

Mar. 27, 1923.

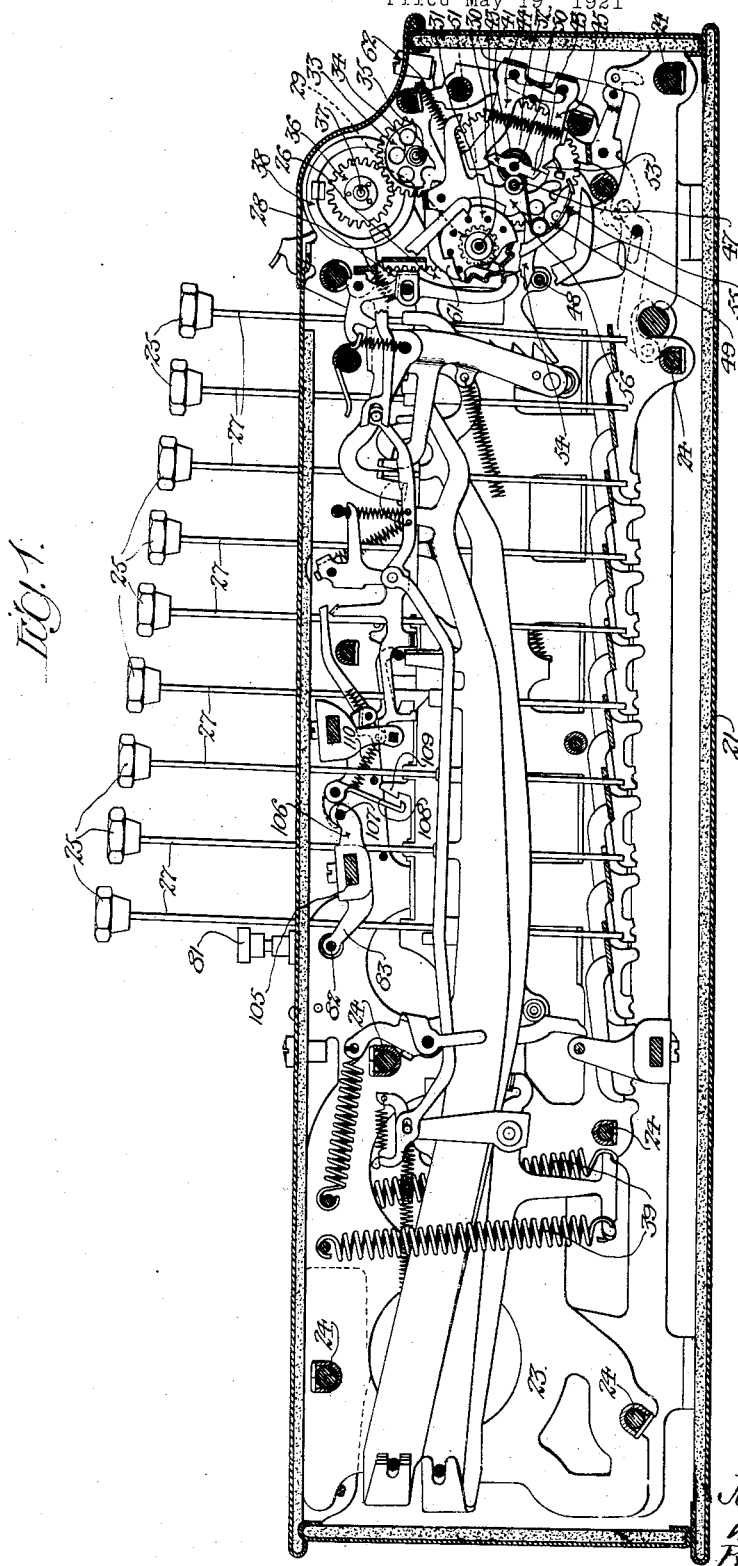
1,449.639

J. A. V. TURCK

CALCULATING MACHINE

Filed May 19, 1921

2 sheets-sheet 1



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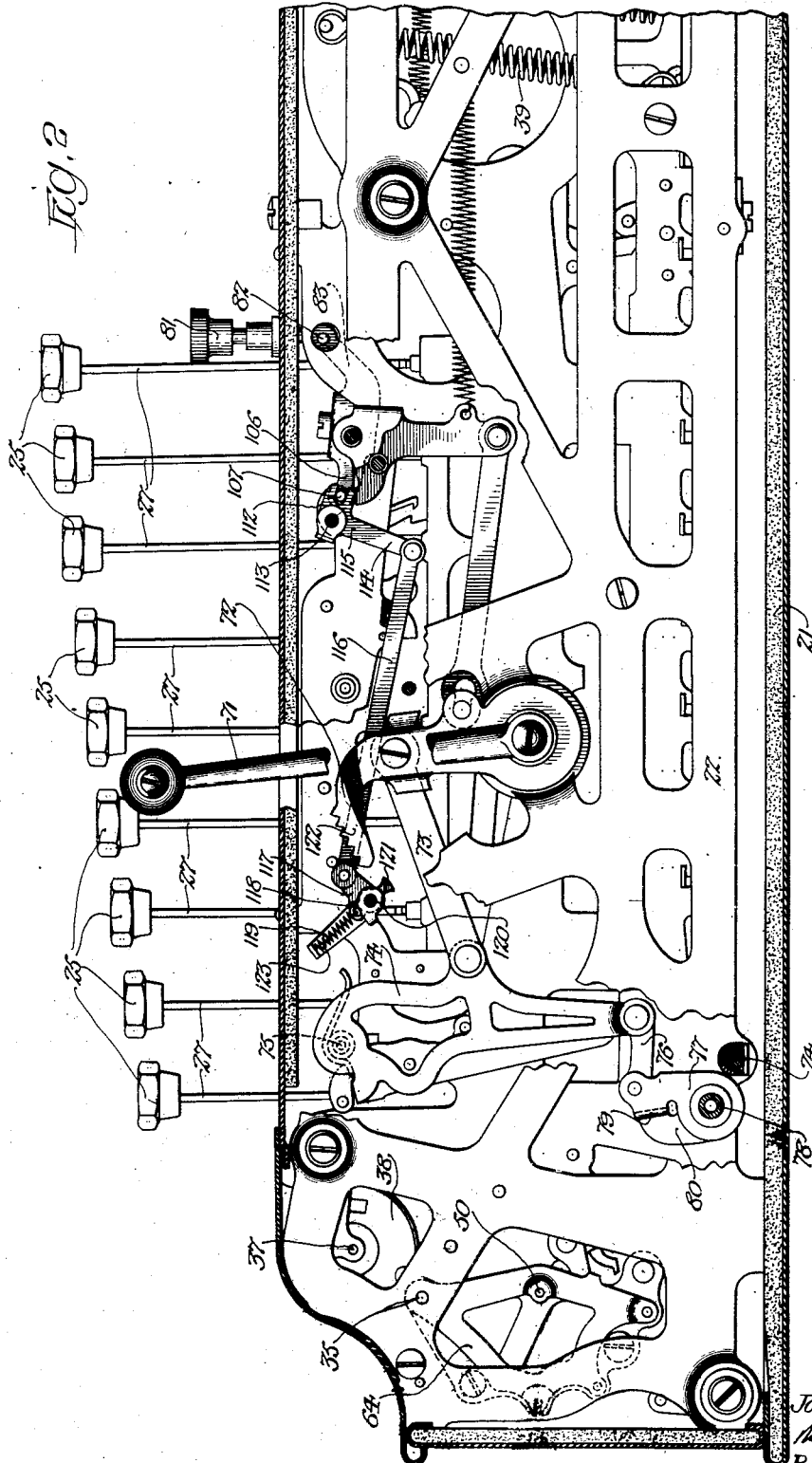
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2 sheets-sheet 2



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UNITED STATES PATENT OFFICE.

JOSEPH A. V. TURCK, OF WILMETTE, ILLINOIS, ASSIGNOR TO FELT & TARRANT MFG. COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

CALCULATING MACHINE.

Application filed May 19, 1921. Serial No. 470,862.

To all whom it may concern:

Be it known I, JOSEPH A. V. TURCK, a citizen of the United States, residing in Wilmette, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Calculating Machines, of which the following is a specification.

This invention relates to calculating machines and has for its object to provide an improved mechanism for preventing errors in calculating operations, which may arise from mismanipulation of the keys; and the invention comprehends the provision of means for effecting an indication to the operator of a mismanipulated key, such indication, in the present embodiment of the invention, consisting in locking the cancelling crank against operation, whereby, in the event of a key mismanipulation occurring during any key stroke of a calculating operation the operator is unable to cancel the machine, until the partial stroke of the mismanipulated key has been completed and the keyboard has been released.

