Nov. 13, 1945. H. L. LAMBERT 2,389,062

CALCULATING MACHINE

Filed Feb. 20, 1942 3 Sheets-Sheet 1

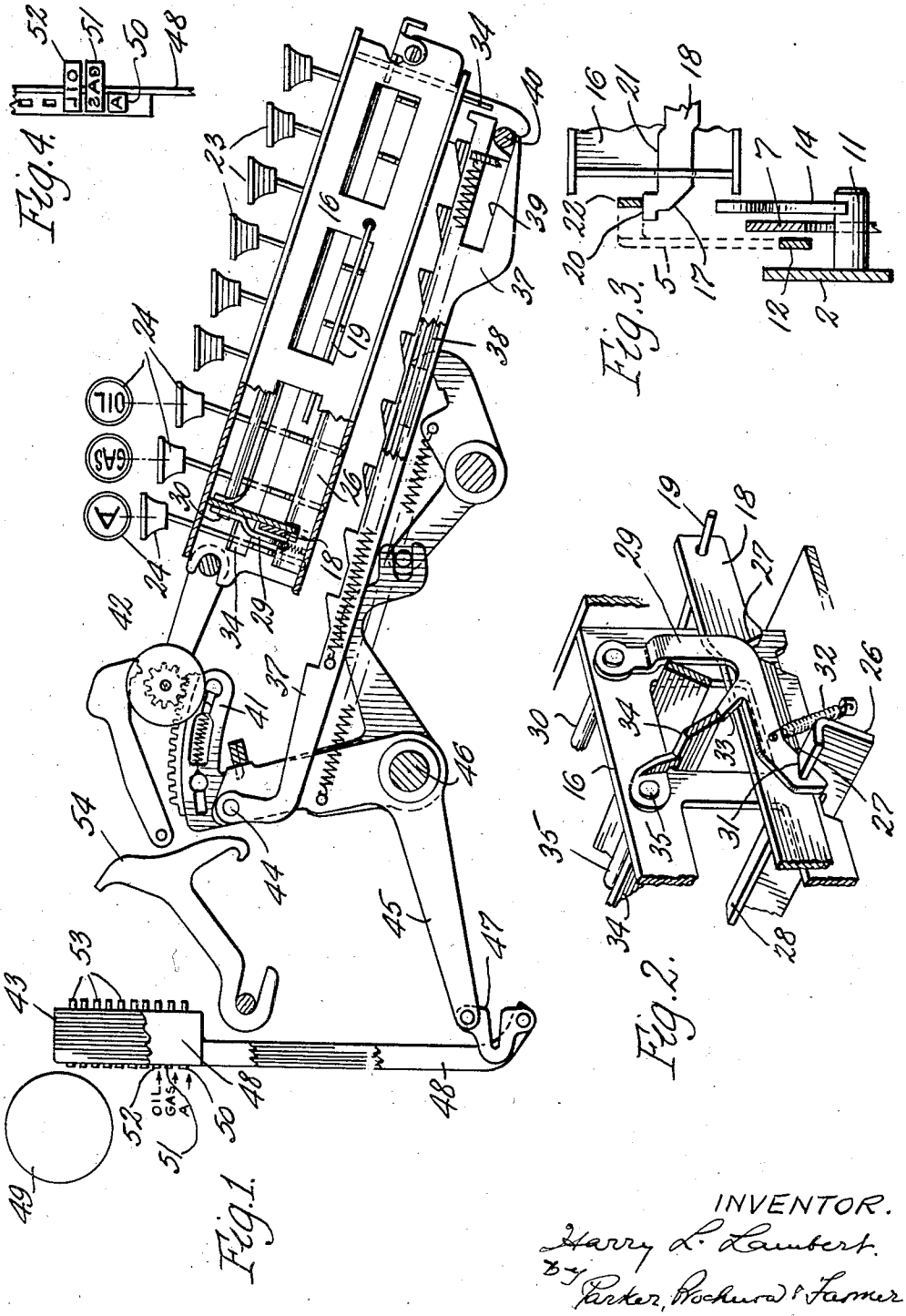


Fig. 1.

Fig. 4.

Fig. 3.

Fig. 2.

