

Sept. 2, 1941.

O. J. SUNDSTRAND

2,254,760

COMPUTING AND PRINTING MACHINE

Original Filed Dec. 18, 1931

7 Sheets-Sheet 1

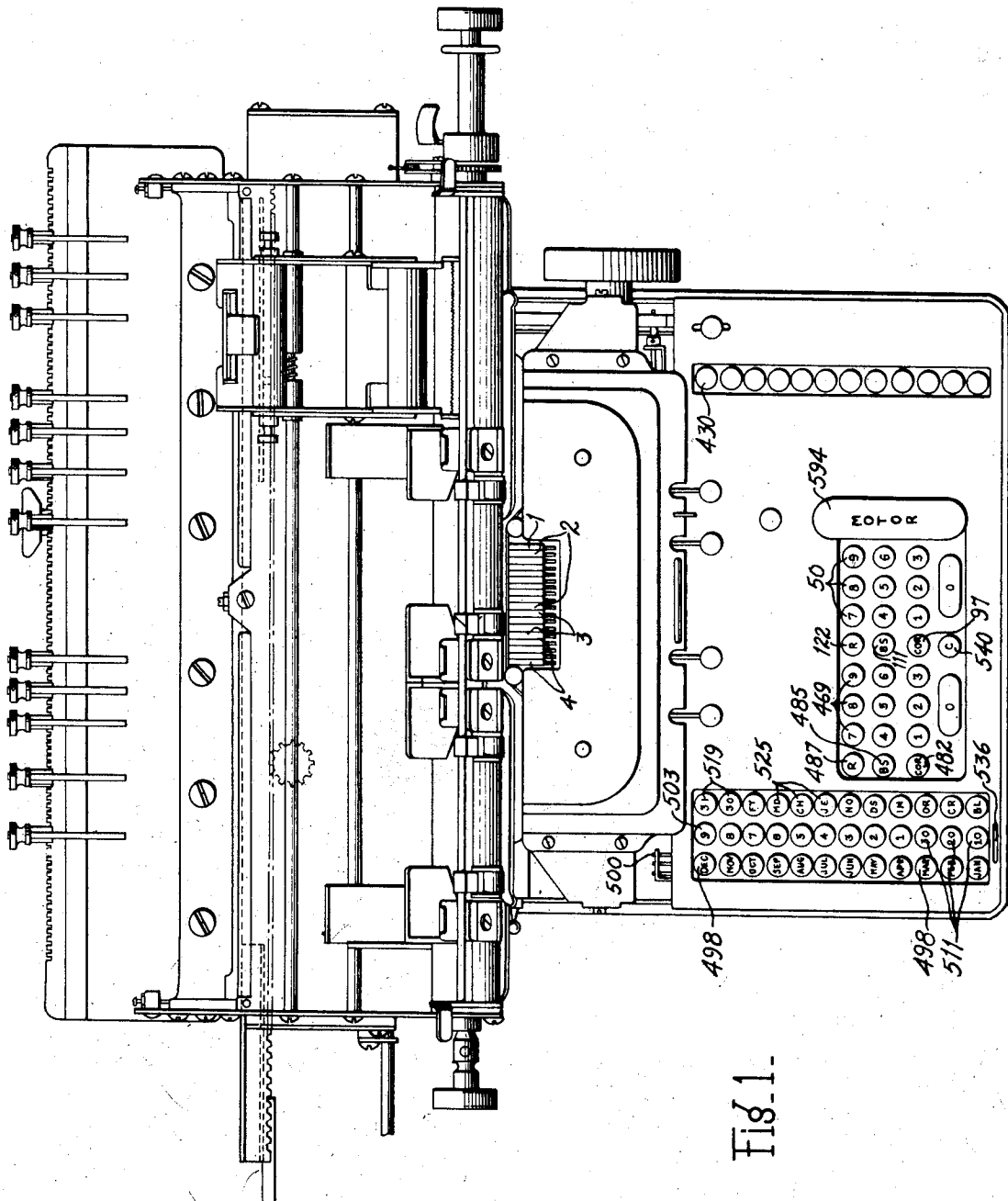


Fig. 1.

INVENTOR.
OSCAR J. SUNDSTRAND.

BY

R. S. Julius
ATTORNEY.

Sept. 2, 1941.

O. J. SUNDSTRAND

2,254,760

COMPUTING AND PRINTING MACHINE

Original Filed Dec. 18, 1931

7 Sheets-Sheet 2

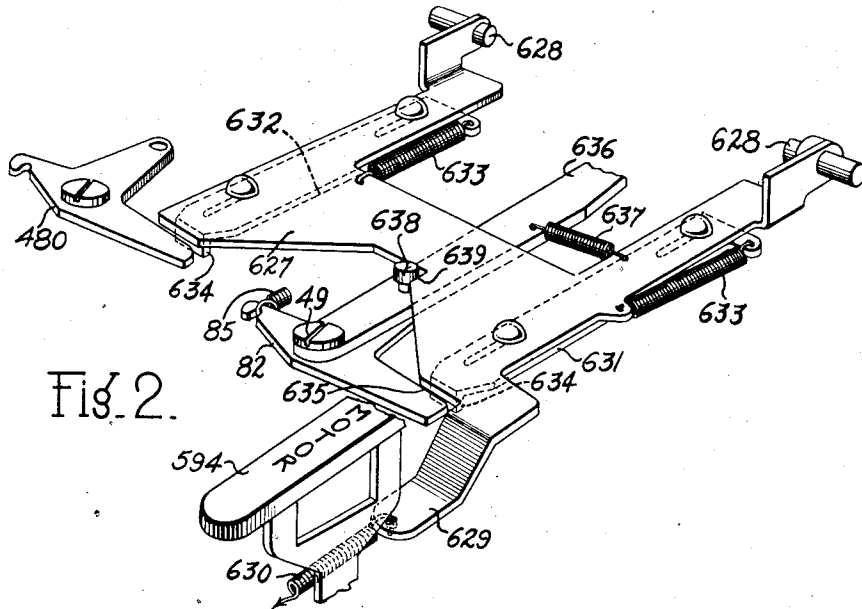


Fig. 2.

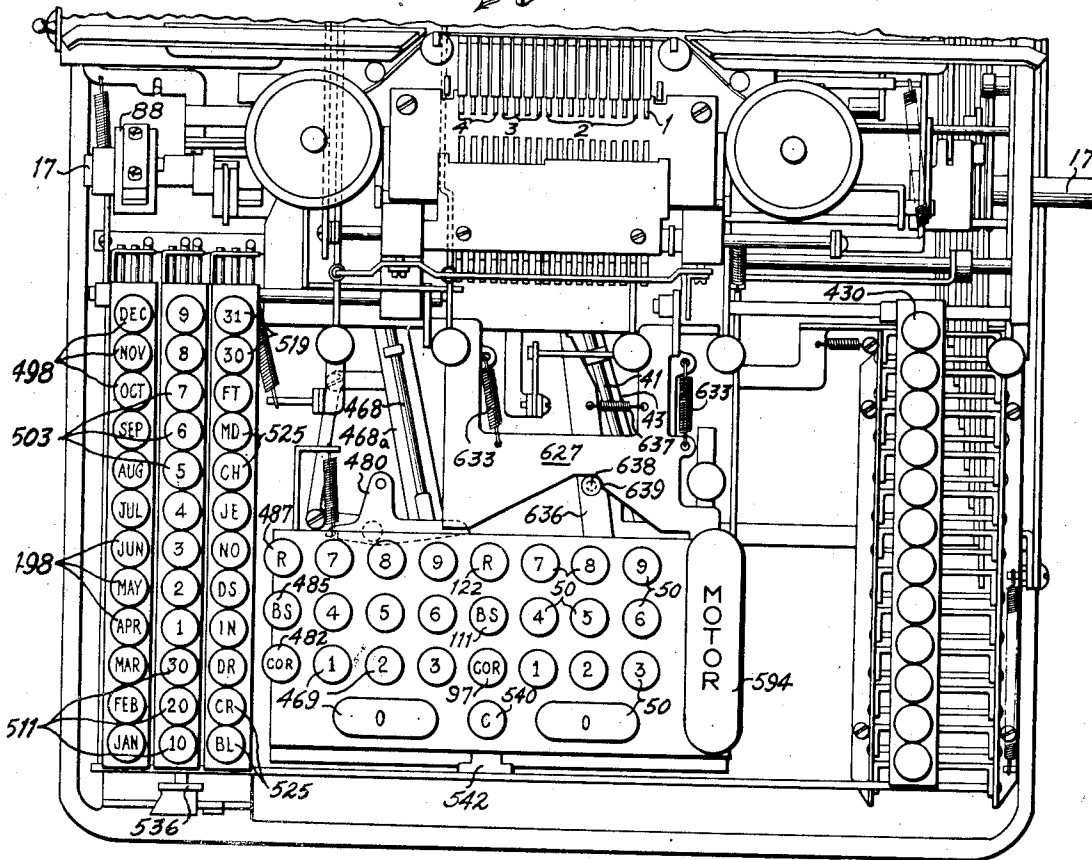


Fig. 3.