The present invention is preferably employed in connection with the usual keyboard locking mechanism of this class of machines, such mechanism being effective to lock the entire keyboard of the machine, with the exception of the mismanipulated key, until the partial stroke of that key has been completed; and the invention constitutes a valuable addition to the error preventing function of such keyboard locking mechanism, in that it prevents the operator from cancelling, without first correcting the error due to a mismanipulated key and releasing the keyboard, and thus effectively prevents the possibility of an error occurring in the last key stroke of a calculating operation, because of failure on the part of the operator to observe the operation of the keyboard locking mechanism.

The invention is particularly applicable for use in connection with calculating machines of the key-driven multiple-order type, although not necessarily restricted thereto, and, in the present embodiment, is illustrated in a machine of the general type of the well-known "duplex comptometer", the general character of which is exemplified in the United States patents to Dorr E. Felt, No. 762,520 and No. 762,521, dated June 29, 1904; No. 1,028,344 dated, June 4, 1912; No. 1,066,096, dated July 1, 1913;

No. 1,072,933, dated September 9, 1913; the patent to Kurt F. Ziehm, No. 1,110,734, dated September 15, 1914, and my prior Patents, Nos. 1,357,747 and 1,357,748, dated November 2, 1920.

In addition to the general objects recited above, the invention has for further objects such other improvements or advantages in construction and operation as may be found in the structures and devices hereinafter described or claimed.

In the accompanying drawings, forming a part of this specification and showing, for purposes of exemplification, a preferred form and manner in which the invention may be embodied and practiced, but without limiting the claimed invention specifically to such illustrative instance or instances:—

Figure 1 is a vertical sectional elevation taken at the left-hand side of a calculating machine of the multiple-order key-driven type, in which the present improvements are embodied; and

Figure 2 is an enlarged vertical sectional elevation taken at the right-hand side of the calculating machine illustrated in Figure 1.

The same characters of reference indicate the same parts in each of the several views of the drawings.

In its present embodiment, the invention is incorporated in a calculating machine of the multiple-order key-driven type, such as the well-known comptometer disclosed in prior United States Letters Patents hereinbefore referred to. As the details of construction of this type of machine may be readily understood from these United States patents, a brief description of the general features of this type of machine, and such parts as are directly concerned with the operation of the present improvements, will be sufficient for an understanding of this invention.

The various instrumentalities of the calculating machine are supported by a frame mounted on the base 21 of a casing, said frame consisting essentially of side skeleton plates 22 and intermediate skeleton plates 23 disposed between the various actuating mechanisms of the several orders of the machine, and all tied together at suitable points by transverse tie rods 24. A number of columns of nine keys each are provided, each key being indicated by the reference charac-

ter 25, and there being a column of nine keys for each numeral wheel that is a duplicate of the other columns, together with the actuating mechanisms and attendant parts interposed between a column of keys and its corresponding numeral wheel. Each column of keys 25 forms a part of an accumulator mechanism for transmitting to its numeral wheel an amount of travel proportioned to the particular key operated, and the accumulator mechanism for each column of keys and the corresponding numeral wheel includes a column actuator in the form of a segment lever 26 pivoted at the rear end of the machine and adapted to be depressed in different amounts, as determined by the particular keys 25 actuated by the operator. Each key is provided with a stem 27 extending down and bearing upon the corresponding column actuator 26. The key at the extreme front of the machine, being farther from the pivotal axis of the column actuator than the key at the extreme rear of the machine, moves the column actuator through a lesser arc than does the key last mentioned. The keys of each column are numbered from "1" to "9" in front to rear order of the machine; the key at the extreme front is adapted to effect operation of the column actuator through an arc substantially one-ninth of that produced by the operation of the key at the extreme rear of the machine, and upon depression of intermediately positioned keys, the column actuator is moved through arcs proportionate with the value of the intermediate key actuated.

The column actuator 26 of each order or column of nine keys is adapted to impart calculating movement to an accumulator, and, for such purpose, is provided at its forward end with a rack 28 which meshes with an accumulator pinion 29, journaled on a transverse shaft 30 that extends across the machine and is supported in suitable bearings in the skeleton frame.

The pinion 29 of each order forms a part of an internal ratchet mechanism, not herein described but fully set forth in the prior patents hereinabove mentioned; such ratchet mechanism becomes effective on the upstroke of the column actuator to clutch the pinion 29 to a lantern wheel 31, which is normally operatively connected by a train of gearing 33 with the numeral wheel pinion 36. The latter pinion is journaled on a transverse shaft 37 and is fixed to the numeral or registering wheel 38. Whenever the column actuator is depressed the ratchet mechanism moves idly and hence no motion is transmitted to the gear train interposed between the lantern gear 31 and the numeral wheel pinion 36. However, upon the return or upward movement of the column actuator, the lantern gear 31 is clutched to the accumulator pinion 29 and the said interposed gear

train rotates the numeral wheel 38 through an arc determined by the particular key of its corresponding order that is actuated. The column actuator is moved upwardly on release of the actuated key, by the column actuator springs 39.

