,303,692

UNITED STATES PATENT OFFICE

2,303,692

CALCULATING MACHINE

Gustaf Hilarius Hellgren, Malarhojden, Sweden

Application August 16, 1938, Serial No. 225,222
In Sweden August 21, 1937

5 Claims. (Cl. 235—60)

This invention relates to improvements in calculating machines of the type in which differential members such as rods, racks, toothed segments or similar reciprocating or swinging members are displaced so as to cooperate or be stopped by a set key or similar stop member which corresponds to the amount involved in the calculation operation. The invention is particularly concerned with a novel construction that will enable new items involved in the next following calculation operation to be set up in the machine before the preceding operating cycle of the machine has been completed.

It is the primary object of the invention to provide a calculating machine which may be operated with greater working speed than machines of the same type hitherto known, and with as little strain and wear as possible on the moving parts.

Another object of the invention is to provide a novel construction which enables the use of a weaker spring for the handle of manually operated calculating machines.

More specifically stated the object is to provide a machine having adjustable stop pins mounted on a carriage and differential members adapted to cooperate with said stop pins, the arrangement being such that the stop pins and the said members are moved away from each other at the end of the forward stroke or immediately at the beginning of the return stroke of the main shaft in order to enable the differential members to freely most past such stop pins which may already have been set for the next following calculation operation. In machines hitherto known, as long as some of the set members or those which during the calculation operation proper cooperate with each other do not occupy initial position, it is not possible to prepare the next following calculation operation, that is to say to set up the new figure involved, because the parts concerned would prevent the movement to initial position of those parts which have been set or adjusted at the preceding operation.

In accordance with the present invention the differential members, for instance, in the form of rods, racks, toothed segments or the like cooperating with pins, keys, or the like stop means, are mounted for the said purpose on a supporting member which is movable in such manner that the said differential members, having the supporting member in a certain position, can freely move past said stop pins or the like (that is to say they will not cooperate with said stop pins or the like). For this purpose the differential members are mounted on a frame which may be rocked or turned or displaced parallel with itself in the same or opposite direction in which the stop means are set and which is so connected with the driving member of the calculating machine that the differential members are brought out of the path of movement of the stop pins or the like immediately upon the differential members having occupied the desired set position. The differential members are preferably provided with or adapted to cooperate with locking means in order to retain the same in their set position even after they have been brought out of engagement with the stop pins or the like.

The invention may be applied to calculating machines of the types described above. It is especially suitable for manually driven machines carrying out additions and of the ten key type, but naturally it may also be applied to multiple key adding machines.

Other objects and advantages will appear from the following specification and drawings.

The invention as applied to different types of key boards is illustrated in the accompanying drawings in which—

Figure 1 is a front elevation, partly in section, of the key board portion of a machine embodying the invention, the casing and the front plate of the machine frame having been removed to expose the interior mechanism, the keys "1" and "9" only having been shown for the sake of clearness;

Fig. 2 is a plan view of the mechanism shown in Fig. 1, some portions of the details at the lower right-hand corner having been broken away;

Fig. 3 is a fragmentary plan view of the carriage return mechanism with the parts shown in their positions after the carriage has moved to its extreme end position and the handle of the machine is about to begin its return stroke;

Fig. 4 is the right side elevation of a machine of the ten key type embodying the invention, the casing being broken away and some plates of the machine frame being removed to expose the interior parts. The keys representing "zero" and the amounts "1," "5" and "9" only have been shown.

Fig. 4a is a fragmentary side elevation, as seen from the left side, of the totalizer and the subtract key control elements, the tens transfer device being omitted for clearness.

Fig. 5 is a partial view similar to Fig. 4 except that the frame with the differential members is shown in working position.

Fig. 6 is a plan view of the details shown in Fig. 4.

Fig. 7 is a perspective view of the movable frame supporting the differential members, a few of which only are shown for the sake of clearness.

Fig. 8 is a diagrammatic view in right side elevation of a portion of a multiple key board machine to which the invention has been applied.

Fig. 9 is a partial plan view of a portion of the key board shown in Fig. 8.

Fig. 10 is a lateral view of one of the keys of Fig. 9 in three different positions.