BY

INVENTOR.
OSCAR J. SUNDSTRAND.

L. E. Julihn
ATTORNEY.

Sept. 2, 1941.

O. J. SUNDSTRAND

2,254,760

COMPUTING AND PRINTING MACHINE

Original Filed Dec. 18, 1931

7 Sheets-Sheet 3

Fig. 4.

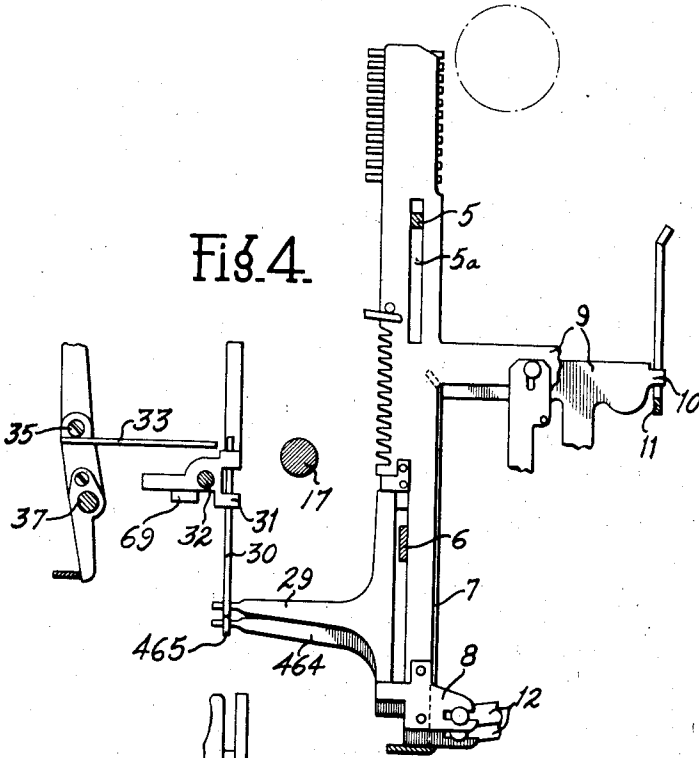


Fig. 5.

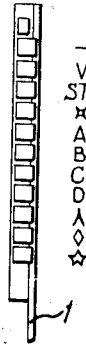


Fig. 6.

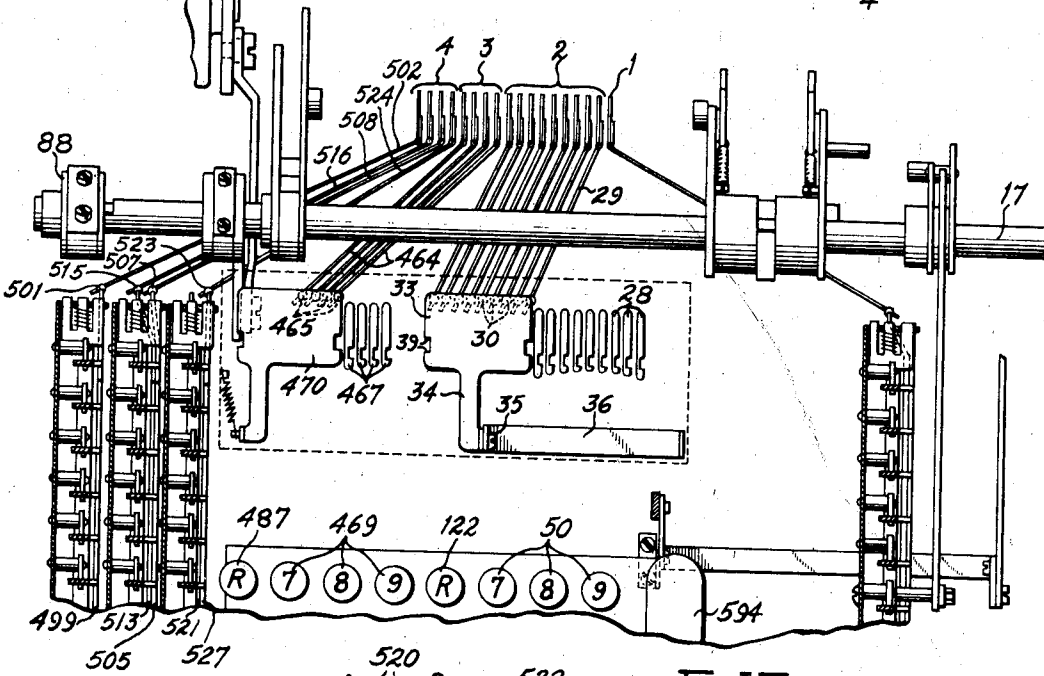
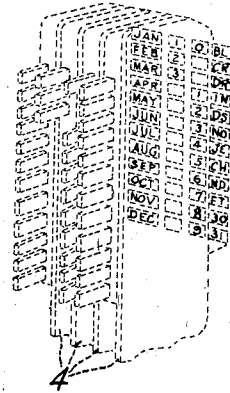
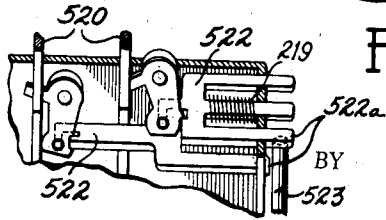


Fig. 7.

Fig. 8.



INVENTOR.
OSCAR J. SUNDSTRAND.

BY
R. S. Julius
ATTORNEY.

Sept. 2, 1941.

O. J. SUNDSTRAND

2,254,760

COMPUTING AND PRINTING MACHINE

Original Filed Dec. 18, 1931 7 Sheets-Sheet 4

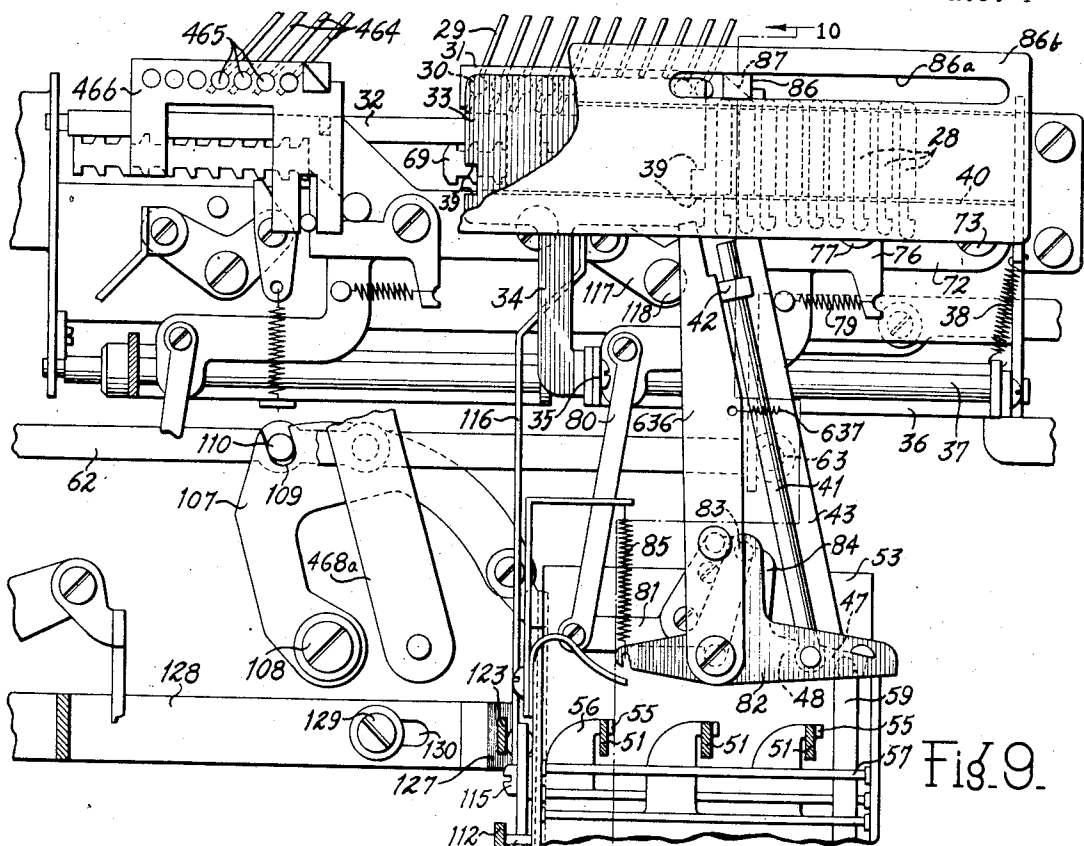


Fig. 9.