Carrying mechanism is co-operatively combined with each ordinal accumulator mechanism for the purpose of actuating the accumulator mechanism of the next higher order of the machine whenever a carry is to go over from a lower order. The ratio of the several gears and various parts is such that a complete rotation of the numeral or registering wheel 38 is accompanied by a half rotation of the gear 32 in the gear train 33, so that, at each half rotation of said gear 32, it is essential that a carry go over to the next higher order. In addition to its function as a member of the gear train 33 for transmitting the motion of the column actuator to the numeral wheel 38, the gear 32 operates as a carrying motor winding gear and, for this purpose, said gear 32 is secured to one end of the carrying motor spring 41. The other end of this motor spring is secured to and constantly tends to impart forward movement to the carrying-escapement member 42, having a stop 43, of well-known construction, which is adapted to be engaged by first one and then the other of the pair of releasing-detents 44 and 45, so that, whenever said stop is released by one of the detents, the escapement member can make only one-half of a complete revolution, before being checked in its movement by the engagement of the said stop with the other of the detents; each such half-rotation of the escapement member gives a corresponding half-rotation to the carrying-cam member that is secured upon the left-hand end of the escapement member. The carrying-cam member is of the type shown and described in the prior United States patents hereinbefore referred to, and consists essentially of a pair of oppositely disposed cam arms against which the dolly roll 47 of the bell crank carrying lever 48 rides during the carrying throws imparted to such lever by such cams. Each such 180° throw of one of these carrying cams lifts the bell crank carrying lever sufficiently to cause the usual carrying pawl 49 that is pivotally mounted at the rear end of such lever, to throw the lantern-wheel ratchet of the next higher or left-hand accumulator one numeral space, which movement of the lantern-wheel is transmitted through the hereinbefore mentioned gear train 33 to the numeral wheel pinion 36, to effect a carrying transfer from the accumulator mechanism of the lower order to the accumulator mechanism of the next higher order. The release of the escapement member from first one and then

the other of its detents 44, 45, is effected by the usual dolly roll (shown and described in the hereinbefore mentioned United States patents) that is mounted on the far side of the carrying motor winding gear 32 and is adapted to ride under a cam-faced ear 51, projecting laterally from each detent, when the winding gear 32 rotates into proper angular relation with the detent to be released.

In this manner, it is provided that, while the winding gear 32 may, by a full rotation, wind into the carrying motor spring 41 power sufficient to effect two carrying throws of the carrying cam member, the alternate engagement and releasing of the escapement member by first one and then the other of the pair of opposed releasing detents 44, 45, whose connecting spring 52 constantly tends to draw one or the other of them into the path of the stop 43 of said escapement member, restricts each throw of such escapement member to a half-rotation of the winding gear 32, thereby releasing only one carrying impulse at a time.

In order to prevent either carrying cam of any carrying cam member from effecting a carrying throw of the co-operating carrying lever at a time when the accumulator of the higher order impelled by said carrying lever is already in motion or is about to be moved by the column actuator that has been or is being depressed by one of the keys in that higher order, there is provided a detaining latch tooth 53 formed on the front end of a stop detent 54, in said higher order, which stop detent 54 is pivotally mounted on the carrying bell crank lever 48 and is adapted to be actuated by a spring 55 to shift said detaining latch tooth into restraining engagement with one or the other of a pair of stops 43, carried by the escapement member. Normally, the retaining latch tooth is held out of engagement with a stop of the escapement member by the dolly roll 56 carried by the column actuator of the next higher order; on depression of such column actuator, however, the dolly roll moves out of engagement with the stop detent 54, thereby permitting the spring 55 to shift said stop detent 54 into such position that the detaining latch tooth is engaged with one of the stops of the escapement member; and this relation of the parts continues until the said column actuator moves to its normal elevated position. The carrying escapement member 42 is caught by the detaining latch just after it has escaped one or the other of said escapement detents 44, 45, just sufficiently to prevent re-engagement with said escapement detents, but not enough to permit movement of the carrying lever 48. Hence, so long as a column actuator is in a position other than its normal elevated position, and notwithstanding a release of the escapement member by either one or the

other of the releasing detents 44, 45, the carrying cam is prevented from making a carrying throw to lift the carrying lever 48, until the detaining latch tooth is again moved out of engagement with a stop of the escapement member by a return to normal of the column actuator of the next higher order,—the order that is to receive the released carrying impulse.