Fig. 11 is a diagrammatic view in right side elevation of a portion of another type of multiple key board machine to which the invention has been applied.

Like parts are identified by the same reference numbers throughout the several views, modifications having the affix *a*, *b* and so on.

The totalizer may be provided with a tens carrying mechanism of the type as shown and described in my Patent No. 2,008,355. For the sake of clearness and as not constituting a part of the present invention, such tens carrying mechanism, however, has not been described or illustrated in the drawings. It is further possible to provide a machine containing the present invention with a printing device of conventional type.

General construction

The machine illustrated in Figs. 1–6 is provided with a set of ten adjustable amount keys, while the modifications shown in Figs. 8 and 11 belong to machines which are provided with a plurality of banks of adjustable amount keys.

The machine as shown in Figs. 1–6 is provided with a main drive shaft 11 which, during the machine operation, is first rocked counterclockwise as viewed in Fig. 4 and then returned clockwise. This shaft may be operated by a hand lever or by a motor. The machine illustrated is a manually driven machine, the hand lever 12 being keyed to the shaft 11.

The amount keys 1 and the "0" key 2 are adapted to actuate stop pins mounted on a carriage 13, which pins, when the machine is operated, control the longitudinal movement of differential members 14 pivoted to actuator racks 15.

The chief feature of the invention is the mounting of the differential members 14 on a movable frame 16, 16*a* which is connected to the same mechanism which controls the engagement and disengagement of the actuator racks 15 with the totalizer 17, which latter is of the so called "tumbling frame" type.

The structure of the various sub-mechanisms will now be described in detail.

The driving mechanism

To the shaft 11 is keyed an arm 21 connected to one end of a link 22 (Fig. 4) whose other end is connected to a double-armed lever 23, 24 pivoted about a shaft 25 which is journalled in a suitable manner such as indicated by the bracket 26 fixed to the bottom plate 3 of the casing. A spring 27 attached to the arm 23 and another bracket 28, tends to turn the lever clockwise. The arm 24 has a notch 29 surrounding a stud 30 fixed to a sector 31 which is keyed to the shaft 25. A finger 32 on the sector 31 normally rests, by the influence of the spring 27, against a stud 33 fixed to the bracket 26. By this means the return stroke of the handle 12 is limited, while the forward stroke is limited by a finger 34 integral with the arm 21 and a stud 35 attached to a bracket 36 which supports the main drive shaft 11. This latter is adapted to be rocked about 110° in forward direction and thus also 110° when it is returned.

The upper arm 23 has attached thereto two rollers 37, 38 adapted alternately to engage a notch 39 in the lower edge of a link 40, a spring 41 tending to keep either of the rollers in engagement with the notch 39. The rearward end of the link 40 is pivoted as at 42 to the upper end of an arm 43 the lower end of which is pivoted to a stud 44 attached to the bracket 28. The forward end of said link 40 has a slot 45 engaging a stud 46 attached to one of the frame plates 47, 48 which support the totalizer 17. The link has a projection 49 adapted to be brought periodically behind a stop 50 fixed to the machine frame.

The stud 42 further supports one end of a rod 51 bent at several places and pivoted at its forward end to a link 52 which is connected to the upper arm 53 of a bell-crank 53, 54 which is pivoted about a stud 55 attached to the machine frame. The lower or forward arm 54 of the bell-crank has a notch 56 engaging a pin 57 fixed to one or two bars 16, 16*a* pertaining to the frame which supports the differential members 14.

The sector 31 is connected by means of a link 58 to a three-armed lever 59, 60, 61 keyed to a shaft 260 supported by the machine frame and itself supporting the actuator racks 15. At the left side of the machine, as seen in Fig. 6, a similar lever is keyed to the shaft 260, and the arms 60 and 61 of the levers by a rod 62 and by a rod 63, respectively. Each rack 15 is connected with the spindle 62 by means of a spring 64 which in initial position of the parts, such as shown in Fig. 4, is not or only slightly tensioned. All racks normally rest against the rod 63 and the movement of the racks in clockwise direction is limited by a stop 65 attached to the machine frame. The said springs 64 will be tensioned when, during the forward stroke of the handle 12, the lever 60 is turned counterclockwise, so that the springs tend to also turn the racks in the same direction to an extent which is determined by the differential movement of the members 14. These members 14 are pivoted to their individual racks 15 by means of studs 66.