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CALCULATING MACHINE

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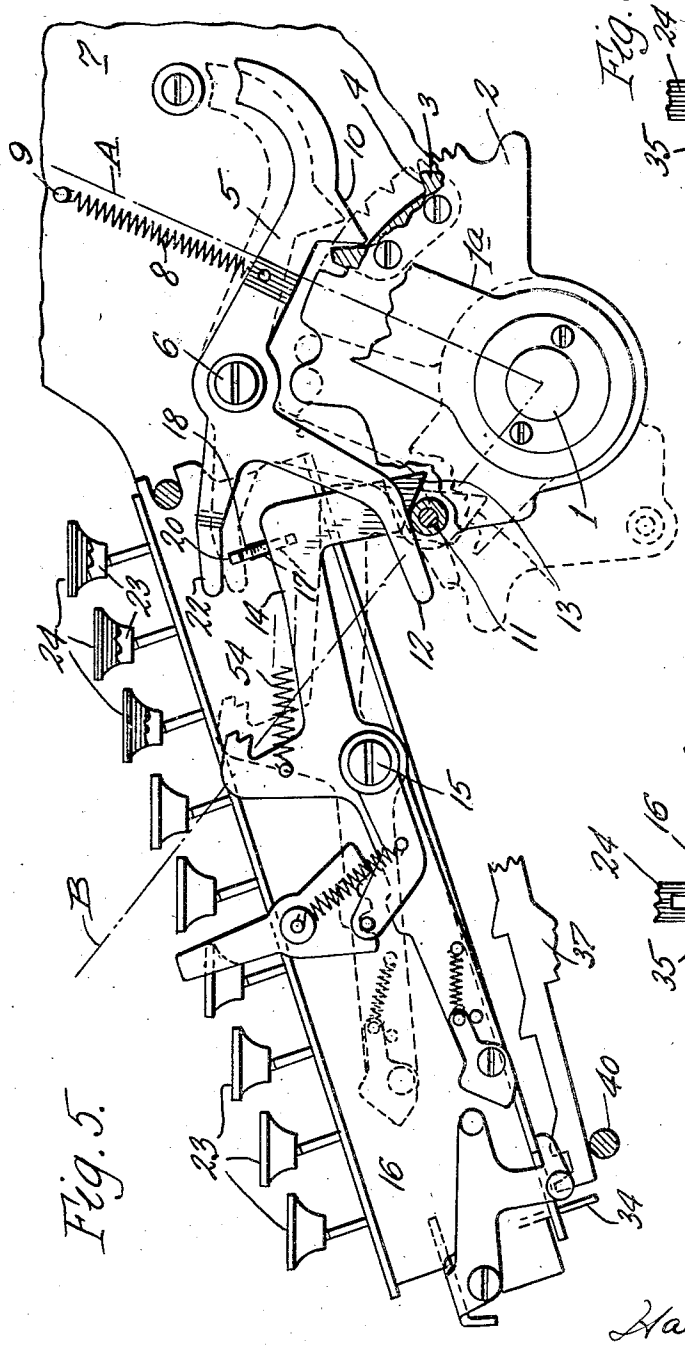


Fig. 5.

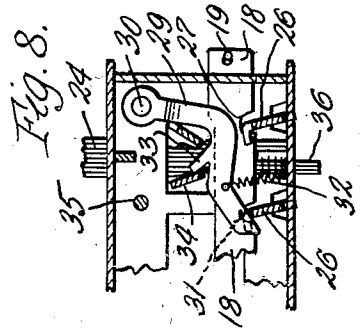


Fig. 8.

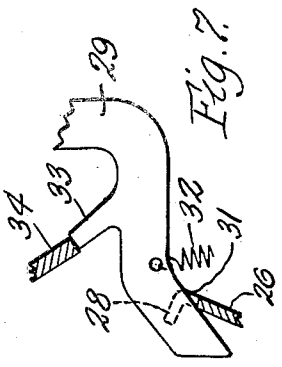


Fig. 7.

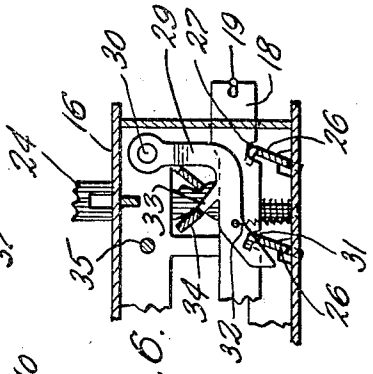


Fig. 6.

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CALCULATING MACHINE

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Fig. 9.

