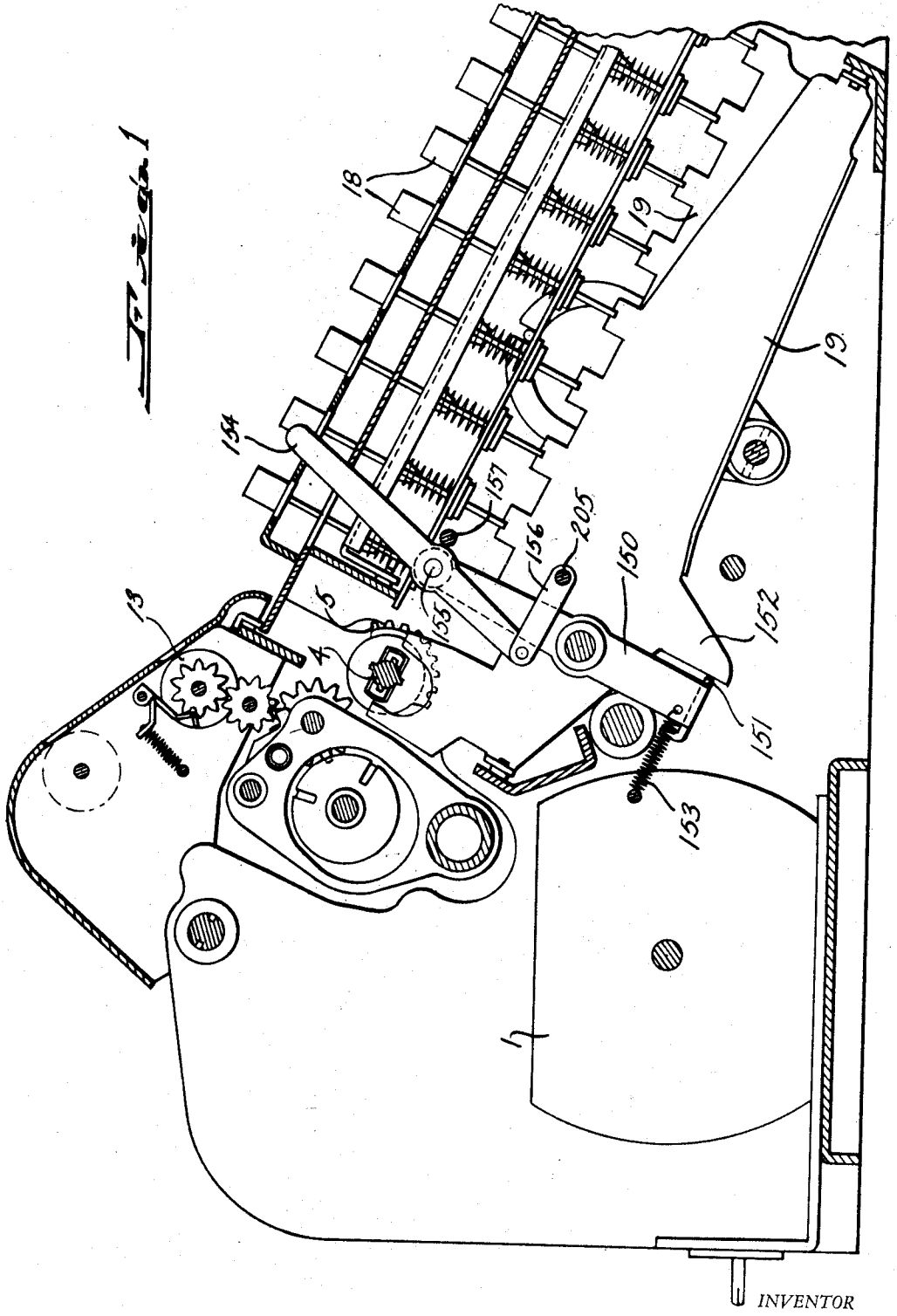
Nov. 14, 1944. S. HILDER 2,362,633

REGISTER

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INVENTOR

Stuart Hilder