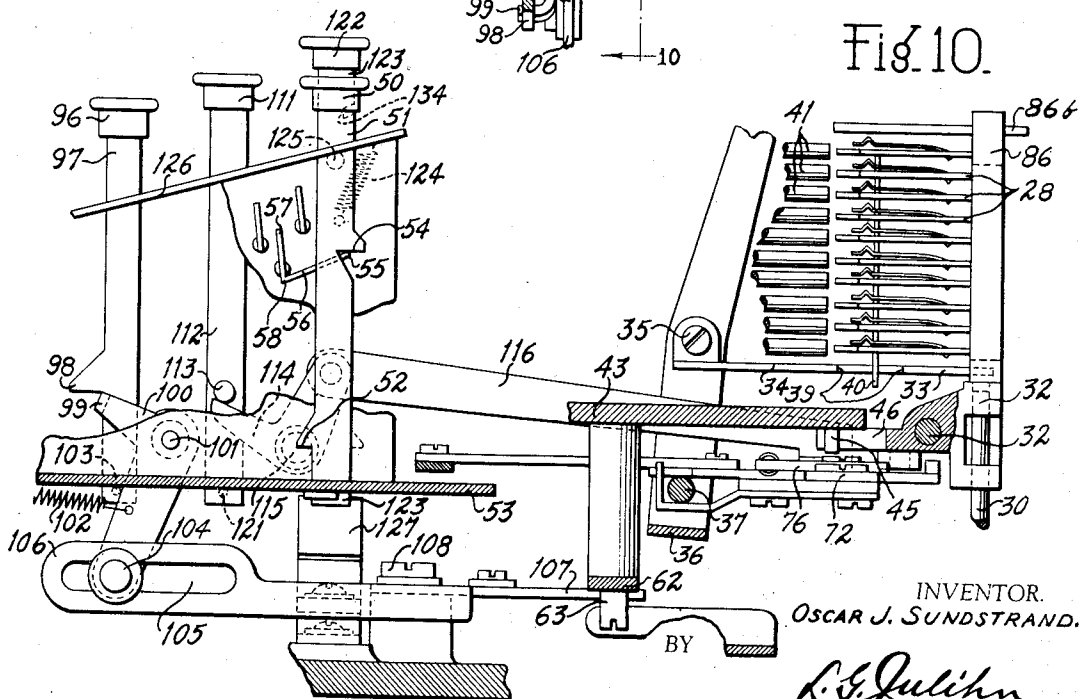


Fig. 10.

INVENTOR.
OSCAR J. SUNDSTRAND.

BY
R. E. Julihn
ATTORNEY.

Sept. 2, 1941.

O. J. SUNDSTRAND

2,254,760

COMPUTING AND PRINTING MACHINE

Original Filed Dec. 18, 1931 7 Sheets-Sheet 5

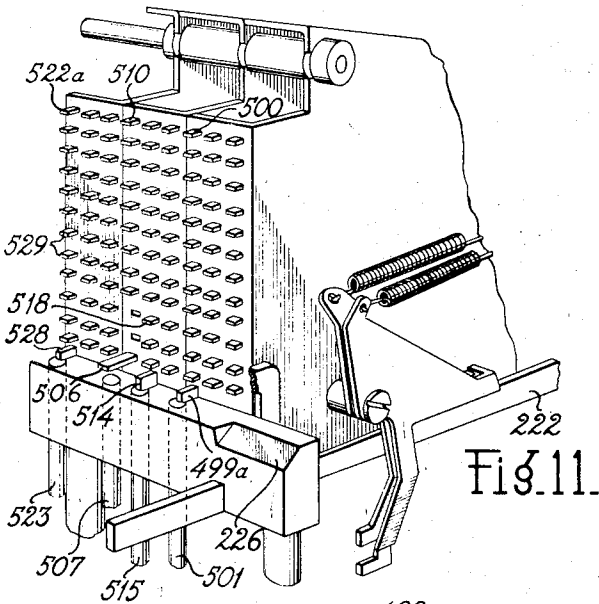


Fig. 11.

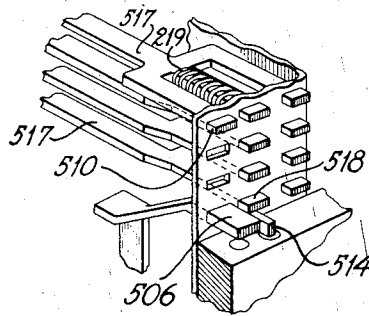


Fig. 12.

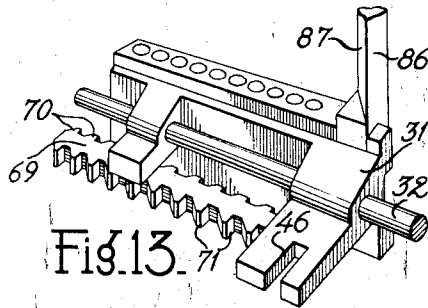


Fig. 13.

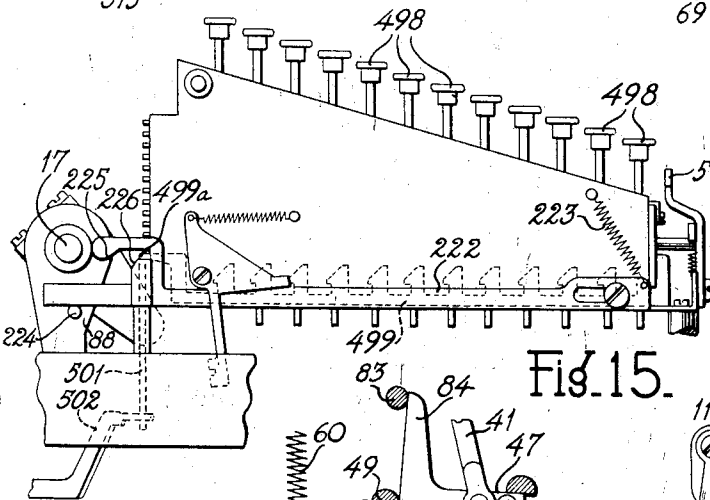


Fig. 15.

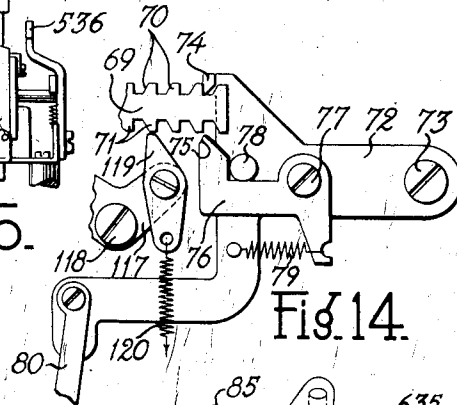


Fig. 14.

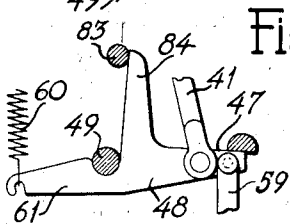


Fig. 16.

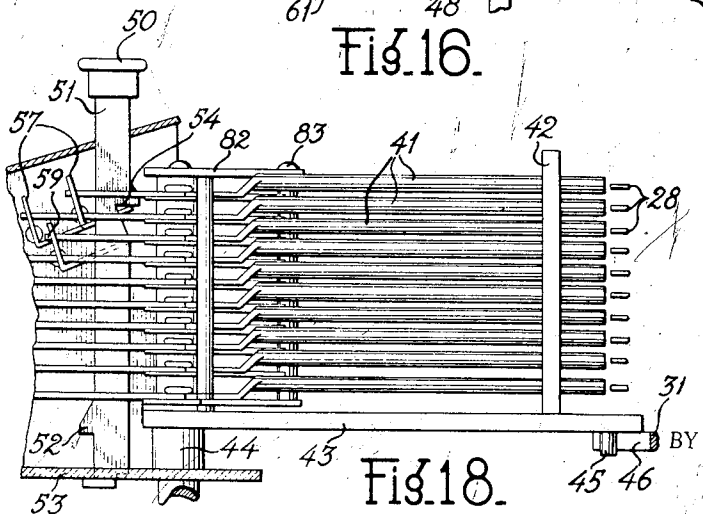


Fig. 18.

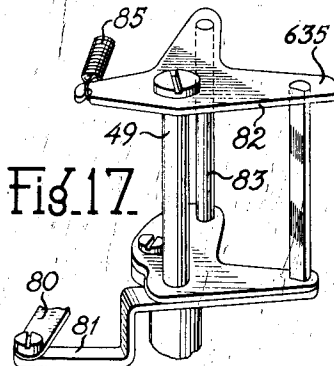


Fig. 17.