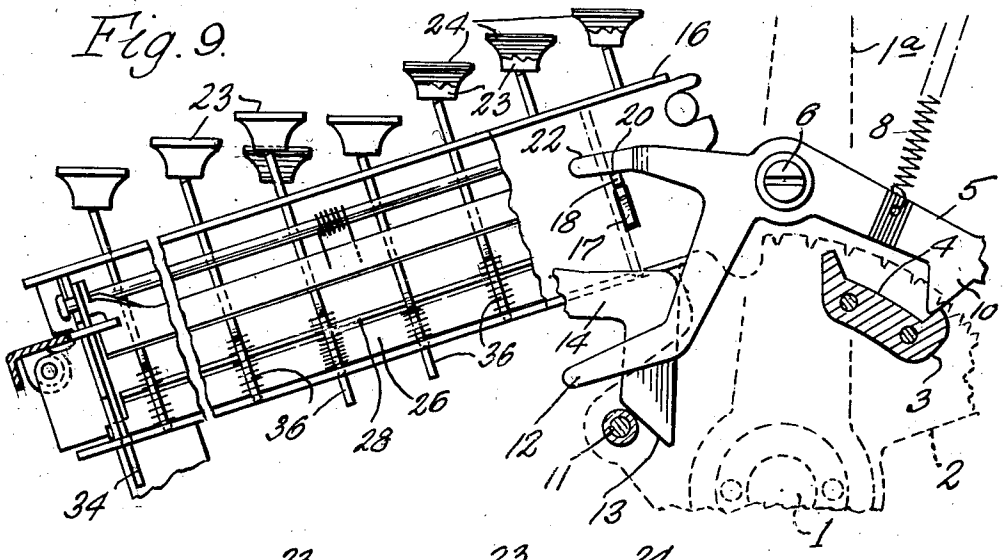


Fig. 10.

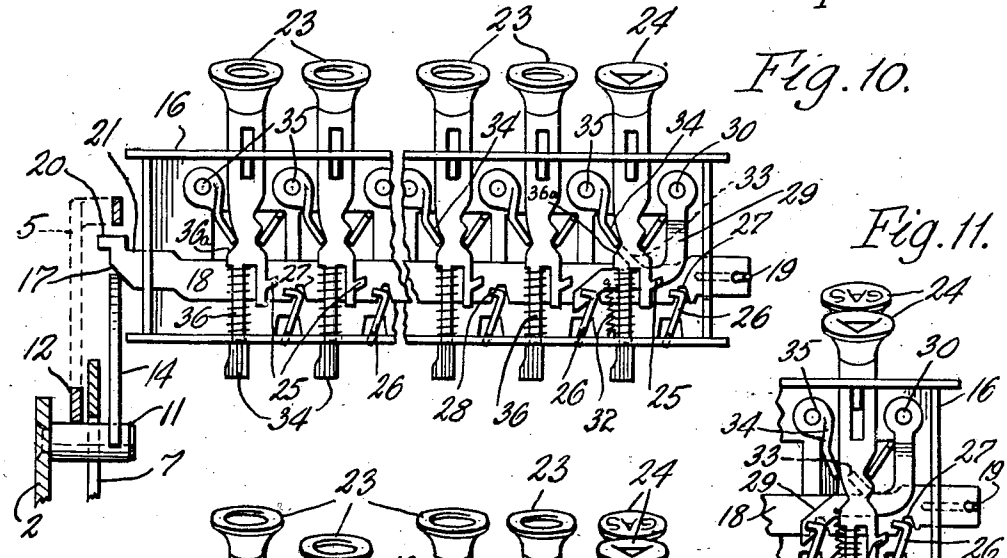


Fig. 11.

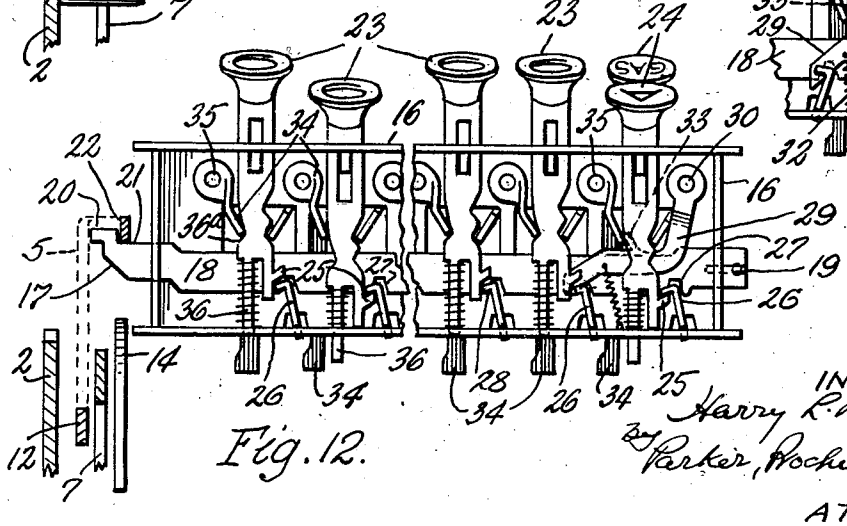


Fig. 12.

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Patented Nov. 13, 1945

2,389,062

UNITED STATES PATENT OFFICE

2,389,062

CALCULATING MACHINE

Harry L. Lambert, Enfield, N. Y., assignor to Allen Wales Adding Machine Corporation, Ithaca, N. Y.

Application February 20, 1942, Serial No. 431,745

4 Claims. (Cl. 235—130)

This invention relates to calculating machines, and particularly to improved means for not only preventing certain accidental errors in the operation of such a machine, but also for ensuring complete entry of desired items in connection with calculating operations.