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Fig. 2

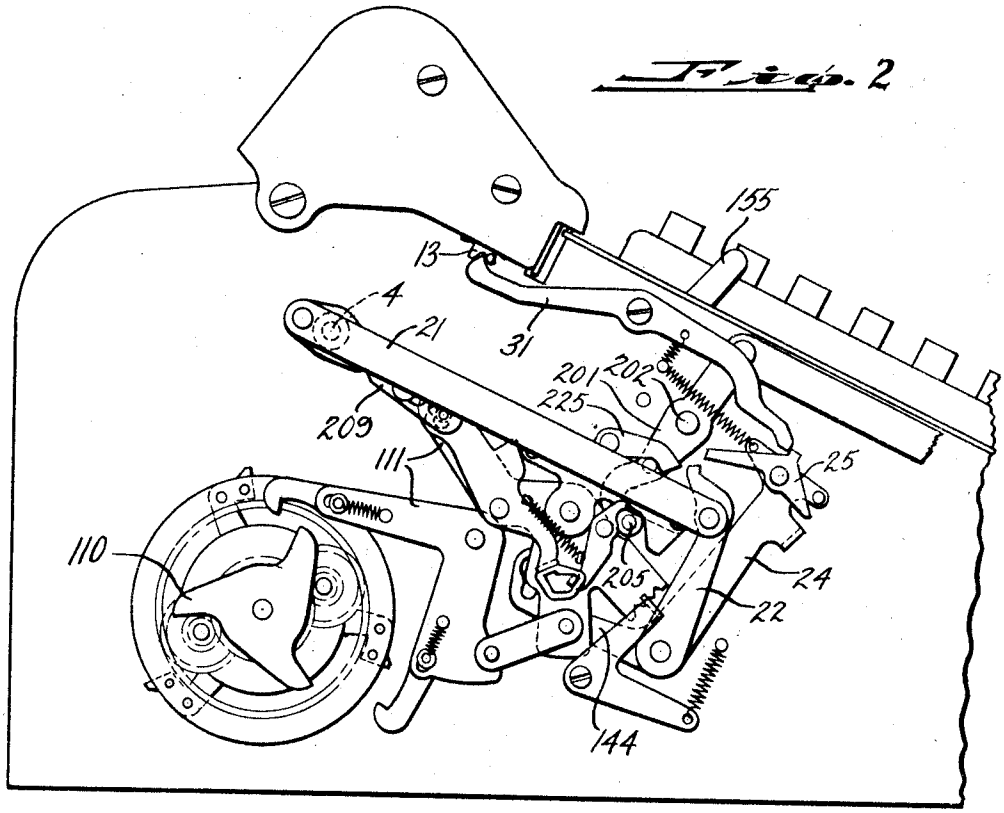


Fig. 4

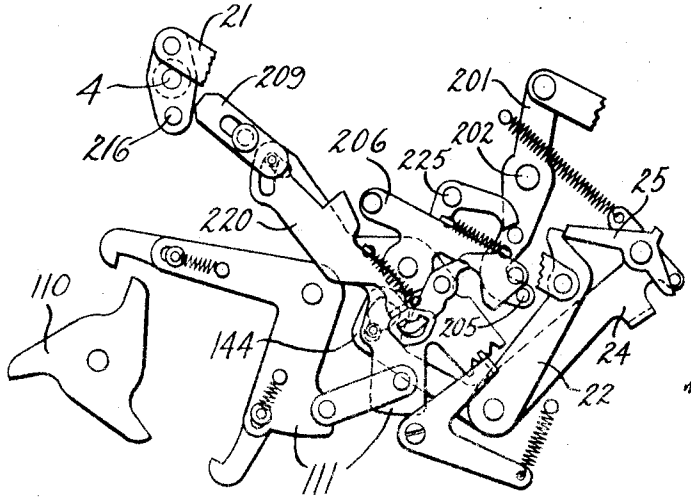
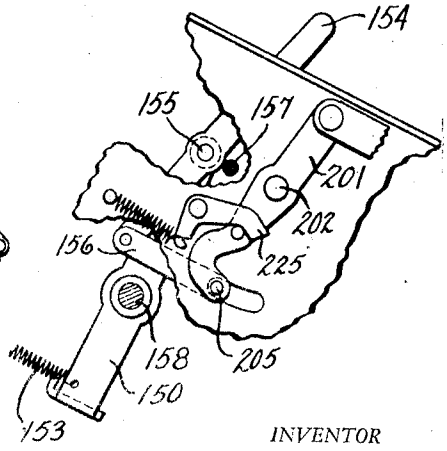