It is thus provided that keys may be depressed simultaneously and column actuator impulses delivered in two or more adjacent orders, and yet any carrying impulses released from a lower one of said orders will not be actually delivered to the next higher of said orders until the column actuator movement of such higher order is complete. The operation of permitting simultaneous key-driven actuation of a plurality of column actuators in adjacent orders, the strokes overlapping each other in any manner, is the action that has hereinbefore been referred to as "duplexing."

The carrying lever shaft supports a spring-pressed back stop 61 for preventing rearward movement of the lantern-wheel 31 during operation by key-actuation. A spring 62, connecting the carrying lever 48 with a fixed portion of the frame, maintains said carrying lever in its normal position and returns the same back to its normal position after each carrying throw. The stop detent 54 is provided at its rear end with a tooth (see said prior patents) for preventing overthrow of the lantern wheel 31, it being understood that, when the lantern gear is operated by key-actuation, the dolly roll 56 of the column actuator is shifted from beneath the aforesaid stop detent, permitting the spring 55 to throw the stop detent into the position wherein the said tooth is out of the path of the pins of the lantern wheel, but, on return of the column actuator to its normal position, the tooth is again moved into the path of a pin of said lantern wheel. In carrying, the movement of the carrying lever 48 during the carrying throw lifts the tooth of the stop detent 54 out of the path of the pins of the lantern wheel, and the return movement of the carrying lever restores the stop detent to its normal position.

Such is, in brief outline, the manner in which prime actuations and carrying impulses are imparted to the accumulator mechanisms in the duplex comptometers of the above mentioned patents. It will also be understood that these actuating mechanisms are associated with various stop mechanisms set forth in the said patents, to limit the movements imparted to the accumulator mechanisms by the prime actuations and carrying impulses; all of these stop mechanisms are shifted variously into and out of their various stop positions to impose additional restrictions to the movement of the carrying

devices and to the prime actuations of the accumulators.

There is also provided a cancelling or zeroing mechanism for clearing the machine or cancelling, that is,—for returning the registering wheels and other parts to the zero positions, and, broadly stated, this zeroing operation is accomplished by disconnecting the connections between the registering wheels 38 and the actuating devices so that, while retaining the various above mentioned stop devices in their normal relations to the accumulator mechanisms, the stored power in the carrying springs may give to the numeral wheels backward rotations, so as to move them rearwardly from the divers positions they may occupy and to stop them when they arrive individually at zero positions. In the present instance, such cancelling is effected by detrainning or disengaging the carrying spring winding gears 32 from the gearing on the shaft 30.

The shaft 37 of the numeral wheels is mounted in bearings fixed in the frame of the machine, as is likewise the shaft 30 of the lantern wheels and gearing and the shaft 35 of the gears 34 of the gear train 33. In order to effect detrainning or disengagement of the gears 32 from the gearing of the lantern-wheel shaft 30, the shaft 50 of the gears 32 is carried by a swinging frame, indicated generally by the reference character 64, the frame 64 being adapted to have a slight outward pivotal movement on an axis coincident with the shaft 35. As the swinging frame carries with it the shaft 50 of the carrying spring winding gears 32, the latter are disconnected from the gearing of the lantern-wheel shaft 30, whenever said swinging frame 64 is imparted an outward pivotal movement on the axis of the shaft 35. In the present embodiment of the invention, the swinging frame is detained in such gear detrainning position, after a cancelling operation has been effected, until a key 25 has been depressed to effect a further operation of the accumulator mechanism, whereupon the swinging frame is again restored to position for entraining the winding gears 32 with the gearing of the shaft 30.

The following instrumentalities are employed for effecting movement of the swinging frame to detrain the aforesaid gears and to permit the carrying springs to return the registering wheels to zero positions. As shown in Figure 2, an operating handle or lever 71, hereinafter termed the "cancelling crank" is journaled in a bearing in the right-hand side plate 22 of the fixed frame. A segment 72 is fixed to this lever, and pivoted to said segment 72 is a link 73 which, in turn, is pivoted to a depending lever 74 that is pivoted at 75 on the fixed frame. The lower end of said lever 74 is pivotally connected by means of a short link 76 with an