This invention is in the nature of an improvement upon the invention disclosed and claimed in United States Patent No. 2,062,731, issued December 1, 1936, to Charles Schroder.

An object of this invention is to provide an improved calculating machine in which the operator is required to make proper designation of details in connection with different items used in calculating operations, and in which a calculating operation will be automatically prevented if any of the keys determining the calculation are only partially depressed or operated, which will require a minimum of changes in existing types of machines, and which will be relatively simple, practical, dependable and inexpensive.

Various other objects and advantages will be apparent from the following description of one embodiment of the invention and the novel features will be particularly pointed out hereinafter in connection with the appended claims.

In the accompanying drawings:

Fig. 1 is a side elevation, partly in section, of a portion of a calculating machine to which this invention is directly related, and in which this invention is incorporated;

Fig. 2 is a perspective of a portion of the mechanism shown in Fig. 1, and illustrating certain features of construction;

Fig. 3 is a transverse sectional elevation through a portion of the mechanism of Fig. 1, to show certain details thereof, and illustrating the relative positions of the parts when a movement of the calculating mechanism is blocked;

Fig. 4 is an elevation of the face of one enforced designation type bar forming a part of this invention;

Fig. 5 is a side elevation of a portion of a calculating machine constructed in accordance with this invention, and illustrating certain details of construction;

Fig. 6 is a transverse sectional elevation of a portion of the same and illustrating a sectional elevation of some of the details shown in perspective in Fig. 2;

Fig. 7 is a similar elevation on a larger scale of some of the details of Fig. 6;

Fig. 8 is an elevation similar to Fig. 6, but with with the parts in a different operative relation to one another;

Fig. 9 is a view similar to Fig. 5, but illustrating the relative positions of the parts at the end of an initial increment of movement of the calculating mechanism, where the operation of the calculating mechanism is blocked by improper operation of the keyboard;

Fig. 10 is a transverse sectional elevation through a portion of the machine at the keyboard, to show the normal inactive positions of certain of the parts forming a part of this invention;

Fig. 11 is a view similar to the right hand end of the apparatus of Fig. 10, but with an item designating key in operative position to release the calculating mechanism; and

Fig. 12 is a view similar to Fig. 10, but illustrating different relative positions of the parts such as occur after the keyboard has been properly operated and an operation of the calculating mechanism has been initiated.

In the illustrated embodiment of the invention, the calculating machine in which the invention is incorporated is of a type that has been available in the open market for some time, and which is shown to some extent in the Schroder patent, above identified, and also in the U. S. patents to Peters Number 1,386,021 and White Number 1,854,875. Those parts of the standard calculating machines which are not particularly modified by the incorporation of this invention in such machines have been omitted in the interest of simplicity and clarity. In machines of this type, the calculating mechanism is operated by or concurrently with a main operating shaft 1, which may be either manually operated by a handle 1*a*, shown by dash lines in Fig. 9, and full lines in Fig. 5, or operated by the application of motive power to the shaft 1 in a manner well known in the art, and which is not, per se, a part of this invention. This shaft 1, during a calculating operation, is usually operated angularly from a position shown by the dot and dash line A in Fig. 5 to a position shown by the dot and dash line B in the same figure, and then returned to the position A.

In certain types of machines, such as addition and subtraction machines, the shaft 1 may be given two successive oscillations of the same extent in performing certain operations, as set forth, for example, in my copending application Serial No. 416,833, filed October 28, 1941. Secured to or operating with the shaft 1 is a member 2 which is commonly known as a full stroke sector, or it may be any separate member attached to or operated concurrently with the shaft

1. The member 2 carries a stop block 3 having in its outer edge a notch 4. An interlocking lever 5 (Fig. 5) is pivoted at 6 to a suitable part of the frame 7 of the machine, and is yieldingly urged in one direction (counterclockwise in Fig. 5) by a spring 8 which at one end is connected to the lever 5 and at its other end is suitably anchored by a pin 9 to the frame 7.

The lever 5 has a nose 10 which is positioned in the notch 4 when the member 2 is in its normal or inactive position shown in full lines in Fig. 5. The spring 8 urges the lever 5 in a direction tending to withdraw the nose 10 from the notch 4. A stud or roller 11 provided on the member 2 engages a tail 12 on the lever 5 and rocks the lever 5 in a direction to tension the spring 8 and carry the nose 10 into the notch 4 as the member 2 completes a calculating operation and moves in a clockwise direction into the full line position shown in Fig. 5. The roller 11 thus holds the lever 5 in the full line position of Fig. 5, with the nose 10 within the notch 4. The roller 11, also at about the same time, engages and works against the oblique cam edge 13 on the depending end of a key release lever 14 which is pivoted at 15 to the frame 16 of the keyboard. This lever 14 when cammed upwardly by the roller 11 at the same time that the lever 5 is rocked into the full line position of Fig. 5, engages against the oblique cam edge 17 (Figs. 5, 10 and 12) of a latching bar or element 18 and operates the latter endwise. The bar 18 also may be designated as a sliding bar.