Fig. 3



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Fig. 5

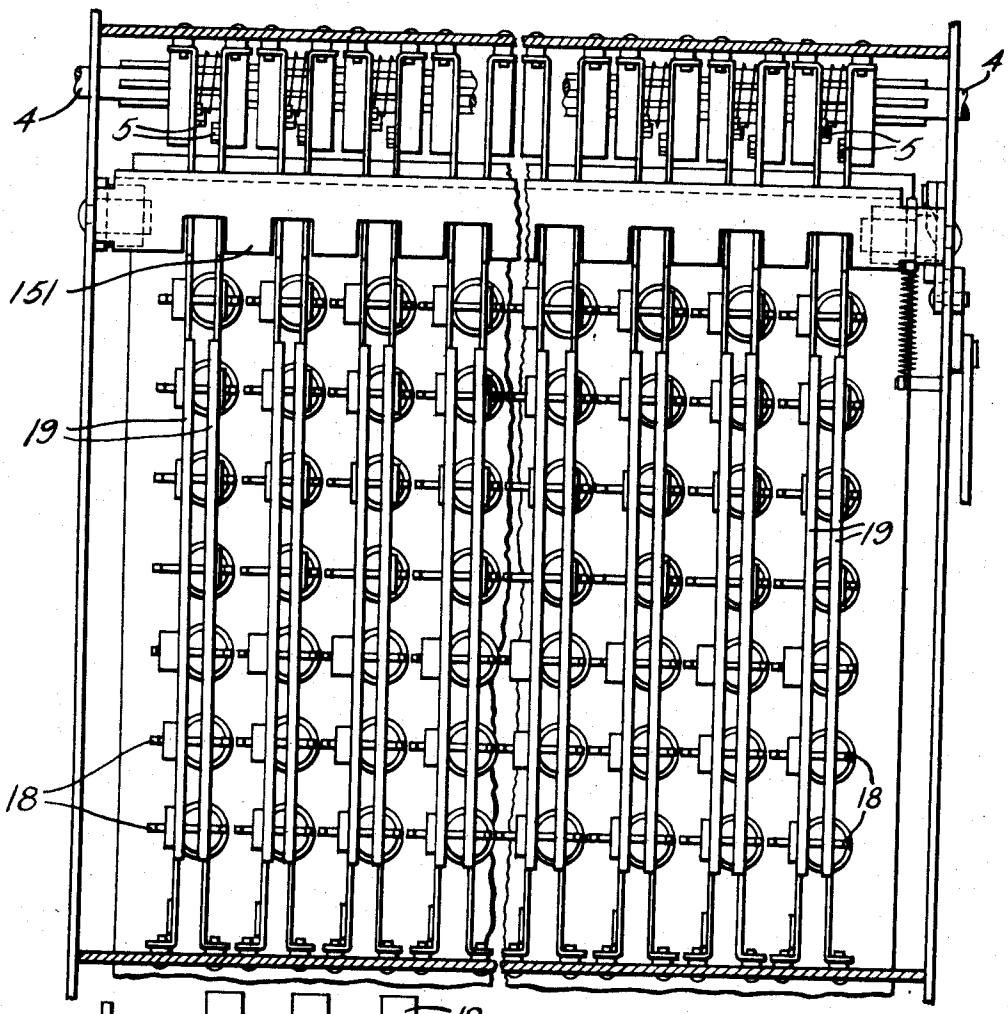


Fig. 6

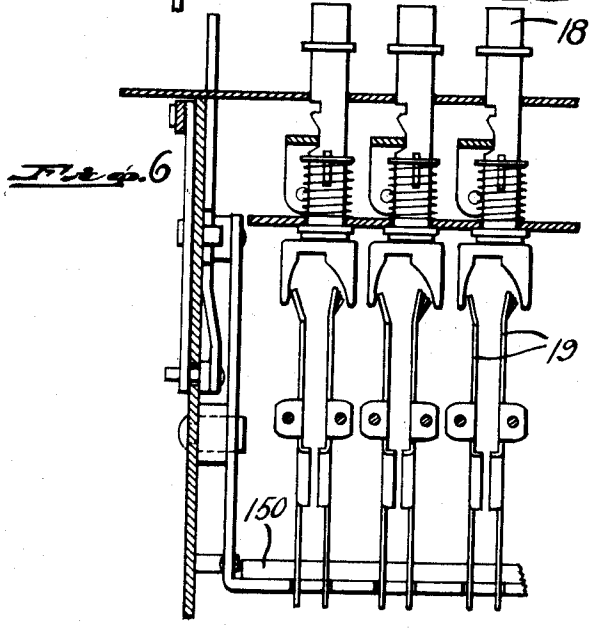
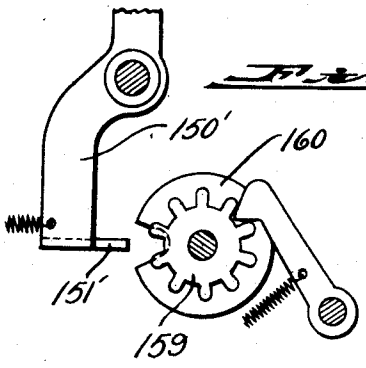