INVENTOR.
OSCAR J. SUNDSTRAND.

BY
L. G. Julihn
ATTORNEY.

Sept. 2, 1941.

O. J. SUNDSTRAND

2,254,760

COMPUTING AND PRINTING MACHINE

Original Filed Dec. 18, 1931 7 Sheets-Sheet 6

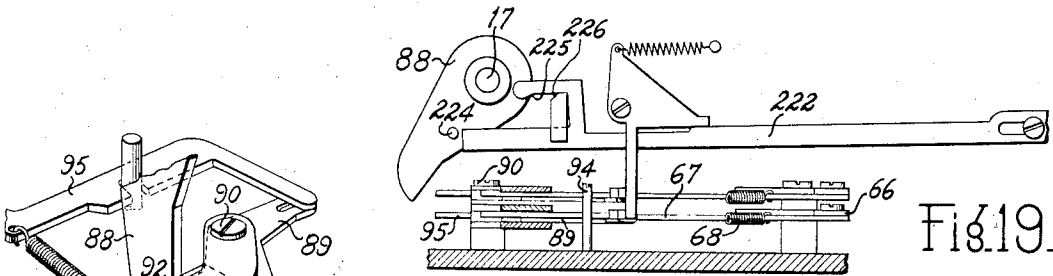


Fig. 19.

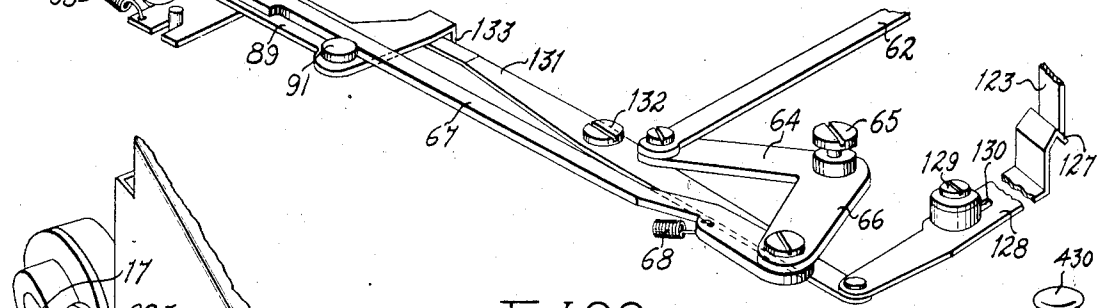


Fig. 20.

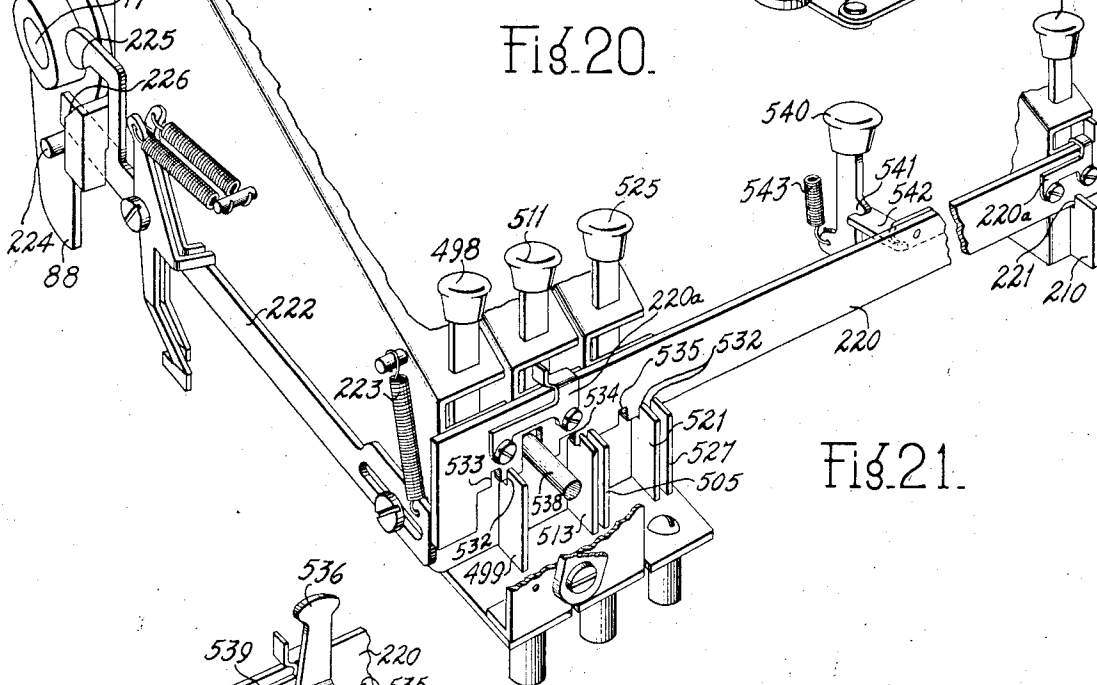


Fig. 21.

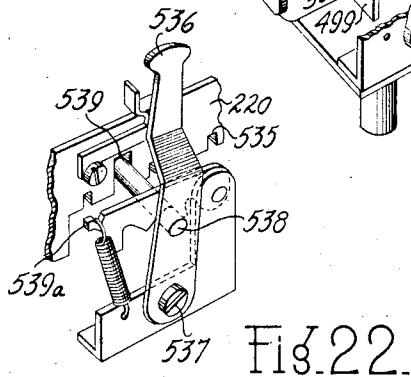


Fig. 22.

BY

INVENTOR.
OSCAR J. SUNDSTRAND.

R. S. Julihn
ATTORNEY.

Sept. 2, 1941.

O. J. SUNDSTRAND

2,254,760

COMPUTING AND PRINTING MACHINE

Original Filed Dec. 18, 1931 7 Sheets-Sheet 7

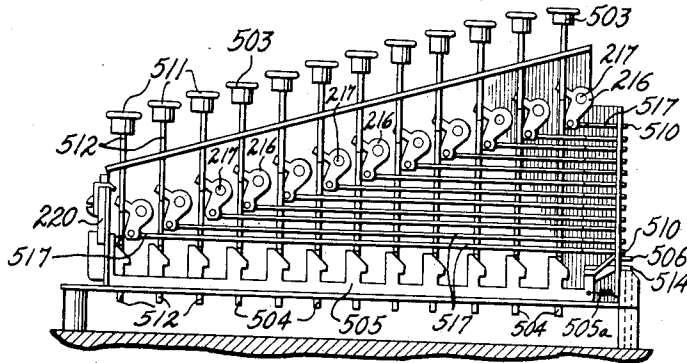


Fig. 23.

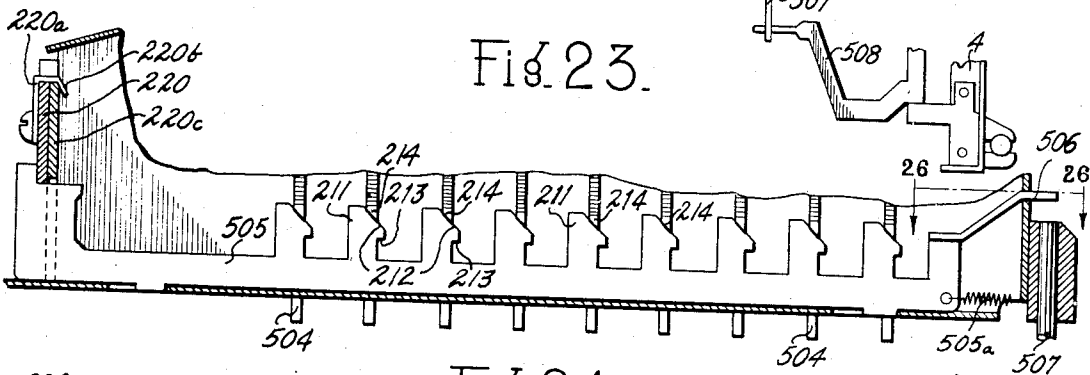


Fig. 24.

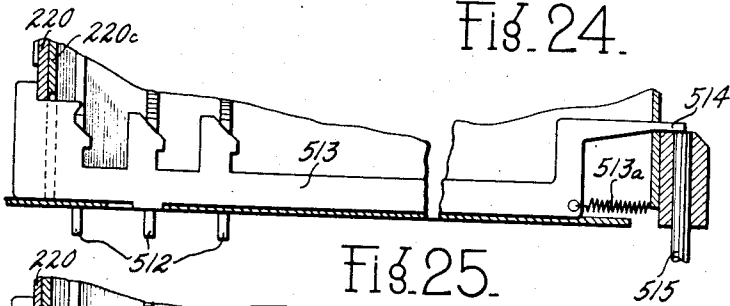


Fig. 25.