This bar 18 is mounted in the frame 16 of the keyboard to slide in a direction from side to side, and is urged resiliently in one direction (to the left in Fig. 10) by a spring 19, Figs. 10 to 12, which passes through an aperture in one end of the bar and is anchored at its other end suitably to the frame 16. When the lever 14 engages cam edge 17 and cams the bar 18 from the full line position of Fig. 12 to the full line position of Fig. 10, the bar 18 is shifted in a direction to tension or stress the spring 19, and then when the bar 18 is released by the lever 14, as happens when the member 2 begins its counter-clockwise movement (Fig. 5) in performing a calculating operation, the spring 19 will shift the bar 18 from the position shown in Fig. 10 to that shown in Fig. 12. The bar 18 is provided with an elevated upper edge zone 20 on its left hand end in Fig. 10, and immediately to the right of that zone 20 is a lower edge zone 21. The lever 5 is also provided with a tail 22 (Figs. 5 and 10) which overlies the projecting end of the bar 18 having the cam edge 17.

When the lever 5 is in its normal or full line position shown in Fig. 5, in which it is held by the roller 11, the tail 22 will lie above and be spaced from the upper edge zone 20 of the bar 18. When the bar 18 is shifted to the left in Fig. 10, such as into the position shown in Fig. 12, and the lever 5 is released, the spring 8 will rock the lever 5 in a direction to carry the tail 22 towards the bar 18, and the tail will then clear the elevated zone 20 and enter and engage the lower zone edge 21. At the beginning of the movement of the member 2 counterclockwise in Fig. 5, which is the first increment of movement in a calculating operation, the roller 11 releases both the tail 12 of lever 5 and the key release lever 14, and the notch 4 is long enough to allow this preliminary increment of movement of the member 2 during which the lever 14 releases the bar 18.

As soon as the bar 18 moves into the full line position in Fig. 12, the tail 22 engages the lower edge zone 21 and the lever 5 is then in the dash line position shown in Fig. 5, in which the nose 10 is out of the notch 4 entirely. The member 2 then may continue its full operation in the manner intended in performing a calculating operation. If, however, the bar 18 when released by the roller 11 and the key release lever 14 is prevented from moving from the position of Fig. 10, to that of Fig. 12, the tail 22 will engage with the elevated edge zone 20 instead of the edge zone 21, as shown in Fig. 9, and this will prevent rocking of the lever 5, even though released by the roller 11, far enough to remove the nose 10 from the notch 4. The nose 10 will then engage with one end of the notch 4 of the stop block 3, and block or prevent movement of the member 2 and main shaft 1 far enough to cause a calculating operation of the calculating mechanism. To this extent, the mechanism may be the same as disclosed in the patent to Schroder above referred to. In the Schroder patent, the bar 18 is controlled by the keys representing numbers to be set up in the keyboard, in order to determine the character of the calculation performed by subsequent movement of the main shaft 1.

The keyboard is provided with a plurality of rows of keys 23, these rows being arranged side by side and each row running in a direction from front to rear of the machine. The keyboard is also provided with one or more additional rows of keys 24 (one only being shown) which are preferably alongside the other rows of keys or parallel thereto. The keys 23 may be considered as one group, which are selectively operated to set up numbers by pressing the keys in the different rows selectively as well understood in this art. The keys 24 represent what may be termed an "enforced designation group", in that they control the making of a record of some details related to the numbers which are set up in the keyboard, such as the identity of the clerk making a calculation, or the department to which the calculation refers, or whether an item entered in a calculation in a filling station is gasoline, oil or some other item.

All of the keys of all of the groups are provided with correspondingly positioned fingers or lugs 25 (Figs. 10 to 12) which are alined in each row. Extending along each row of keys is a locking strip or member 26 which is rockably mounted on the bottom plate of the keyboard frame 16 and extends edgewise upwardly therefrom toward the lower edge of the bar 18. There is a strip 26 for each row of keys, all individually mounted, and each of these bars at its upper edge enters a notch 27 in the lower edge of the bar 18, so that the bar 18 when moved endwise of itself will rock all of the strips 26 in the same manner and same direction.