Fig. 7



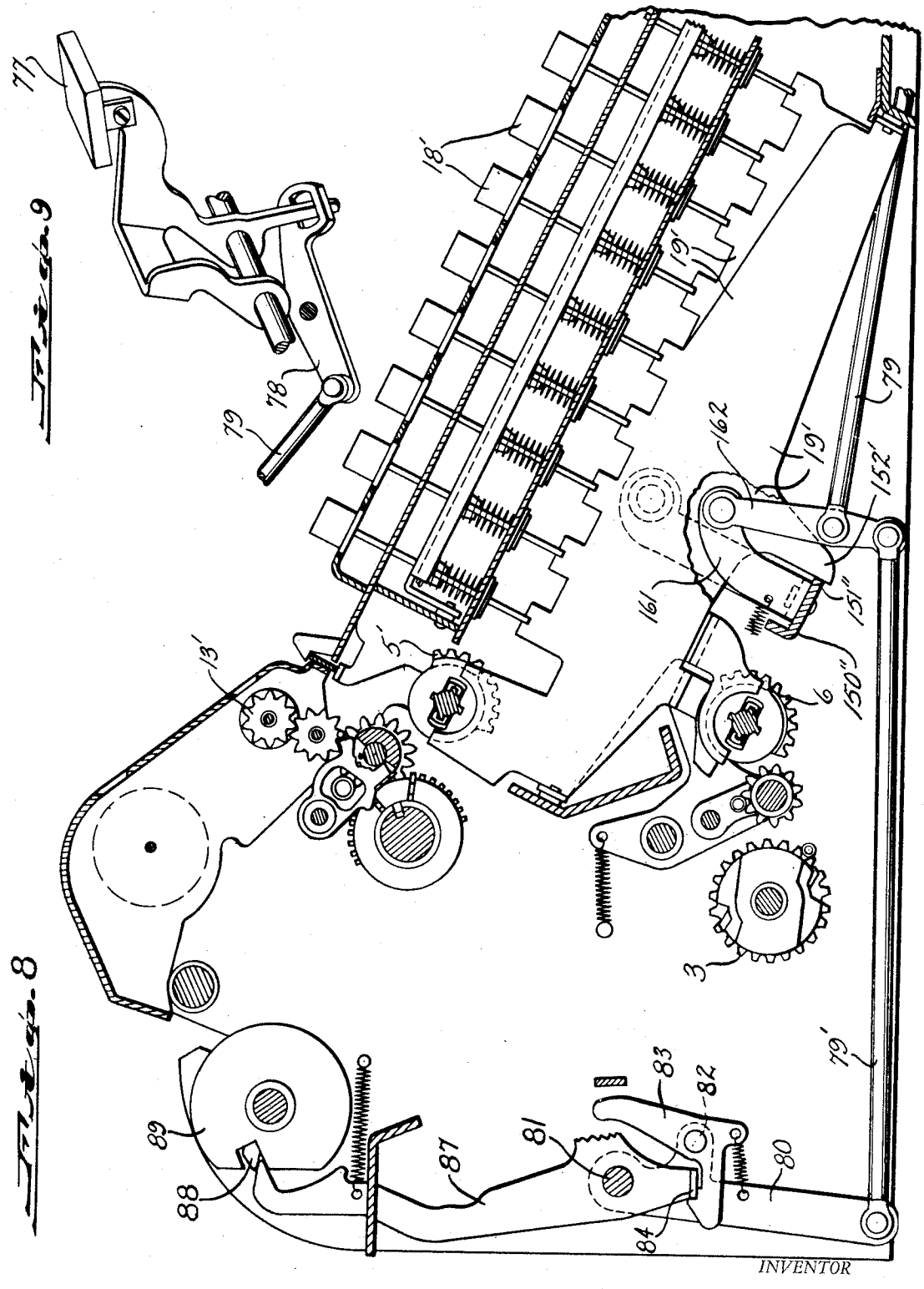
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INVENTOR

Stuart Hilder.

Patented Nov. 14, 1944

2,362,633

UNITED STATES PATENT OFFICE

2,362,633

REGISTER

Stuart Hilder, Arlington, Va., assignor to Monroe Calculating Machine Company, Orange, N. J., a corporation of Delaware

Application November 17, 1943, Serial No. 510,617

3 Claims. (Cl. 235—79)

The invention has relation to registers, and more particularly to means whereby an operation control lever of an adding machine, calculating machine or the like will remain inoperative to set the machine for a particular operation and/or to initiate such operation so long as certain value representing devices, such as digit entering means, stand at zero position.

The invention consists in the novel construction and combination of parts, as set forth in the appended claims.

In the accompanying drawings, illustrating the invention:

Fig. 1 is a longitudinal section through a calculating machine wherein the invention is applied to automatic division controls.

Fig. 2 is a left side elevation of the same with the casing removed and parts shown in their normal position of rest.

Fig. 3 is a detail left side elevation of the division lever and associated parts.

Fig. 4 is a left side elevation of certain parts illustrated in Fig. 2, shown with the division lever in active position and the controls in the positions taken during an over run of the actuators beyond full cycle position.

Fig. 5 is a bottom plan view of the keyboard, with certain frame elements shown in section.

Fig. 6 is a fragmentary transverse section through the keyboard.

Fig. 7 is a detail face view of a modified form of value representing members, and associated parts.

Fig. 8 is a longitudinal section through a calculating machine wherein the invention is applied to automatic multiplication controls.

Fig. 9 is a detail perspective view of a key for initiating multiplication.