Supporting frame for differential members

The differential members 14 are slidably mounted, according to the present invention, with their bent forward ends 67 on wires 68 which are secured to the forward plate 69 of the frame 16, 69, 16*a* (Figs. 2 and 4), on one end, and to a transverse plate 70 of said frame, on the other end. The rearward end of the two side plates 16, 16*a* are pivoted on a shaft 71 which is journalled in brackets 72, 73. Each differential member 14 has a shoulder 74 extending downwardly and adapted to cooperate either with the "0" rail 75 that is fixed to the plate 83, Fig. 1, or with one of the stop pins 76 on the carriage, which has been set by a numeral key as will be described later. The upper edge of each differential member has a series of ten teeth 77 adapted to cooperate with a pawl 78, when the frame 16, 69, 16*a* is in its upper position, such as illustrated in Fig. 4. The pawls 78 are pivoted on a spindle 79 mounted on the side plates 16, 16*a*. Toward the differential

member each pawl has an inclined surface 80 cooperating with a fixed shaft 81, springs 82 urging the pawls against said shaft. When the frame 16, 69, 16a is rocked counterclockwise, as will be explained later, the pawls 78 slide with the inclined surfaces around the fixed shaft 81, so that they leave their engagement with the teeth 77 and the differential members 14 are allowed to be moved toward the rear end of the machine. At the rocking of the frame 16, 69, 16a in opposite direction, that is clockwise, the springs 82 will draw the pawls 78 into engagement with that tooth 77 of the differential member 14 which lies in register with the pawl and which is determined by the differential movement of the member 14 at the calculation operation under consideration.

The carriage

The stop pins 76 of substantially rectangular section and the "0" rail are mounted for axial movement on the carriage 13 which substantially consists of an upper plate 83 having projections 84, 85 fixed to sleeves 86, 87 and a tongue 88 slidable in a slot 89 of a front plate 90, a lower plate 91 and two connecting side plates 92, 93. (Figs. 1, 2 and 4.) The sleeves 86, 87 are mounted for free displacement on a shaft 94 fixed to two side plates 95, 96 of the machine frame. Both the upper plate 83 and the lower plate 91 are provided with rows of ten holes each, through which holes extend the stop pins 76 representing the numerical values 0, 1, 2 and so on, to 9 inclusive, in each row. The "0" rail 75 is arranged in the same line as the "0" stop pins 76, that is the pins in the first (lowest) line (Fig. 2). When the carriage is in normal position (to the right, Figs. 1 and 2) the "0" rail 75 prevents all differential members 14 from moving rearwardly. According as the carriage moves step by step to the left, when the machine is operated, the differential members 14 will be free one after the other, counted from the right (Fig. 1), and may now move rearwardly until stopped by the pins 76 which have been set. Each pin 76 is pressed in between its ends to form a projection 97 of somewhat triangular section, and individual leaf springs 98 of corresponding shape are inserted between two adjacent pins serving to retain the pertaining pin in either of the two positions, namely an upper effective position in which it can cooperate with the shoulders 74 on the differential members 14 and a lower ineffective or normal position such as shown in Fig. 4. The lower carriage plate 91 has a tongue 99 which is connected to the extreme end of an arm 100 by means of a link 101. The said arm 100 belongs to a driving device for the carriage as will be described later.