arm 77 rotatably mounted with respect to a transverse shaft 78 that is journaled in the fixed frame. The arm 77 is provided with an engaging face 79 adapted to contact with a second arm 80 fixed on the shaft 78. The operation of this construction is as follows: When the parts are in the relative positions indicated in Figure 2, a short swinging movement of the cancelling crank 71 toward the left will, through the segment 72, link 73, lever arm 74, short link 76, arm 77 and rocker arm 80, impart a short rocking movement to the shaft 78 in a counter-clockwise direction, as viewed in Figure 2, and such counter-clockwise rocking of the shaft 78 is effective, through the instrumentality of connections fully described in my Patent No. 1,357,748 hereinbefore referred to, to swing the frame 64 outwardly and to detrain the gears 32 from the gearing of the lantern-wheel shaft 30. The action of detrainning the gearing releases the carrying springs 41, permitting them to unwind and to turn the several registering wheels rearwardly from their various positions to zero positions. The unwinding of the carrying springs is terminated by stops which are projected in operative positions, by means of devices and in the manner shown and described in my said prior patent.

The present invention comprehends the provision of means for preventing errors in calculating operation, by effecting a positive indication to the operator of a mismanipulated key, such indication of key mismanipulation consisting in locking the cancelling crank against operation, until the partial stroke of the mismanipulated key has been completed and the keyboard, which is locked as further incident to such mismanipulation, is again released for operation. The invention thus prevents the operator from cancelling, without first correcting the error due to a mismanipulated key and releasing the keyboard, thereby preventing the occurrence of errors in the final key strokes of calculating operations, which errors might otherwise occur because of failure on the part of the operator to observe the locking of the keyboard. Should a key 25 be only partially depressed and released, the partial key stroke will, of course, effect only a partial operation of the accumulator mechanism in order which the key controls, and consequently an erroneous result will be indicated in the registration made by the numeral wheels of the accumulator mechanism. When any key is partially depressed and released, the usual spring at the bottom of its stem will throw it up, but the prime actuator is locked in its depressed position of the locking of the connected lantern wheel and registering wheel. The error is indicated by the locking of the cancelling crank, and, in the present embodiment of

the invention, also by locking of the keyboard in all the orders excepting that in which the mismanipulated key is located.

The keyboard locking mechanism for preventing actuation of the prime actuators or segment levers of other ordinal actuating mechanisms, when a key of one order is permitted to rise before reaching the bottom of its stroke, comprises a rock bar 105 extending across the frame of the machine and carrying with it arms 106 which support a latch releasing rod 107 for latches 108, as described and shown in the said prior United States patents, said latches 108 being adapted to engage respectively beneath co-operating latches 109 on the prime actuators or segment levers. The bar 105 is normally in the inoperative position shown in Figure 1 with the rod 107 engaged beneath tails 111 of the latches 108 to hold these tails elevated and the latches 108 out of engagement with the segment levers. Whenever any key is permitted to rise after a partial down-stroke, the rock bar 105 is rocked downwardly in a direction to depress the releasing bar 107, thereby releasing the latches 108 and permitting them to move under the influence of their springs 110 to engage and lock all of the segment levers, except the one feeling the influence of the key improperly operated, as particularly set forth in the prior patent to Dorr E. Felt, No. 1,028,344. The segment levers and their keys of all the other orders, thus locked, remain in such locked position until the mistake is corrected by completing the stroke of the previously only partially-depressed key and the keyboard locking mechanism is released. Completion of the stroke of the partially-depressed key, locks the latter in common with the keys of all the other orders, and, in order to unlock the machine which has become locked in the manner above set forth, there is provided a key 81 which engages a cross rod 82 supported by tails 83 of the rock bar 105. Depression of the key 81 effects a lifting movement of the rod 107 supported in front of the bar 105, and such lifting movement will cause the instant disengagement of all the latches 108 from the segment lever latches 109, thereby releasing all the segment levers and keys, with the result that the operator may then proceed with his computation as though no incomplete stroke had been given any key.

As shown in Figure 2, the latch releasing rod 107 projects beyond the arm 106 of the rock bar 105 on the right side of the machine, and the projecting portion of said rod 107 enters the jawed arm 112 of a bell crank 115 pivoted at 113 on the fixed frame. The lower end of the lower arm 114 of said bell crank 115 is pivotally connected by a link 116 with one arm 117 of a bell crank 118