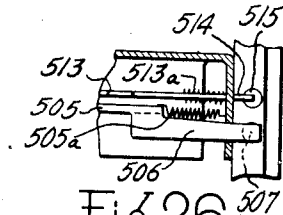


Fig. 26.

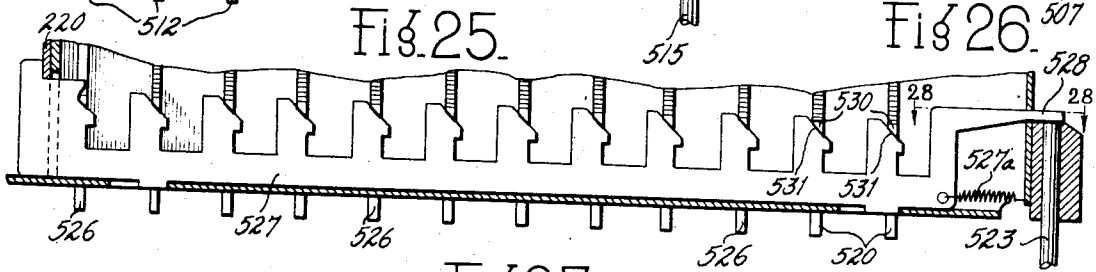


Fig. 27.

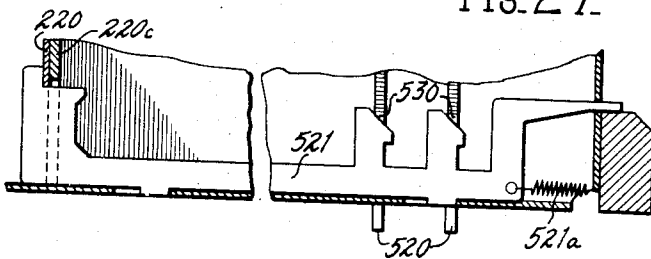


Fig. 29.

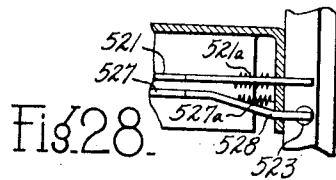


Fig. 28.

INVENTOR.
OSCAR J. SUNDSTRAND.

BY

K. S. Julihn
ATTORNEY.

UNITED STATES PATENT OFFICE

2,254,760

COMPUTING AND PRINTING MACHINE

Oscar J. Sundstrand, Bridgeport, Conn., assignor to Underwood Elliott Fisher Company, New York, N. Y., a corporation of Delaware

Original application December 18, 1931, Serial No. 581,800. Divided and this application April 28, 1937, Serial No. 139,538

3 Claims. (Cl. 235—60)

The present invention relates to computing and printing machines and is illustrated on the type of machine employing a traveling paper carriage and a group of vertically movable type bars. This case is a division of my U. S. Patent No. 2,194,270, issued March 19, 1940. This divisional application relates to keyboard mechanism, and more particularly to the means for controlling the movement of the actuators, the means for restoring this controlling mechanism, the means for selectively releasing various keys, and various locking mechanisms to properly control manipulation of the keyboard.

With these and incidental objects in view, the invention consists in certain novel features of construction and combinations of parts, the essential elements of which are set forth in appended claims, and a preferred embodiment of which is hereinafter described with reference to the drawings which accompany and form part of the specification.

In the drawings:

Figure 1 is a plan view of a bookkeeping machine embodying the features of my invention,

Figure 2 is a fragmental perspective view of a keyboard lock, the parts being shown in the position assumed when the motor bar is depressed,

Figure 3 is a plan view of the keyboard mechanism,

Figure 4 is a fragmental elevation of the type bar mechanism,

Figure 5 illustrates the signal type bar and the characters printed thereby,

Figure 6 is a fragmental phantom view of the four type bars farthest to the left,

Figure 7 is a fragmental plan view showing the connections between the type bars and the keyboard,

Figure 8 is a fragmental perspective view showing two of the stops comprised in one of the character sections,

Figure 9 is a fragmental plan view of the stops and stop-setting mechanism,

Figure 10 is a vertical sectional view taken in the plane of line 10—10 of Figure 9,

Figure 11 is a fragmental perspective view of the three left-hand character sections, looking from the rear of the machine,

Figure 12 is a fragmental perspective view of the stop mechanism comprised in the middle character section,

Figure 13 illustrates, in perspective, a slide comprised in the stop-setting mechanism of the amount keyboard,

Figure 14 is a detail plan view of the escapement lever of the stop-setting mechanism of the amount keyboard,

Figure 15 is a left-hand side elevation of the "months" character key bank, and shows parts of the key restoring mechanism,

Figure 16 is a horizontal sectional view of certain parts comprised in the amount keyboard,

Figure 17 is a perspective view of a pivoted unit comprised in the amount keyboard,

Figure 18 is a fragmental perspective view of the mechanism for setting the stops,

Figure 19 is a fragmental left-hand side elevation illustrating a portion of the mechanism concerned with the resetting of stops,

Figure 20 is a fragmental perspective view of the means for restoring the stops to their initial position,

Figure 21 is a fragmental perspective view of the character sections and the means for releasing operated character keys,

Figure 22 is a fragmental perspective view illustrating a means for adjusting the character key releasing mechanism,

Figure 23 is a right-hand elevation of the middle character section, i. e., the section that controls the printing of the numbers of the days of the month,

Figure 24 illustrates the latch mechanism and stop mechanism for the units keys used in setting up the numbers of the days of the month,

Figure 25 shows the latching mechanism and stop mechanism for the tens keys used in setting up the numbers of the days of the month,

Figure 26 is a plan section on line 26—26 of Figure 24,

Figure 27 illustrates the latching mechanism and stop mechanism associated with the keys used in setting up various bookkeeping symbols,

Figure 28 is a plan section on line 28—28 of Figure 27, and

Figure 29 represents the latching mechanism and the stop mechanism for the two keys used in setting up the numbers denoting two years.

GENERAL DESCRIPTION

The machine illustrated in the accompanying drawings is of the key set motor operated type, having one adding and subtracting totalizer (crossfooter) and four totalizers capable of adding (registers). Folio numbers and amounts are entered by the use of "10 key" keyboards, and the dates and characters are printed by the use of 55 keys situated in parallel banks generally simi-

lar to the "81 key" keyboard construction. Repeat, back spacing, and correction keys are provided for controlling the functions of the other keys.

Actuators or type bars

The type for printing items, totals, dates, folios, etc., upon the work-pieces are carried by type bars or actuators of which there may be any desired number. Herein there is a type bar 1 (Figure 1) for printing symbols or "signals" to denote the character of the amount or to indicate that a particular counter is clear, nine type bars 2 for use in printing amounts and for printing two naughts to signify that a counter was clear, four type bars 3 for printing folios, and four type bars 4 for printing dates and various abbreviations used in bookkeeping.

In this instance, the type bars or actuators 1, 2, 3 and 4 have a rectilinear vertical movement. They are guided by a rod 5 (Figure 4) fixed in the machine frame and extending through a slot 5a in each of the type bars, a bar 6 secured in the machine frame, and a plate 7 likewise fixed in the machine frame, said plate having vertical slots through which brackets 8 fixed to the type bars extend. Each type bar has a rearward extension 9 having at its rear end a lug 10 that extends through a vertical guide slot in a plate 11 fixed in the machine frame.

The means for raising the type bars includes a plurality of levers 12, one for each type bar, said levers being pivoted in the machine frame as illustrated in the parent case. The forward arm of each lever 12 has a pin and slot connection with the bracket 8 on the corresponding type bar. A coiled spring tends to move the lever in the direction to raise the type bar.

Stop mechanism for amount keyboard

The actuator 2 farthest to the right serves for the printing and registration of units, the next actuator for tens, and so on. The means for determining the extent to which the actuators 2 shall rise comprises a stationary group of stops 28 (Figures 9 and 10). The stops are arranged in as many columns as there are actuators 2, there being ten stops 28 in each column. Pivoted to the lower portion of each actuator 2 is a forwardly extending bar 29 (Figure 4) the front end of each bar 29 extending slidably into an opening in a vertically extending pin 30. The pins 30 are guided for vertical movement in a slide 31 (Figures 10 and 13) which is mounted upon a stationary rod 32 for movement transversely of the machine. The slide 31 is arranged to shift the pins 30 from their normal or initial position at the lefthand side of the group of stops 28 (shown in Figure 9) into the vertical planes of the columns of stops. The rear end of a stop which has been moved rearwardly into set position overhangs the transverse path of movement of the group of pins 30. When an actuator 2 is raised until its pin 30 stops against the lowermost stop in a given column, the actuator is in position to effect printing and/or registration of the digit "0." The second stop from the bottom corresponds to "1" and so on.