Adjacent each key of its related row, each strip 26 is provided with a flange 28 which extends toward the adjacent finger 25. When the keys of all groups are all fully up or fully depressed, that is, when none are partly but incompletely operated or depressed, the flanges 28 will pass above or below the related fingers 25 of all keys when the bar 18 is moved to the left in Figs. 10 and 12 under the action of the spring 19. If any key of any group is only partially and incompletely depressed, then the end of the flange 28 which is adjacent the finger 25 of that key will engage the end of the finger 25. This prevents continued movement of that strip 26, and it in turn

stops the movement of the bar 18 under the action of spring 19 into the position shown in Fig. 12, where the tail 22 is released. Thus if any key is only partially depressed, the finger 25 of that key, by engagement with the flange 28 of its related locking strip 26, will prevent movement of the bar 18 far enough to release the locking lever 5. This prevents movement of the main shaft beyond the initial preliminary extent which does not cause an operation of the calculating machine, all as disclosed in said Schroeder patent above identified.

In accordance with this invention, the bar 18 is utilized to prevent an operation of the calculating mechanism unless at least one of the keys 24 of one or more other groups is operated or depressed, and the manner in which this is accomplished for one second group of keys 24 will now be described. At one end of the row of keys 24 (Figs. 10 to 12) and on the frame 16 of the keyboard, a lever 29 is pivoted by pin 30 and it extends over one of the locking strips 26. The particular strip 26 over which this lever 29 extends may be provided with a notch 31 in its flange 28 into which notch the free end of lever 29 may be received, and a spring 32 connected at one end to the lever 29 and at its other end to the bottom plate of the keyboard frame 16, resiliently urges the lever 29 in a direction against the strip 26 which is engaged by the lever 29. Since the same strip 26 is also engaged with the bar 18, it follows that whenever the bar 18 moves to the left in Figs. 10 and 12, the strip 26 engaged by lever 29 will rock the lever 29, in a direction to tension the spring 32, such as from the position shown in Fig. 6 to the position shown in Fig. 8. The lever 29 is provided on its upper edge with a lug or projection 33.

Also pivoted on the frame 16 adjacent each row of keys is a zero stop member 34 pivoted at 35 and urged by a spring (not shown) toward an edge of the related row of keys 23 or 24 (Figs. 6 and 10 to 12). Each member 34 extends along each row of keys in a position to be operated or cammed aside by any key of that row or group which is depressed, each key of that row having a notch 36a in which the related member 34 may engage when that key is fully retracted. When any key is depressed, it cams the related zero stop member 34 to one side such as from the position shown in Fig. 10 to the position shown in Figs. 11 and 12, to release the stop bar of that row. The member 34 for the row of keys 24 extends in front of the tongue or lug 33 on lever 29 for that row as shown in Figs. 6 and 7, but when any key 24 is depressed the member 34 of that row is cammed aside so that it no longer abuts against the end of the related lug 33.

If while no key 24 is depressed and the member 34 of that row abuts endwise against the related lug 33, the locking bar 18 is released by a preliminary movement of the main shaft 1, the bar 18 is prevented from operating out of the retracted position shown in Fig. 10, because to do so the strip 26 engaged by the lever 29 would be rocked in a direction to force the lug 33 against the edge of member 34. The unoperated member 34 of the keys 24 prevents such rocking of the lever 29, and hence this prevents movement of the bar 18. If, however, any key 24 is operated, the member 34 of that group is cammed to one side and held out of the path of the related lug 33, and then when the bar 18 is released by this preliminary initial movement of the main shaft, member 34 will not interfere with the swinging of the related lever 29, and the bar 18, in moving under the action of its spring, will carry lever 29 into the position shown by full lines in Figs. 8 and 12.

In this type of calculating device, the keys when depressed or operated carry their lower ends 36 into the path of lugs on stop bars 37. These stop bars are arranged side by side, one for each row of keys 23 and one for the row of keys 24. The stop bar 37 for the keys 24 is similar to the stop bars 38 for the rows of keys 23. These bars at their forward ends have slots 39 which are guided upon a cross rod 40. The rear ends of the stop bars 38 for all keys 23 are connected to rack bars 41 which operate totalizer wheels 42 in a manner well understood in this art, and these bars 38 also have rearwardly extending connections which operate related type bars 43 in the usual manner.

The stop bar 37 for the keys 24 is pivotally connected by a pin 44 to a lever 45, having no rack bar 41 but pivoted on a shaft 46 which also mounts the rack bars 41 for the stop bars related to keys 23. The lever 45 is connected by a link 47 to the lower end of a related designating type bar 48 which extends upwardly along side of the number type bars 43 in position to be shifted to different extents in front of the platen 49 as usual in this type of machine. Each type bar 48 carries on its face, instead of numbers, suitable symbols or designations such as letters 50, Fig. 4, or designations 51 for gas, 52 for oil, or any other selected symbols. If the machine is intended to require the different clerks or attendants to designate by a suitable symbol, the clerk or attendant who is making the operation, then the keys 24 will bear on their faces proper designations of the different clerks such as by letters A, B, C, etc., and the designations 50, 51, and 52, etc., on the designating type bar 48 will be similar designations. The bars 43 and 48 carry individually movable type that will print corresponding designations on the paper on the platen during the printing operation. If the attendant is to designate different departments or different classes of items, then the symbols on the keys 24 will represent those different items and the designations 50, 51 and 52 will represent type that will print similar designations. After the type bars are shifted vertically to different extents to position particular type in printing position in front of the platen 44, the individual type 53 thereon will be driven against the platen to perform a printing operation by hammer mechanism 54 as usual in this type of machine.