Figures 1 to 6 of the drawings, inclusive, show the invention applied to the automatic division mechanism of a calculating machine; the disclosure of the known mechanism being similar to that of U. S. Patent No. 1,888,161, issued on November 15, 1932, to George C. Chase, and entitled "Automatic control for calculating machines."

In accordance with this disclosure an electric motor 1 (Fig. 1) has driving connections (not shown) with a series of differential actuators 5, mounted upon a drive shaft 4, a clutch 110 (Fig. 2) being interposed in the drive connections. Clutch 110 is fully described in the Chase patent heretofore referred to and comprises differential gear elements operable selectively by a clutch yoke 111 to effect additive or alternatively subtractive registering movement of the actuators, and thereby of the numeral wheels 13 of the dividend register. As shown clutch yoke 111 consists of a compound lever operable by a division lever 201. Lever 201 is fulcrumed at 202 and has a stud 205 movable in a counterclockwise adjustment of said lever to engage an interponent 206 and thereby move clutch yoke 111 counterclockwise to engage an element of clutch 110 and initiate subtractive registration.

Division lever 201 remains set in its counterclockwise adjusted position during division operations while clutch yoke 111 is alternately disengaged from clutch 110 and reengaged therewith, to provide for subtractive and additive registrations in known manner.

The means for disengaging the clutch and thereafter reengaging the same is controlled from the numeral wheels 13, also in known manner. For this purpose a rock arm 22 is connected with a crank on shaft 4 by a link 21 designed to be engaged by a pawl 25 carried on a stop arm 24, upon release of said pawl by a trigger 31 operated by a pin on one of the numeral wheels 13, whenever said wheel is moved by the tens transfer mechanism of the register, when registration therein passes from positive to negative or from negative to positive. Stop arm 24 is provided with an extension 144 (Fig. 4) having pin and cam slot engagement with clutch yoke 111, so that upon engagement of pawl 25 with rock arm 22 and consequent clockwise movement of stop arm 24, the clutch yoke will be disengaged from clutch 110. So long as division lever 201 remains set in counterclockwise adjusted position, disengagement of the clutch will be succeeded by reengagement thereof to effect calculation of the opposite sign, this being effected by means of a tooth 209 slidably mounted on yoke 111 and settable into active position by interponent 206 and cam member 220. In this active position of tooth 209, the normalizing of the clutch yoke will bring said tooth into the path of movement of a stud 216 mounted in a crank arm of shaft 4, and during rotation of said shaft in either direction (tooth 209 serving as a rigid extension of the clutch yoke 111) the yoke will be moved into engagement with clutch 110. After the retraction of division lever 201 to normal position, tooth 202 will be retracted and the parts above described will operate to bring the machine to rest.

From the above, it will be apparent that once the machine is thrown into subtraction by division lever 201 all further control of the machine is dependent upon registration in the numeral wheels 13, consequently if no value is set

up in the differential actuators 5, the machine will continue to run indefinitely, and that the running of the machine will not be stopped by retraction of said division lever. In a machine built in accordance with the disclosure of the Chase patent hereinbefore referred to, this indefinite running of the machine is stopped by depression of an addition or of a subtraction key, these keys having means independent of the division mechanism for disengaging the clutch. In other full automatic dividing machines, the same condition is met by the provision of a special stop key, operable to disengage the clutch independently of the division mechanism. In either case the mere stopping of the machine does not bring it back to its original condition, since the quotient register will display an arbitrary and unwanted value, which must be cleared before any further registrations are effected. Further, if the division key in any of these machines is accidentally thrown to active position while the electrical connection of the motor is disengaged, the machine will be started in subtraction as soon as the connection is made, even though the division lever has been retracted before-hand, nothing about the external controls of the machine indicating that it is not in normal condition.

It is the object of the present invention to overcome these and similar objections by the provision of an external or hand lever for the division mechanism which will not be effective unless one or more of the differential actuators have been set to represent a value other than O.