The actuators 2 for the numerical orders which are not needed in printing or registering a given amount are prevented from rising above the cipher-printing position by a detent plate 33 (Figures 7, 9 and 10) located at the left of the group of stops 28 and guided to move horizontally forward and back in the machine. Said plate has an arm 34 which is pivoted at 35 to a

lever in the form of a bail 36, said bail being pivoted on a rod 37. A spring 38 (Figure 9) normally holds the plate 33 in its rearward position, with its rear edge overhanging the pins 30. The forward and back movements of the detent plate 33 are limited by the engagement of shoulders 39 (Figures 7 and 10) on the plate with the back wall 40 (Figure 10) of the frame in which the stops 28 are mounted.

The means for pushing the stops 28 rearwardly into position to limit the rising movement of the pins 30 comprises a tier of ten push pins 41 (Figures 9, 10 and 18), the forward portions of which are slidable in openings in a post 42 which is fixed to a bracket 43 that swings upon an axis 44. The slide 31 and the bracket 43 are connected to move in unison by means of a stud 45 (Figure 10) on the bracket which lies in a fork 46 (Figure 13) on the slide. By means herein-after described, the bracket 43 is caused to swing step by step from the initial position shown in Figure 9 toward the right to position the rear ends of the push pins 41 in register with successive columns of stops 28. The forward ends of the push pins 41 are pivoted to the arms 47 (Figures 9 and 16) of a series of three-arm levers 48 (Figure 16). The levers 48 are mounted upon a pivot 49 in the machine frame and are arranged to be swung counter-clockwise, as viewed in Figure 9, to set the stops, by means of numeral keys 50 (Figures 3 and 10) having stems 51 (Figure 10) which are guided in the framework of the keyboard for vertical movement. The movements of the keys 50 are limited by engagement of lugs 52 on the lower ends of the key stems 51 with a stationary plate 53. Each key stem 51 has a notch 54 to receive a lug 55 (Figure 9) on a rocking element consisting virtually of two bell crank arms 56 and 57 and a shaft portion 58, the shaft portion being pivoted at opposite ends in the framework of the keyboard. To the arm 57 of each rocking element is connected a link 59 which is pivoted to one of the arms 47 (Figures 9 and 16). It will be apparent from Figure 18 that depression of a numeral key 50 will cause the corresponding push pin 41 to be pushed rearwardly to set a stop 28. A coiled spring 60 (Figure 16) connected to the arm 61 of each of the levers 48 restores the lever 48 and the key 50 as soon as the operator releases the key.

The means for impelling the slide 31 and the bracket 43 to move toward the right comprises a link 62 (Figure 9) pivoted at its right-hand end to the bracket 43 at 63, and pivoted at its left-hand end to an arm 64 (Figure 20) which is pivoted in the machine frame on the axis 65. Rigid with the arm 64 is an arm 66 to which is connected a resetting lever 67. A spring 68 connected to the lever 67 exerts its force through the connections just described to move the slide 31 and the bracket 43 toward the right as viewed in Figure 9. Such movement of the slide and the bracket is controlled by an escapement consisting, in this instance, of a bar 69 (Figure 13) fixed to the slide 31 and having two series of teeth 70 and 71. An escapement lever 72 (Figures 9 and 14) pivoted in the machine frame at 73 has a tooth 74 arranged to move into the path of successive teeth 70. An escapement tooth 75 is formed upon a pawl 76 pivoted to the lever 72 at 77 and is normally held against a stop pin 78 by a spring 79. The tooth 75 is arranged to engage successive teeth 71. The teeth 74 and 75 are so located as to engage the teeth 70 and

71 alternately as the escapement lever 72 is swung. Said lever is swung by a link 80 (Figure 9), the forward end of which is pivoted to an arm 81. The arm 81 is rigid with a structure 82 (Figure 17) pivoted in the machine frame on the axis 49. Said structure comprises a universal rod 83 held in contact with the arms 84 (Figure 16) of the three-arm levers 48 by a spring 85 (Figures 9 and 17). Whenever one of the numeral keys 50 is depressed, the corresponding arm 84 causes the structure 82 to swing counter-clockwise, as viewed in Figure 9, thereby operating the escapement lever 72 to withdraw the tooth 75 from the tooth 71 with which it was in engagement, and placing the escapement tooth 74 in position to engage the next tooth 70. When the operator permits the key 50 to rise, the spring 85 turns the structure 82 in the clockwise direction, thereby restoring the escapement lever 72 to normal position, withdrawing the tooth 74 from the tooth 70 with which it was in engagement, and allowing the tooth 75 to move into position to engage the next tooth 71.

As the operator sets up, by means of the keyboard, an item containing, say, four digits, the slide 31 and the bracket 43 move step by step toward the right. Depression of a digit key in setting up the thousands digit of the item causes the selected stop 28 in the column farthest to the left to be set. The release of the key permits the bracket 43 to move to place the push pins 41 in register with the next column of stops and allows the slide 31 to shift the pins 30 so as to bring the one that is connected with the units actuator 2 into position beneath the stop that has just been set. Setting up of the hundreds digit of the item causes setting of a stop in the second column from the left and advances the group of pins 30 another step. When the tens digit of the item is set up on the keyboard, the corresponding stop is set in the third column from the left and the group of pins 30 is moved another step. The setting up of the units digit of the item causes the setting of the selected stop in the fourth column from the left and advances the group of pins 30 another step. It will be seen that the pin 30 associated with the units actuator 2 is now located beneath the set stop in the fourth column from the left, the pin 30 connected with the tens actuator 2 is located beneath the set stop in the third column from the left, the pin 30 which is connected with the hundreds actuator 2 is below the set stop in the second column from the left, and the pin 30 which is associated with the thousands actuator 2 is located beneath the set stop in the column farthest to the left. Thus the item is set up by the operator in the natural order, and the required number of pins 30 are moved out from under the detent plate 33 and brought into alignment with the proper columns of stops.

Stops that have been pushed rearwardly into set position are restored to initial position by a post 86 (Figures 10 and 13) fixed to the slide 31 and having a beveled face 87 adapted in the leftward movement of the slide 31 to cam the stops 28 back to initial position. The upper end of the post 86 extends through a slot 86a (Figure 9) in a stationary plate 86b, said slot assisting to guide the slide 31.

In the normal cycling of the machine, the stops 28 are reset and the slide 31 and the bracket 43 returned to initial position at the end of the cycle of operations by an arm 88 (Figures

15 and 19) fixed to the rock shaft 17. Near the end of the return stroke of the rock shaft, the arm 88 engages the end of the resetting lever 67 (Figure 20) and pushes said lever forward to a point slightly beyond its normal position.

In order to move the rear end of the resetting lever 67 out of line with the arm 88 so as again to permit the setting up of numbers in the keyboard, I provide a lever 89 pivoted at 90 in the machine frame and carrying a stud 91 against which the resetting lever 67 is normally held by the spring 68. As the arm 88 approaches its initial position, it engages a lug 92 on the lever 89 and thereby turns said lever counter-clockwise. The stud 91 thereon contacts the resetting lever 67 and swings it to the right sufficiently to withdraw the rear end of said resetting lever from in front of the arm 88. The forward movement imparted to the resetting lever 67 by the arm 88 is sufficient to cause the beveled face 87 (Figure 9) to reset the stops in the most leftward column of stops. As soon as the rear end of the resetting lever 67 has been moved out of line with the arm 88, the spring 68 (Figure 20) moves said lever 67 toward the rear and the slide 31 toward the right until the foremost tooth 71 stops against the tooth 75, which movement is sufficient to withdraw the cam face 87 from a position directly behind the column of stops 28 farthest to the left, and to place the push pins 41 in register with said column of stops.

At the beginning of the next cycle of operation of the machine, the arm 88 swings away from the lug 92, whereupon a coiled spring 93 (Figure 20), secured to a link 95 and to the machine frame, pulls link 95 forward in the machine, swinging lever 89 clockwise until said lever stops against a stop pin 94 (Figure 19), thereby allowing the spring 68 (Figure 20) to place the resetting lever 67 in the path of the return movement of the arm 88.