The carriage driving device

The arm 100 is integral with a pivoted lever 102, 103 which is urged by a spring 104 to turn clockwise, thereby tending to draw the carriage 13 to the left. The arm 103 of said lever supports a roller 105 and a stud 106. A finger 107 urged by a spring 108 normally rests against the roller 105, and the tip 109 of the finger is adapted to cooperate with the stud 106. The finger 107 is pivoted to a rod 110 having an enlarged portion 200 with a curved slot 201 in which a stud 112 may slide. This stud is fixed to an arm 111 securely fastened to the shaft 25. The shape of the curved slot and the radial and angular positions of the stud 112 on the arm 111 are such that the return stroke of the finger 107 is substantially greater than that required to restore the carriage to normal position. During the early part of the forward stroke of shaft 25, during which the shaft is turned anti-clockwise as seen in Figs. 4 and 5 and clockwise as seen in Figs. 14 and 15, the pin 112 moves freely in the slot 201 of the member 200 until it reaches the radius x—x. From this position until the position shown in Fig. 15, the pin 112 moves in the vertical portion of the slot 201 of the member 200 and at the same time moves the rod 110 and all parts connected thereto to the left, see also Fig. 13. When thereafter the operator releases the handle, the main spring 27, Figs. 4 and 5, draws all parts back to initial position. In the early part of the return stroke of shaft 25 the pin 112 moves from the position shown in Fig. 15 to the radius x—x, and at the same time the rod 110 and all parts connected thereto are moved from the position shown in Fig. 13 to the position shown in Fig. 2, that is to say the pin carriage is moved back to its initial position. The handle 12 and thus the shaft 25 must, however, move further, that is to say the pin 112 moves from the radius x—x to the position shown in Fig. 14. During this extended stroke the pin carriage is pushed slightly beyond its normal forward position, and the stud 106 then engages the tip 109 of the finger 107 to shift the finger 107 to the right, Fig. 2, and out of engagement with the roller 105. All of the previously actuated pins, including those of the first row to the left in Fig. 1 are returned to their normal positions by the plate 113 by the slight overtravel of the carriage, and the carriage is moved back to normal position by the spring 104 when the finger 107 leaves the roller 105. Since the carriage is restored to normal position before the shaft 25 and main shaft 11 complete their return strokes, the operator may set up a new value on the pin carriage upon releasing the handle 12 and without awaiting the completion of the entry of the previous value in the totalizer.

The key board

Each numeral key 1 and the "0" key 2 has a pivoted lever 114 bent at an angle, and the free end of the lever is connected by a pin and slot connection 115 to a pivoted bell-crank 116 (Fig. 1). The extreme portion of the free end of the bell-crank has the form of a hammer 117 adapted, on the operation of the key, to push the respective pin 76 upwards. It is to be observed that only the bell-cranks pertaining to the keys 0, 1–8, both inclusive, have such hammer-like projection, while the "9" bell-crank terminates at 118, because the "9" pins are utilized to control the escape of the carriage 13 to the left, as will be explained presently. On the same spindle 119 which supports the bell-cranks 116 is pivoted a plate 120 having a ridge 121 extending over all levers 116, a spring 122 urging the plate 120 against the latter. A hammer-like projection 123 is formed on the plate 120 and is situated immediately below the pin 76 representing the value "9" (Figs. 1 and 2). As the carriage proceeds step by step to the left, the pins "9" rest with their lower ends 124 against a stop 125 fixed to the bottom plate 3. The device just described works in a manner similar to the escapement of a type-writer machine. When a key 1 is pressed down, the hammer 117 presses the pin 76 upwardly and at the same time the plate 120 presses by means of its projection 123 the pin "9" in the same row upwardly, so that the lower end 124

is freed from the stop 125 and the spring 104 draws the carriage to the left about half a step, inasmuch as the "9" pin of the next following row will abut the right hand surface of the projection 123. When, now, the key is released, a spring 126 urging the same back to normal, the projection 123 leaves the said "9" pin which now, by the action of the spring 104, will be pressed against the stop 125, the carriage having thereby completed the second half step to the left.

The key board may of course be completed with control keys of the usual type and for conventional purposes. Of these keys only that one has been shown which is adapted to "tumble" the totalizer over to subtract position.