In the operation of the simple machine illustrated in the drawings, it will be understood that when the machine is idle, the parts are in the relative positions shown in Figs. 5, 6, and 10. To perform a calculation, the attendant depresses selected keys 23 in the different rows to represent a number to be run into the totalizer 42, and also depresses one of the keys 24. When any key 24 is depressed in this manner, it cams aside the zero stop member 34 for that row and places it out of abutting relation to the related lug 33 on lever 29, that is, the zero stop member 34 is moved from the abutting position shown in Figs. 6, 7 and 10 to the position shown in Figs. 8, 11 and 12, which releases the lever 29. When the main shaft 1 is then operated either by hand or by motive power, from the angular position shown by the line A in Fig. 5, to the line B, the particular initial or preliminary increment of movement will carry the roller 11 from engagement with the cam edge

13 of the key release lever 14 and from the tail 12 of the lever 5.

As soon as the lever 14 drops under the action of its spring 54, Fig. 5, it releases the latching bar or device 18, and the latter is then moved by its spring 19 from the position of Fig. 10 to that of Fig. 12 during which it rocks all of the locking strips 26 to the left. If all of the keys 23 are either fully retracted or fully set the flanges 28 on the strips 27 will clear all of the fingers 25 and pass above or below the same to enable the bar 18 to complete its movement into the position shown in Fig. 12, where the edge zone 20 is moved from beneath the tail 22 of the lever 5. The lever 5 is then rocked by spring 8 into the dash line position of Fig. 5 to remove the nose 10 from the notch 4 just as soon as the roller 11 clears the tail 12, Fig. 5. The shaft 1 with member 2 can then continue the movement by which a calculation is performed, and during such calculation the number type bars 43 are shifted to different extents in front of the platen 49 and the hammer mechanism forces the individual type on said bars then in printing position in front of the platen, against the platen to print the numbers corresponding to those of the keys 23 which were depressed.

At the same time and by the same operation, the stop bar 37 is limited in its movement by the tail 36 of the depressed key 24 and this limits the extent to which the lever 45 is rocked and hence the extent to which the type bar 48 is shifted upwardly in front of the platen 49. This determines the particular symbol 50, 51, 52, etc., which is in printing position in front of the platen, and hence the particular symbol that is printed on the platen during the same printing operation that prints the numbers. Thus, during such printing operation which prints the numbers corresponding to those of the keys 23 depressed, a designating symbol is also printed alongside of the number so printed as explanatory of that number.

If any key of any group is partly but incompletely depressed, then the finger 25 of that key will be disposed in the path of the adjacent flange 28 of the adjacent locking strip 26, and then when the bar 18 is released by the key release lever 14, engagement of the flange 28 against the end of the finger 25 of the improperly depressed key will prevent full movement of the bar 18, and thus will prevent movement of the edge zone 20 from beneath the tail 22 of lever 5. Then, when the lever 5 is released by the roller 11, the spring 8 will rock the tail 22 against the edge zone 20 but this movement will not be sufficient to remove the nose 10 from the notch 4 and hence at the end of this preliminary movement of the shaft 1 and member 2, the nose 10 will engage with the end of notch 4 and block farther movement of the member 2 and shaft 1.

This will inform the operator either that some key has been improperly depressed, and is not either in its retracted or fully set position or that no key 24 has been operated. Thus by providing this control of one or more of the locking strips 26 by one or more levers 29, and the control of the latter by a related zero stop member 34, we require the attendant or operator to operate one or more proper designating keys 24 before a calculating operation can be performed.

Thus a record will be made on the paper on the platen, not only of the amounts which have been added or subtracted representing the sales or payments for any given period, but also a symbol will be printed alongside each item that will indicate which clerk made the sale or payment, or the character of the product sold, or give any other information desired as to the nature of that entry. It is only necessary to add a very few parts to the mechanism shown in the Schroder patent, in order to give this additional result.