pivoted at 120 on the fixed frame. The bell crank 118 carries a pawl 121 that is adapted to cooperate with rack teeth 122 on the cancelling crank segment 72 in both the forward and rearward movements of said segment to insure a full stroke in both directions of the cancelling crank 71. Connecting the upper end of arm 119 of the bell crank 118 with the pawl 121 is a spring 123, which holds the pawl 121 in yielding engagement with the teeth 122 of the segment 72 during the normal forward and rearward movement of the segment 72. Whenever the rock bar 105 is in its normal position, with the latches 108 released from the latches 109, the pawl 121 is in position to permit the normal pawl-and-ratchet movement of the segment 72, in both forward and rearward movements of said segment, with the result that the cancelling crank 71 may be operated at will to effect cancelling operations. On partial depression and release of a key 25, however, the rock bar 105 and latch releasing bar 107 moves forwardly and downwardly to permit the latches 108 to engage the segment lever latches 109, and when the error due to key mismanipulation has been corrected the entire keyboard is locked by reason of the engagement of the latches 108 with the latches 109 in every order of the machine. The hereinabove set forth downward movement of the latch releasing bar 107 is transmitted to the jawed arm 112 of the bell crank 115 to effect a forward movement of the arm 114 of said bell crank, accompanied by a forward movement of the link 116. Such forward movement of the link 116 moves the bell crank 118 forwardly, together with the pawl 121, to position the pawl so that its face is directly in the path of the forward end of the segment 72 of the cancelling crank. As long as the pawl 121 is in such position the cancelling crank 71 cannot be operated because forward movement of its segment 72 is blocked by the pawl 121. Consequently, it is impossible to cancel the machine until the mismanipulated key has been operated to correct the error and the keyboard release key 81 has been depressed to restore the rock bar 105, release the latches 108 from the latches 109, and through the connections 112, 114, 116 and 118, to restore the pawl 121 to its normal position.

The calculating machine described in the above specification embodies various other instrumentalities and devices which need not be herein described, for the reason that they are fully set forth in the prior patents above mentioned.

The term "cancelling crank," wherever employed in the ensuing claims, has been adopted for convenience and is not to be construed strictly, but includes broadly, in addition to the specific disclosure of the drawings and description, cancelling or

zeroizing mechanism, whether manually or power operated.

The invention as hereinabove set forth is embodied in a particular form of construction, but may be variously embodied within the scope of the claims hereinafter made.

I claim:

1. In a calculating machine, in combination: a plurality of ordinal keys; registering wheels; actuating devices for said registering wheels rendered operative upon movement of the keys; a cancelling crank including a rack segment movable with said cancelling crank; a pawl normally co-operable with said rack segment to permit pawl-and-ratchet movement thereof during operation of the cancelling crank; keyboard locking mechanism rendered operative on partial depression and release of a key in any order of the machine; connections between said keyboard locking mechanism and said pawl for displacing said pawl to block movement of the cancelling crank segment whenever the keyboard locking mechanism is operated; and means for restoring said keyboard locking mechanism to its normal inoperative position, and for concurrently operating said connections to restore said pawl to position for permitting movement of said cancelling crank segment; substantially as specified.

2. In a calculating machine, in combination: a plurality of ordinal keys; registering wheels; actuating devices for said registering wheels rendered operative upon movement of the keys; a cancelling crank including a rack segment movable with said cancelling crank; a pawl normally co-operable with said rack segment to permit pawl-and-ratchet movement thereof during operation of the cancelling crank; keyboard locking mechanism rendered operative on partial depression and release of a key in any order of the machine; and connections between said keyboard locking mechanism and said pawl for displacing said pawl to block movement of the cancelling crank segment whenever the keyboard locking mechanism is operated; substantially as specified.

3. In a calculating machine, in combination: a plurality of ordinal keys; registering wheels; actuating devices for said registering wheels rendered operative upon movement of the keys; a cancelling crank including a rack segment movable with said cancelling crank; a pawl normally co-operable with said rack segment to permit pawl-and-ratchet movement thereof during operation of the cancelling crank; keyboard locking mechanism rendered operative on partial depression and release of a key in any order of the machine; connections between said keyboard locking mechanism and said pawl for displacing said pawl to block movement of the cancelling crank segment whenever

the keyboard locking mechanism is operated; and means for concurrently restoring said keyboard locking mechanism and said pawl to their normal positions; substantially as specified.

4. In a calculating machine, in combination: a plurality of ordinal keys; registering wheels; actuating devices for said registering wheels rendered operative upon movement of the keys; a cancelling crank including a rack segment movable with said cancelling crank; a pawl normally co-operable with said rack segment to permit pawl-and-ratchet movement thereof during operation of the cancelling crank; keyboard locking mechanism rendered operative on partial depression and release of a key in any order of the machine; connections between said keyboard locking mechanism and said pawl for displacing said pawl to block the movement of the cancelling crank segment whenever the keyboard locking mechanism is operated; and means for restoring said pawl to position for permitting movement of said cancelling crank segment, substantially as specified.