The totalizer

As stated above the totalizer is in this particular case of the "tumbling frame" type. The side plates 47, 48 of the totalizer rocking frame are mounted for oscillation on the main shaft 11. Each plate has a stud 130 on which is pivoted a frame 131 supporting two spindles 132, 133. The spindle 132 supports the so called add wheels 134 each provided with a numeral drum 135, the figures of which may be read through a window 4 arranged in the casing 5 of the machine. Normally the wheels 134 are in mesh with the teeth 136 of the actuator racks 15 and they are permanently in mesh with the so called subtract wheels 137 mounted on the spindle 133. Immediately at the beginning of the forward stroke of the shaft 11 the totalizer 17 is rocked away from the racks, so that these latter may be differentially positioned in accordance with the settings of the pins 76. At the end of the forward stroke the frame 131 may be tumbled, if desired, to subtract position, or vice versa to add position. Immediately at the beginning of the return stroke of the shaft 11 the totalizer, either with its add wheels 134 or with its subtract wheels 137, is brought into mesh with the actuator racks 15, so that the movement of the latter back to normal may be transmitted to the totalizer, whereby the amount set up by the keys 1, 2 is registered in the totalizer.

The subtract key

The arrangement for changing the totalizer over from add position to subtract position by means of the subtract key may be of any conventional type. A suitable form thereof has been illustrated in Fig. 4 and consists of the following parts.

The subtract key 140 has a stem 141 with a notch 142 adapted to snap beneath a stop 143 fixed to the casing 5, when the key is pushed down and pressed slightly backwardly, a spring 144 tending to hold the key in this depressed position. To again release the key it will only be necessary to draw with the finger the key somewhat forwardly and to remove the finger, so that the spring 144 draws the key upwards. A pivoted lever 145 has an open slot 146 engaging a stud 147 on the key stem 141, the other end of the lever being connected to the minor tumbling frame 131 supporting the totalizer wheels, by means of a spring 148 normally extending below the axis of rotation 130 of said totalizer frame. This frame 131 has two radial projections 149, 150, one 149 serving to limit the tumbling movements of the frame 131 against two stop pins 156, 157, the other 150 being wedge-shaped with opposed surfaces 150*a*, 150*b* adapted to cooperate alternately with a stud 151 on a pivoted double-armed lever 152, 253, see Fig. 5. A spring 154 urges the lever counterclockwise, Fig. 5, to press the stud 151 towards the frame 131 and into engagement with one of the surfaces 150*a*, 150*b* of projection 150, and the lever may be rocked in the opposite direction by a stud 151 which cooperates with the free end of the arm 153, the stud being mounted on an arm 156' that is fixed to the main shaft 25. The subtract key mechanism just described operates in the following manner. The parts of the totalizer mechanism come to rest after an addition in the positions shown in Fig. 4, with the add wheels 134 in engagement with the teeth of the actuator racks 15, since the spring 148 has rocked the totalizer frame 131 clockwise to the limit determined by the engagement of the projection 149 with the stop 156. The main frame plates 47, 48 rock counterclockwise to move the totalizer frame 131 and the add wheels 134 away from the actuator racks 15 at the beginning of a cycle of operations, but the angular position of the frame 131 on the main frame plates 47, 48 is not altered when the wheels leave the rack teeth 136 as the spring 148 retains the projection 149 against the upper stop pin 156. However, when the subtract key 140 is depressed, the spring 148 extends from the lever 145 to the tumbling frame 131 above the axis of rotation 130 of the latter, thereby tending to throw the same over into the subtract position. This, however, cannot yet occur, until the totalizer main frame 47, 48 has rocked over to its extreme forward position and not until about at the end of the forward stroke of the handle 12 the stud 155 engages the lever 153, thereby releasing the stud 151 from the shoulder 150*a* of the minor frame 131, so that this latter tumbles over to the subtract position. In this position it will remain as long as the key 140 is pressed down. When the main frame 47, 48 is tumbled backwardly into the position shown in Fig. 4 the stud 151 will lie on the shoulder 150*b*. When the key 140 is released after a subtraction operation, the spring 148 will be positioned as shown in Fig. 4 tending to tumble the frame 131 over to add position. This, however, cannot occur until at about the end of the subsequent forward stroke of the handle 12 the stud 155 has removed the lever 152, 153 with the stud 151 away from the shoulder 150*b*, so that the rocking of the frame 131 now can take place.

It thus will be clear, that the tumbling of the minor totalizer frame 131 only occurs when the wheels 134 or 137 are out of engagement with the racks 15.