Correction key for amount keyboard

A correction key 96 (Figure 10) is provided for manually restoring, by a single depression thereof, any of the stops 28 that have been set. The stem 97 of said key has a lug 98 that bears against a lug 99 on a bell crank lever 100 pivoted at 101 in the machine frame. A spring 102 normally holds the correction key elevated, a pin 103 on the stem 97 limiting the action of the spring by engaging the plate 53. On the bell crank 100 is a stud 104 which lies within an elongated opening 105 formed in a link 106. The rear end of the link 106 is connected to an arm 107 (Figure 9) pivoted in the machine frame at 108. In the arm 107 is a slot 109 to receive a pin 110 on the link 62. It will be seen that depression of the correction key 96 will cause the link 62 to be moved toward the left, as viewed in Figure 9, to reset the stops 28.

Back-space key for amount keyboard

A back-space key 111 (Figure 10) provides means for restoring the stops 28 at the rate of one numerical order for each depression of the key. On the stem 112 of the key 111 is a pin 113 that engages a bell crank lever 114 pivoted in the machine frame at 115. To the other arm of the bell crank lever 114 is pivoted a link 116, the rear end of which is pivoted to a bell crank lever 117 (Figure 9) pivoted in the machine frame at 118, the bell crank 117 carrying a pivoted dog 119 (Figure 14) adapted to engage teeth 71. When the back-space key 111 is released, a spring 120 restores the pawl 119 and the key 111 to their

normal position, the action of the spring being limited by a stop pin 121 (Figure 10) on the key stem 112, said pin stopping against the plate 53.

Repeat key for amount keyboard

In order to permit printing or registering the same amount more than once under manual control, I provide a repeat key 122 (Figure 10) having a stem 123, the key being normally held in elevated position by means of a spring 124. The normal position of the key is determined by contact of a stop pin 125 on the key stem 123 with the top plate 126 of the keyboard. The lower end of the stem 123 is arranged to engage a cam surface 127 (Figures 9, 10 and 20) formed on a slide 128 guided for movement transversely of the machine by two guide studs 129 (Figures 9 and 20) extending through elongated openings 130 in the slide. The lefthand end of the slide is connected to one arm of a lever 131 (Figure 20) pivoted at 132. The other arm of said lever is arranged to engage a downwardly extending lug 133 on the lever 89. When the repeat key 122 is depressed, the slide 128 is pushed toward the left, thereby causing the lever 89 to swing in the counter-clockwise direction so as to swing the resetting lever 67 toward the right, out of the path of arm 88. The key stem 123 is notched (Figure 10) to provide a shoulder 134 adapted to engage beneath the top plate 126 and thus retain the repeat key depressed and hold the reset lever 67 in its right hand position, to permit the repeated printing or registration of the same amount as many times as desired. When the operator disengages the shoulder 134 from the plate 126, the spring 124 restores the repeat key to its normal position and permits the spring 93 to swing the lever 89 in the clockwise direction, the spring 68 at the same time swinging the reset lever 67 toward the left into position to be engaged by the arm 88 at the conclusion of the cycle of operations.

Keyboard lock

Means is provided to lock the keyboard so as to prevent the setting up of an item or a folio until the item last set up has been eliminated by the operation of the stop-resetting post 86 (Figure 13). The means herein provided for this purpose comprises a plate 627 (Figure 2) in the nature of a lever pivoted in the machine frame on the axis 628. At right-hand side of the plate 627 is a lug 629 to which a spring 630 is connected. This spring serves to hold the plate 627 normally elevated. On the under side of the plate 627 are mounted two detents 631 and 632 urged forward by springs 633. On the forward end of the detent 631 is a down-turned lug 634 which, when the plate 627 is depressed, lies directly behind the edge 635 of the pivoted structure 82 (Figure 17), and thereby prevents the depression of any of the amount keys 50 unless sufficient pressure is applied to overcome the force of the spring 633. (In the "touch system," which is the method commonly employed, only light pressure is applied to the keys. The detents 631 and 632 are yieldingly mounted to prevent damage in case the operator, on meeting with resistance, should strike the keys with excessive force.) There is a similar lug 634 on the front end of the detent 632 which serves to lock the pivoted structure 480 (Figure 3) when the plate 627 is in its lowered position, thereby preventing use of the folio keys 469 unless enough pressure is applied to overcome the spring 633 for the detent 632. An arm

636 pivoted on the axis 49 is in contact with the post 42 (Figure 9) when the latter is in its initial position, a spring 637 holding the arm in contact with said post. On the arm 636 is a headed stud 638 (Figure 2). The setting up of the first digit of a number by one of the amount keys 50 will allow the spring 637 to move the arm 636 so that the head of the stud 638 lies in contact with the edge 639 of the plate 627. Depression then of the motor bar 594 depresses the plate 627 so as to allow the spring 637 to move the arm 636 farther to the right so as to cause the head 638 to overlie the edge of the plate 627, thus latching said plate down and thereby maintaining the lugs 634 in position to block movement of the pivoted structures 82 and 480.

When the stop or stops 28 (Figure 9) are reset by the post 86, the accompanying movement of post 42 moves the arm 636 to the left to its normal position, thereby disengaging the headed stud 638 from the plate 627, whereupon the spring 630 lifts the plate 627 to its normal position and thus releases the keys 50 for operation. The keys 469 are similarly controlled by the corresponding parts therefor.

Because of the above mechanism, when the repeat key 122 is depressed, and an amount set up and the machine operated, the failure of the post 42 to move to the left (because of the depression of the repeat key) to release plate 627 from stud 638 prevents another number from being set up on the amount keyboard until after the repeat key has been released and the stops 28 reset. The same applies to the folio repeat key 487.

The mechanism just described also serves to prevent the operator from beginning to set up an item until the last preceding item has been completely eliminated through the operation of the stop-resetting post 86.

The folio keyboard

Referring now to the means for printing folios, invoice numbers, car numbers or other numerals which are used merely as designations: As shown in Figures 7 and 9, each of the folio type bars 3 is provided with a pivoted arm 464 similar to the arms 29 and connected to stop pins 465 similar to the stop pins 30. The stop pins 465 are guided in a slide 466 (Figure 9) similar to the slide 31. The upward movement of the type carriers 3 is selectively limited by stops 467 (Figure 7) similar to the stops 28. The stops 467 are set by push pins 468 (Figure 3) similar to the push pins 41, and are carried by a swinging bracket 468a similar to the bracket 43. The push pins 468 are operated by numeral keys 469 constructed and connected similarly to the keys 50. The type bars 3 for the numerical orders not needed in printing a given number are prevented from rising by a plate 470 (Figure 7) which for all practical purposes is a stationary element. The means for moving the slide 466 (Figure 9) to carry the stop pins 465 successively out from under the plate 470, and the means for returning the slide 466 and stop pins are similar to the corresponding parts for the amount keyboard, and are fully shown and described in U. S. Patent No. 2,194,270.

A correction key 482 (Figure 3) permits of manually resetting all of the stops 467 in one movement, said key being constructed and connected quite similarly to the correction key 97.

A back-space key 485 similar to the back-space key 111 constitutes means for resetting the

stops 487 at the rate of one numerical order for each depression of the key.

In order to permit the printing of the same folio or other designating amount more than once under manual control, I provide a repeat key 487. The parts operated by depression of this key render the pin restoring mechanism for the folio index pins ineffective to restore the pins. These parts operate similarly to those of the amount keyboard and are fully described in U. S. Patent No. 2,194,270.

Character keys

At the left of the folio keyboard are three banks of character keys. These keys are latched in depressed position during a given cycle of operations of the machine by slides such as 505 (Figure 24) reciprocable longitudinally of the machine and having lugs 211 thereon. Each lug has a beveled surface 212 and a locking shoulder 213. On each of the key stems is a locking lug 214 having a beveled surface to engage the surface 212 when a key is depressed, and thus push the slide forward to allow the lug 214 to engage beneath the shoulder 213 when its respective slide is drawn rearwardly by a spring such as 505a. Near the end of the cycle of operations the slide 505 is drawn forward to release the key by the action of the key restoring means.

The key restoring means consists of a bell crank such as 216 (Figure 23) pivoted at 217, one arm of the bell crank engaging the stem of its associated key, and the other arm being pivoted to the forward end of a slide such as 517. The rear end of the slide is guided in the frame work. An expansive spring 219 (Figure 12) holds the slide 517 in its forward position, thus holding the key elevated. Depression of a key compresses spring 219 and moves slide 517 to the rear. These parts are held in this position until the key restoring mechanism is operated. When the slides such as 505 (Figure 24) are drawn forward to release the depressed keys, springs 219 (Figure 12) return slides 517 (Figure 23), the bell cranks 216, and their corresponding keys, to their normal undepressed position.