The means for setting the differential actuators are shown as corresponding to the disclosure of U. S. Patent No. 1,399,652, issued on December 6, 1921 to E. E. Phinney and entitled "Setting-up means for calculating machines." In accordance with this disclosure banks of keys 18 (Figs. 5 and 6) representing the values 1 to 9, and a pair of setting bails 19 underlie each bank of keys, one or the other or both of a pair being cammed by a depressed key and thereby, through yoke extensions of the bails, setting one or the other or both of the complemental actuator members 5 into position to act upon the gear connections of the wheels 13. The teeth of the actuator members 5 are graded in lateral extent and thereby serve to give the desired number of steps of movement to the numeral wheels during each cycle of operation.

According to the present invention a universal bail 150 (Figs. 1, 3, 5 and 6) extends transversely of the series of bails 19, said universal bail being provided with projections 151 as seen in Fig. 5 and being normally held by a spring 153 in the position illustrated in Fig. 1, with the projections 151 adjacent to projections 152, but leaving operative clearance therebetween. The supporting arm at one end of bail 150 is extended upward and a hand lever 154 is fulcrumed thereon at 155, the lower extension of said hand lever being connected by a link 156 with the stud 205 of division lever 201.

When any of the keys 18 stand depressed, the projections 152 of bails 19 will be held in position opposite the related projections of universal bail 150, and upon hand lever 154 being thrown rearwardly by the operator (movement of bail 150 being blocked) said hand lever will fulcrum about the point 155, and will throw division lever 201 into its active position where it will be held by the action of a spring click 225 (Fig. 3).

If it is desired to terminate a division operation by manual retraction of lever 154, said lever will fulcrum upon a fixed stud 157, and will act through link 156 to retract division lever 201. Any desired means for automatically terminating the division operation (such as that disclosed in U. S. Patent No. 2,250,403, issued on July 22, 1941, to George C. Chase and entitled, "Division stop mechanism for calculators") may be connected either with lever 154 or lever 201.

If lever 154 is thrown into its operative position when none of the keys 18 are depressed, the projections 152 of bails 19 will stand out of alignment with the projections 151 of universal bail 150, and, click 225 resisting movement of lever 201, lever 154 will rock bail 150 counter-clockwise about its pivot 158. Upon manual release of lever 154 spring 153 will restore the parts to normal position.

Figure 7 represents a different form of value representing member, whcih may be felt out in the manner above described to control the setting and/or initiation of a special operation. The value is here represented by a rotary member 159 which may be used for instance for setting the differential actuators or as an item register. Members 159 are illustrated in Fig. 7 as standing in zero position, wherein the projection or engaging portion 151' of bail 150' stands opposite the notched portion of a disk 160. When a member 159 is set to represent a value other than O, the unnotched peripheral portion of the disk 160 will lie in the path of movement of the part 151', so that the bail 150' will be held as a fulcrum for the operating lever as previously described.

Figures 8 and 9 of the drawings illustrate the invention as applied to a machine wherein a stored multiplier value is placed in control of the repeated registration of a multiplicand, to obtain the product. The machine illustrated corresponds to the disclosure of British Patent Specification No. 509,747, issued to Monroe Calculating Machine Company upon a specification accepted July 20, 1939.

According to this disclosure, the multiplier value is set in the actuators 6 (Fig. 8) by means of the keys 18' and bails 19', and is transferred from said actuators into storage wheels 3, these wheels being moved step by step back to zero position during the calculation of the product. The multiplicand is set on keys 18', the bails 19' serving to set the actuators 5' and to hold them set during the calculation.