Mode of operation

With all parts at normal, including the subtract key in raised position and the add wheels 134 in mesh with the rack teeth 136, the first number is set up by the keys 1, whereby the pins 76 are raised and the carriage is displaced step by step to the left, the roller 105 sliding along the left-hand edge of the finger 107 (Fig. 2). Now, the handle 12 is turned counter-clockwise (Fig. 4), and immediately at the beginning of the forward rocking movement of the shaft 11 the roller 37 pushes the link 40 to the left, thereby rocking away the totalizer 17 from the racks 15 and rocking the bell-crank 53, 54 counterclockwise. In this way the frame 16, 69, 16*a* is rocked about the shaft 71 and the shoulders or hooks 74 on the differential members or rods 14 are lowered, so that they stand immediately in front of the "0" rail 75 or in front of the first

(left-hand, Fig. 4) row of the pins 76. Simultaneously the shaft 25 is rotated counter-clockwise an angle of about 10°, whereby the finger 107 is drawn rearwardly toward the position shown in Fig. 3. When, now, it is continued to rock the handle 12 counter-clockwise, the roller 38 lifts the link 40, so that the roller 37 leaves the notch and the displacement of the link 40 to the left ceases, the projection 48 being lifted behind the stop 50, Fig. 5, thereby preventing any return movement of the parts concerned. About at the same moment the left end surface of the notch 29 of the arm 24 has reached the stud 30 on the segment 31 which now follows the rocking of shaft 25. By means of link 58, the lever 60, 61 is turned counter-clockwise, thereby tensioning the springs 64 and removing the rod 63 from the racks 15 which will be drawn differentially by the springs 64 in counter-clockwise direction to such extent as will be determined by the rearward stroke of the rods 14 in accordance with the stop pins 76 raised.

At the end of the forward stroke of the handle 12 the finger 107 has reached the position shown in Fig. 3 and it is now prepared to engage the roller 105, immaterial of which position the carriage 13 occupies. Fig. 13 shows the lever 102, 103 in a position which would correspond to the extreme left position of the carriage. It is clear that an engagement between the finger 107 and the roller 105 always will take place during the return stroke of the handle at any position of the carriage between its two extreme end positions.

At the end of the forward stroke the roller 38 has reached a position in which it registers with the notch 39, and the link 40 is drawn downwardly by the spring 41, so that the projection 48 reaches a lower position than the lower edge of the stop 50, thereby rendering the mechanism ready for the return stroke.

Immediately at the beginning of the return stroke the link 40 is displaced rearwardly by the action of the roller 38 on the notch 39. Thus, the totalizer 17 is thrown into gear with the racks and the frame 16, 69, 16a is again raised to the position shown in Fig. 4, which will permit the setting up of new figures, i. e., raise the respective pins 76 on the carriage, as soon as the latter has returned to normal. The handle 12 may now be released (by the right hand) and the free hand may be utilized to set up the new figure as soon as the carriage 13 is returned to initial position. The main spring 27 which as a consequence of the new construction, may be made considerably weaker than in machines of the same type hitherto known, whereby the wear of the moving parts is reduced, draws the lever 23, 24 in clockwise direction, the notch 29 of the arm 24 changing sides of the stud 30, so that the segment 31 is also turned clockwise. When the link 40 has been displaced to the right by the roller 38 to its end position, Fig. 4, the roller 37 lifts the link, which is permitted by the slot 46 at the end of the link 40, and it slides along the lower edge thereof until it finally snaps into the notch 39.

The rocking of the sector 31 is accompanied by the rocking of the lever 60, 61 clockwise, whereby the rod 63 pushes all racks which had been displaced under the preceding forward stroke of the machine, back to normal and at the same time this rotary movement is transmitted to the totalizer 17, the final result being visible through the window 4.

Multiple key boards

The invention applied to a calculating machine of the type employing banks of amount keys, one bank for each denominational order, in which no stop pins supporting carriage is necessary, is illustrated in two embodiments in Figs. 8–11.