5. In a calculating machine, in combination: a plurality of ordinal keys; registering wheels; actuating devices for said registering wheels rendered operative upon movement of the keys; a cancelling crank including a rack segment movable with said cancelling crank; a pawl normally co-operable with said rack segment to permit pawl-and-ratchet movement thereof during operation of the cancelling crank; keyboard locking mechanism rendered operative on key manipulation; and means responsive to operation of said keyboard locking mechanism for displacing said pawl to block movement of the cancelling crank segment; substantially as specified.

6. In a calculating machine, in combination: a plurality of ordinal keys; registering wheels; actuating devices for said registering wheels rendered operative upon movement of the keys; a cancelling crank including a rack segment movable with said cancelling crank; a pawl normally co-operable with said rack segment to permit pawl-and-ratchet movement thereof during operation of the cancelling crank; and means responsive to partial depression and release of a key in any order of the machine for displacing said pawl to block the movement of the cancelling crank segment; substantially as specified.

7. In a calculating machine, in combination: a plurality of ordinal keys; registering wheels; actuating devices for said registering wheels rendered operative upon movement of the keys; a cancelling crank including a rack segment movable with said cancelling crank; a pawl normally co-oper-

able with said rack segment to permit pawl-and-ratchet movement thereof during operation of the cancelling crank; and means responsive to mismanipulation of a key in any order of the machine for displacing said pawl to block movement of the cancelling crank segment; substantially as specified.

8. In a calculating machine, in combination: a plurality of ordinal keys; registering wheels; actuating devices for said registering wheels rendered operative upon movement of the keys; a cancelling crank; a cancelling crank lock; keyboard locking mechanism rendered operative on partial depression and release of a key in any order of the machine; connections between said keyboard locking mechanism and said cancelling crank lock for operating the latter whenever the keyboard locking mechanism is operated; and means for restoring said keyboard locking mechanism and said cancelling crank lock concurrently to their normal inoperative positions; substantially as specified.

9. In a calculating machine, in combination: a plurality of ordinal keys; registering wheels; actuating devices for said registering wheels rendered operative upon movement of the keys; a cancelling crank; a cancelling crank lock; keyboard locking mechanism rendered operative on partial depression and release of a key in any order of the machine; connections between said keyboard locking mechanism and said cancelling crank lock for operating the latter whenever the keyboard locking mechanism is operated; and means for restoring said cancelling crank lock to its normal inoperative position; substantially as specified.

10. In a calculating machine, in combination: a plurality of ordinal keys; registering wheels; actuating devices for said registering wheels rendered operative upon movement of the keys; a cancelling crank; a cancelling crank lock; keyboard locking mechanism rendered operative on mismanipulation of a key; and connections between said keyboard locking mechanism and said cancelling crank lock for operating the latter

whenever the keyboard locking mechanism is operated; substantially as specified.

11. In a calculating machine, in combination: a plurality of ordinal keys; registering wheels; actuating devices for said registering wheels rendered operative upon movement of the keys; a cancelling crank; a cancelling crank lock; and means responsive to partial depression and release of a key in any order of the machine for rendering operative said cancelling crank lock; substantially as specified.

12. In a calculating machine, in combination: a plurality of ordinal keys; registering wheels; actuating devices for said registering wheels rendered operative upon movement of the keys; a cancelling crank; a cancelling crank lock; and means responsive to mismanipulation of a key for rendering operative said cancelling crank lock; substantially as specified.

13. In a calculating machine, in combination: a plurality of keys; registering wheels; actuating devices for said registering wheels; a cancelling crank; a cancelling crank lock; means responsive to mismanipulation of a key for rendering operative said cancelling crank lock; and means operable on correction of the error due to key mismanipulation for restoring said cancelling crank lock to its normal inoperative position; substantially as specified.

14. In a calculating machine, in combination: a plurality of keys; registering wheels; actuating devices for said registering wheels; a cancelling crank; a cancelling crank lock; and means responsive to mismanipulation of a key for rendering operative said cancelling crank lock; substantially as specified.

15. A calculating machine provided with keys, registering wheels, actuating devices for said registering wheels, and zeroizing mechanism, combined with means, controlled by mismanipulation of a key, for locking said zeroizing mechanism; substantially as specified.

In testimony whereof I have hereunto set my hand.

JOSEPH A. V. TURCK.