It will be understood that various changes in the details and arrangements of parts, which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

I claim:

1. In a machine of the class described, having a plurality of rows of keys; means on the keys; sensing means including members normally out of engagement with the keys but movable a predetermined extent to engage the keys; means tending to move the sensing means a predetermined extent to move the members into engagement with the keys during an initial portion of an operation of the machine; said means on the keys being effective, when a key is in a partially depressed or intermediate position, to cooperate with the members and prevent the sensing means from moving said predetermined extent during said initial portion of the operation of the machine; and means controlled by the sensing means to prevent the operation of the machine beyond said initial portion of its operation if the sensing means has not moved said predetermined extent during said initial portion of the machine operation, the combination of a control means cooperable with the keys of one of said rows and shiftable from a normal position by the depression of any key in the row; and interponent means cooperable with said sensing means and with the control means in its normal position to prevent the sensing means from moving said predetermined extent during the initial portion of the operation of the machine; said interponent allowing the sensing means to move the members toward the keys during the initial portion of the operation of the machine if the control means has been shifted from its normal position by the depression of a key in said one row, whereby the keys of said one row are also effective to control the operation of the sensing means to prevent the operation of the machine beyond said initial portion of its operation unless one of the keys in said row has been depressed.

2. In a machine of the class described having a plurality of rows of keys; lugs on the keys; a control member for each row of keys; means on the keys for moving the related control member from a normal position when a key in the row is depressed; locking means including members, one for each row of keys, normally out of engagement with the keys but movable a predetermined extent to engage the keys and cooperate with the lugs on the keys to lock the keys to prevent the depression or release of any key during an operation of the machine; means tending to move the locking means said predetermined extent into locking engagement with the keys during an initial portion of an operation of the machine; said lugs on the keys cooperating with the members of the locking means, when any key is in a partially depressed or intermediate position, to prevent the locking

means from moving said predetermined extent during said initial portion of the operation of the machine; and means cooperating with the locking means to prevent the operation of the machine beyond said initial portion of its operation if the locking means has not moved said predetermined extent during the initial portion of the operation of the machine, the combination of an interponent member; means on the interponent member extending in the path of movement of the locking means and engaged by the locking means so that the locking means, when operated, will operate the interponent member; and other means on the interponent member engaging the control member for one row of keys, when the control member is in its normal position, to block the movement of the interponent member and thereby the locking means when no key is depressed in said one row, said control member, when operated by the depression of a key in said one row, releasing the interponent member and the locking means for movement during said initial portion of a machine operation and thereby controlling the operation of the machine to allow the machine to be operated beyond said initial portion of its operation.

3. In a machine of the class described having a plurality of rows of keys; lugs on the keys; locking means including members, one for each row of keys, normally out of engagement with the keys but movable a predetermined extent to engage the keys and cooperate with the lugs on the keys to lock the keys to prevent the depression or release of any key during an operation of the machine; means tending to move the locking means a predetermined extend during an initial portion of an operation of the machine; said lugs on the keys being effective, through the cooperation with said members, when any key is in a partially depressed or intermediate position, to prevent the locking means from moving said predetermined extent during said initial portion of the operation of the machine; and means cooperating with the locking means to prevent the operation of the machine beyond said initial portion of its operation if the locking means has not moved said predetermined extent during the initial portion of the operation of the machine, the combination of a control member; means on the keys of one of said rows of keys for moving the control member from its normal position; an interponent member; means on the interponent member extending in the path of movement of the locking means to be operated thereby so that the locking means, when operated, will operate the interponent member; and other means on the interponent member engaging the control member, when the control member is in its normal position, to block the movement of the interponent member and thereby the locking means when no key is depressed in said one row, said control member, when operated by the depression of a key in said one row, releasing the interponent member and the locking means for movement during said initial portion of a machine operation and thereby controlling the operation of the machine so that the machine can be operated beyond said initial portion of its operation when a key in said one row has been depressed.

4. In a machine of the class described, having a plurality of rows of keys; means on the keys; locking means including members, one for each row of keys, normally out of engagement with the keys but movable a predetermined extent to engage the keys of their respective rows and cooperate with the means thereon to lock the keys to prevent the depression or release of any key during an operation of the machine; means tending to move the locking means said predetermined extent during an initial portion of an operation of the machine; said means on the keys being effective, through cooperation with said members, when a key is in a partially depressed or intermediate position, to prevent the locking means from moving said predetermined extent during said initial portion of the operation of the machine; and means controlled by the locking means to prevent the operation of the machine beyond said initial portion of its operation if the locking means has not moved said predetermined extent during said initial portion of a machine operation, the combination of a control member cooperable with the keys of one of said rows; means on the keys of said one row for shifting the control member from a normal position upon the depression of any key in said one row; and a pivoted interponent element having thereon an extension extending into the path of movement of one of said members of the locking means for operation thereby when the locking means moves said predetermined extent to move the members into engagement with the keys, and having thereon another extension which engages the control member in the normal position of the control member to block the rocking of the interponent element and thereby block the locking means from moving said predetermined extent unless the member has been shifted from its normal position by the depression of a key in said one row, whereby the keys of said one row are effective, through the locking means, to prevent the operation of the machine beyond said initial portion of its operation unless one of the keys has been depressed.

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