The values having been set into the machine, the calculation is started by the depression of an operation key 77 (Fig. 9) this key serving through lever 78 and pull rods 79, 79' to rock a lever 80. A latch 83 is pivoted upon lever 80 at point 82, said latch normally engaging a lug 84 of a clutch detent 87 pivoted upon the frame of the machine at 81. Forward movement of rods 79, 79' will thus rock detent 87, against spring tension, out of engagement with the spring clutching pawl 88 of a multiplier clutch 89. This clutch is of well-known form, the spring pawl 88 engaging the driving member of the clutch when the detent is moved out of restraining position. Upon release of the key detent 87 will ride upon the periphery of the driven element housing of cam 89, until the clutch has completed a cycle of operation, whereupon pawl 88 will encounter the end of detent 87 and will be moved out of clutching position. Clutch 89 operates mecha-

nism for conditioning the machine for multiplication and for engaging the main clutch, to effect the calculation. In case the multiplicand value has not been set on the keyboard at the time the operation key is depressed, the machine of the British patent would make an entry in the multiplier register without having obtained a product, and a still more serious result would be the elimination of the multiplier setting from the storage wheels by the counting back operation.

These objections are overcome in the same manner as in the case of automatic division. For this purpose the projections 151'' of bail 150'' cooperate with the projections 152' of the bails 19' in manner previously described, bail 150'' having a bracket 161 mounted thereon, upon which bracket a lever 162 is fulcrumed, the other extremity of said lever being pivotally connected with rod 79' and rod 79 being pivoted intermediately of the lever.

With an amount set in the keyboard 18', depression of key 77 and consequent forward movement of rod 79 will cause lever 162 to fulcrum upon bracket 161, and effect forward movement of rod 79' and engagement of clutch 89. In case all the keys 18' stand at zero when key 70 is depressed, bail 16 may swing forward freely (except for the restraint of its light restoring spring) and, since detent 87 will be held by its strong spring, lever 162 will rock with the bail about its pivotal connection with rod 79' and no operation will be effected.

Obviously the division mechanism of Figs. 1 to 6 and the multiplication mechanism of Figs. 8 and 9 may both be present in a single machine, and in this case the invention may be applied to the operation of the division key and the multiplier key, using the same bail 150, 150'' for both controls.

In the case of any special operation in which it is desired to start an operation with none of the digit keys 18, 18' depressed, as might be the case if means were provided for automatically depressing given keys, a special key for this purpose could be added, such key operating to adjust division lever 201 or multiplier member 80 directly, since the special mechanism herein provided will not interfere with independent adjustment of such members.

It may be noted that the mechanism imposes no load on the digit setting keys, is entirely inactive during the operation of the machine by other control mechanisms and that there is no extra load imposed upon the division or multiplication operating members.

I claim:

1. In a register having a series of differentially settable value representing devices and an operating lever; a universal member movable toward said value representing devices and designed to contact with any one of them standing in set position representing a value other than zero, and a control lever having operating connection with the operating lever and with the universal member, designed for idle movement by displacement of the universal member when the value representing devices all stand at zero and to fulcrum upon the universal member and displace the operating lever when said universal member contacts a set value representing device.

2. In a register having a series of differentially settable value representing devices and an operating lever; a universal member movable toward said value representing devices and designed to contact with any one of them standing in set position representing a value other than zero, a control lever having operating connection with the operating lever and with the universal member designed for idle movement by displacement of the universal member when the value representing devices all stand at zero and to fulcrum upon the universal member and displace the operating lever when said universal member contacts a set value representing device, and a stationary abutment providing a fulcrum for the control lever in the retraction thereof to restore the operating lever.

3. In a register having a series of differentially settable value representing devices and a yieldably located operating lever; a universal spring retracted bail movable against its spring tension toward said value representing devices and designed to contact with any one of them standing in set position representing a value other than zero, and a control lever pivotally mounted upon the bail and having operating connection with the operating lever, designed for idle movement by displacement of the bail when the value representing devices all stand at zero and to fulcrum upon said bail and displace the operating lever when said bail contacts a set value representing device.

STUART HILDER.