In the first of these two embodiments the hook 14a of the differential members 14a cooperate direct with the key 160 which has been set (pressed down). The keys cooperate with a plate 161 which is pivotally connected to a zero stop 162. Fig. 10 shows the key in three positions which disclose that the stop is lifted out of the path of movement of the differential member 14a as soon as a numeral key is pressed down. The stems 163 of the keys are bent in this case in order to render possible a limited movement of the differential member 14a. This may also be achieved in connection with straight key stems by means of a lever system of the kind such as for instance shown in Fig. 11. In this case the rod 14b is pivotally connected to a double-armed lever 165, 166, the arm 165 of which is considerably longer than the arm 166, so that the differential member 167 pivotally connected to the latter moves, in accordance with the ratio of gearing 166:165, a shorter distance than the rod 14b. The differential member 167 has shoulders 168 adapted to cooperate in known manner with the pertaining key stem 169. The differential member 157 is further provided with a zero stop 170 adapted to cooperate with a bell-crank 171 which is actuated by a latching slide 172 cooperating with the key stems. The differential member 167 receives in the present case a vertical movement parallel with itself by means of the following device. The rod 16b which is a modification of the rail 16 according to Fig. 4, has a prolongation 174, at the end of which is fixed a pin 175 extending into a slot 176 of a horizontal rail 177. This latter is fixed at the ends to two guided vertical rods 178, 179, the upper ends of which support spindles 190, 191 which extend into slots 192, 193 of the differential members 167. It is to be observed that a set of the parts 16b, 174—179 is arranged at each side of the differential members assembly in order to assure a satisfactory parallel movement. The mode of operation is otherwise of the same kind as that described in connection with Figs. 1–6.

What I claim is:

1. In a calculating machine, the combination with a totalizer, actuator racks, longitudinally movable differential members connected to each actuator rack, stop means adjustable from normal inoperative positions to cooperate with said differential members to limit the longitudinal movement thereof in accordance with the value to be entered in said totalizer, and means including a cyclically operable main shaft for operating said differential members and actuator racks to enter the value in said totalizer, of a movable support including means slidably mounting said differential members for longitudinal movement, and means actuated by said main shaft prior to the completion of an entry into said totalizer by said actuator racks to displace said support to move said differential members away from the stop means.

2. In a calculating machine, the combination with a totalizer, actuator racks, a plurality of axially adjustable stop means, longitudinally movable differential members attached to said racks

and cooperating with said stop means, and a rocking drive shaft, of a support on which said differential members are slidably mounted for longitudinal movement, means mounting said support for movement substantially parallel to the direction of axial movement of said stop means, and means actuated by said drive shaft to move said support towards the said stop means at the very beginning of the forward rocking of the drive shaft and to move the support away from the stop means at the very beginning of the return stroke of the drive shaft.

3. In a calculating machine, a totalizer, adjustable stop means, actuator racks, longitudinally movable differential members attached to said racks and limited as to longitudinal movement by said stop means, a rocking drive shaft, a rockable frame slidably supporting said differential members for longitudinal movement, and means actuated by said drive shaft to rock the frame towards the stop means at the very beginning of the forward stroke of the drive shaft and to rock the frame away from said stop means at the very beginning of the return stroke of the drive shaft.

4. In a calculating machine, a totalizer, adjustable stop means, actuator racks, longitudinally movable differential members each pivotally connected at one end thereof to individual actuator racks, said differential members being controlled as to longitudinal movement by said stop means, a rocking drive shaft, a rockable frame slidably supporting the other end of each differential member, and means actuated by said drive shaft to rock the frame towards said stop means at the very beginning of the forward stroke of the drive shaft and to rock the frame away from said stop means at the very beginning of the return stroke of the drive shaft.

5. In a calculating machine of the type having adjustable stop means and a totalizer; actuator racks, differential members attached to said racks for cooperation with said stop means, a rocking drive shaft, a rockable frame supporting said differential members, means actuated by said drive shaft to rock said supporting frame towards said stop means to carry said differential members into position to engage the stop means and thereafter to rock said supporting frame away from said stop means, means for moving said differential members into engagement with the stop means during that part of a cycle of machine operation in which the supporting frame is rocked towards the stop means, and locking means operative during a part of the cycle following the movement of the supporting frame away from the stop means to retain the several differential members in the positions established by their engagement with the stop means, said locking means including pawls mounted on the supporting frame and means to disengage said pawls from said differential members prior to the completion of a cycle of operation.

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