The bank of twelve keys 498 (Figure 1) at the extreme left are used in printing the names of the months. The keys in this bank are arranged to be locked by a slide 499 (Figure 15). Each key 498 operates a slide similar to the slides 517 (Figure 23), one tine of the fork at the rear end of each of said slides serving as a stop 500 (Figure 11) to limit the upward movement of a pin 501 connected to an arm 502 (Figure 15) pivoted to the lower portion of the type bar 4 that is farthest to the left (see Figure 7). This type bar has twelve type adapted to print abbreviations of the names of the months (see Figure 6). The rear end 499a (Figure 15) of the slide 499, when in its normal or ineffective position, serves as a stop to keep the pin 501 from rising. When any one of the keys 498 is depressed, the slide 499 is moved and held far enough forward for its rear end to be out of the path of upward movement of the pin 501.

The keys in the middle bank at the left hand side of the keyboard are used in printing numerals indicating the days of the month. The printing of the units digits "1" to "9", inclusive, is controlled by nine keys 503 (Figure 23) having key stems 504 arranged to be latched in depressed position by a slide 505. A spring 505a normally holds said slide in its rear position. On the rear end of said slide is a stop portion 506 (Figures

24 and 26) located in the path of the upward movement of a pin 507 connected to an arm 508 hinged to the lower portion of the type bar 4 that lies third from the left (Figure 7). This type bar carries ten numeral type as indicated in Figure 6. The stop 506 is located so as to limit the rising movement of the type bar to the point where the cipher type is positioned at the printing line.

Connected to each of the keys 503 is a slide 517 having at its rear end a fork, one tine of which constitutes a stop 510 (Figure 11) to limit the upward movement of the pin 507.

The printing of the tens digit in the number of the day of the month is controlled by three keys 511 (Figures 3 and 23) having key stems 512. The keys 511 are arranged to be latched in depressed position by a slide 513 (Figure 25), said slide being urged rearwardly by a spring 513a. The rear end of said slide constitutes a stop 514 for a pin 515 connected to an arm 516 (Figure 7) pivoted to the type bar 4 that lies second from the left end. When the slide 513 is in its normal position, the stop 514 prevents upward movement of said type bar, but when said latch is operating to hold one of the keys 511 depressed, the stop portion 514 is out of the path of upward movement of the pin 515. Said type bar carries three numeral type, as shown in Figure 6.

Each of the keys 511 is connected to a slide 517 (Figure 23) having at its rear end a fork, one tine of which forms a stop 518 (Figure 12) for the pin 515.

The third bank from the left controls the printing of the numbers denoting, say, two years, also a variety of symbols used in bookkeeping work. Herein I have shown the two upper keys in this bank as arranged for controlling the printing of "30" and "31". These year keys are indicated at 519 (Figure 3) and have key stems 520 (Figure 29) arranged to be latched in depressed position by a slide 521. Said slide is urged rearwardly by a spring 521a. The keys 519 are connected to slides 522 (Figure 8) having at their rear ends forks, one tine of each of which serves as a stop 522a to limit the rising movement of a pin 523 connected to an arm 524 (Figure 7) hinged to the lower portion of the type bar 4 farthest to the right as viewed in Figure 7.

The remaining keys in this bank are denoted by the number 525 (Figure 3). They have key stems 526 (Figure 27) arranged to be latched down by a slide 527. A spring 527a tends to move the slide 527 rearwardly. The rear end of said slide forms a stop 528 which, when the slide is in its normal position, serves to prevent the pin 523 from rising. When the slide 527 is acting to hold one of the keys 525 down, the stop portion 528 is out of the path of upward movement of the pin 523.

To each of the key stems 526 is connected a slide (similar to 517 in Figure 23) having at its rear end a fork. One tine of each fork constitutes a stop 529 (Figure 11) to limit upward movement of the pin 523.

The beveled lugs 530 (Figure 29) arranged to be engaged by the slide 521 for the purpose of locking either of the two year keys down, are also arranged to operate against beveled surfaces 531 (Figure 27) on the slide 527, for the purpose of moving the slide 527 forward far enough to withdraw the stop 528 from the path of the pin 523. Depression of any one of the symbol keys 525 serves to move the slide 527 forward a further

slight extent to permit of latching said symbol keys down.

A row of operation controlling keys 430, etc., is situated at the right hand side of the keyboard for controlling the various machine functions, such as non-adding, totaling, sub-totaling, etc. The various functions of these keys are covered in the parent case and will, therefore, not be discussed here. The manner in which the depression of these keys controls the printing mechanism and also the manner in which they are latched down and restored is similar to the manner in which the three rows of keys at the left of the keyboard control the printing mechanism, so this also need not be discussed.

Releasing character keys

The bank of operation controlling keys at the right side of the keyboard and the three banks of character keys at the left side of the keyboard are released to the restoring action of their respective restoring springs in the following manner.

A plate 220 (Figure 21) is pivoted along its upper edge to the machine frame. The pivotal support consists of brackets 220a secured to plate 220 and having rearwardly extending projections 220b (Figure 24) overhanging a stationary plate 220c on the machine frame. The lower edge of the plate 220 (Figure 21) at the right hand side of the machine engages behind a lug 221 on a slide 210 for the bank of operation controlling keys, and behind lugs 532 on the slides 499, 505, 513, 521 and 527 for the keys at the left side of the keyboard. Near the end of the cycle of operations the plate 220 is thrown forward by a slide 222 guided in the machine frame for movement longitudinally of the machine. Spring 223 normally holds the slide 222 in its rearward position. A pin 224 is secured to the arm 88 secured in turn to the oscillating drive shaft 17 that receives a clockwise and then a counter-clockwise oscillation during each operation of the machine (see also Figure 19). Pin 224 engages the rear end of slide 222 and pushes it forward, on its return oscillation, thereby tilting plate 220 forward by the forward end of slide 222 abutting the left end of slide 220. When slide 222 is thus moved forward a cam surface 225 thereon rides over a stationary cam surface 226 and thereby raises the rear end of plate 222 sufficiently to allow it to be free of the pin 224, whereupon spring 223 returns slide 222 to its normal rear position.

This forward movement of the lower edge of plate 220 pulls the slides 499, 505, 513, etc., forward, and moves the locking shoulders 213 (Figure 24) from above the lugs 214 on the stems of the depressed keys, allowing the key restoring springs 218 (Figure 12) to restore the keys as mentioned above.

In the present embodiment of the invention, the operation-controlling keys at the right hand side of the keyboard and the ten symbol keys 525 are automatically released at the conclusion of every cycle of operations of the machine. Means is provided whereby the remaining keys in the three banks of character keys may be released or held depressed as desired. It will be noted in Figure 21 that the lower edge of the plate 220 has notches 533, 534 and 535 therein. A manually operable lever 536 (Figure 22) is pivoted in the framework at 537. Fixed to said lever is a pin 538, one end of which lies within a notch 539 in the plate 220. It will be seen that

when the lever 536 is swung toward the right, the plate 220 will be also slid toward the right so as to bring the notch 533 into register with the slide 449, the notch 534 into register with the slides 505 and 513, and the notch 535 into register with the slide 521, it being noted that the pivotal support of plate 220 permits of such sliding movement. A spring actuated detent 539a (Figure 22) yieldingly holds the clearing plate 220 in either of its two positions. With the plate 220 thus positioned, pivotal movement of said plate will not cause forward movement of the slides 499, 505, 513 and 521, and consequently the keys which may have been latched down by those slides will not be released.

Manually operable means is provided for releasing the keys in the four banks of keys. This means comprises a clear key 540 (Figures 3 and 21), the stem of which has a lug 541 arranged to bear against an arm 542 fixed to the upper edge of the plate 220. A tension spring 543 normally holds the key 540 elevated. It will be seen that depression of the clear key 540 will release the keys in accordance with the position that may be occupied at the time by the plate 220.

While the form of mechanism herein shown and described is admirably adapted to fulfill the objects primarily stated, it is to be understood that it is not intended to confine the invention to the one form of embodiment herein disclosed for it is susceptible of embodiment in various forms all coming within the scope of the claims which follow.

What is claimed is:

1. In a computing machine, the combination of a group of stops, keys for setting the stops, means for restoring the stops, means to initiate a cycle of operations of the machine, means to prevent normal depression of the keys, said preventing means being movable into effective position under control of and upon operation of said cycle initiating means, and means sensitive to operation of the keys for latching said preventing means in effective position.

2. In a computing machine, the combination of a group of stops, keys for setting the stops, means for restoring the stops, means to initiate a cycle of operations of the machine, means to prevent normal depression of the keys, said preventing means being movable into effective position under control of and upon operation of said cycle initiating means, and means sensitive to operation of the keys for latching said preventing means in effective position, said preventing means being movable out of effective position during operation of said restoring means.

3. In a machine of the class described, having digit indexing mechanism and amount keys for operating the mechanism, a restoring device for the indexing mechanism including an arm adapted to receive an advancing and a return movement during each machine operation, a rod connected with the indexing mechanism and lying normally out of the path of the arm, means to move the rod into the path of the arm during the advancing movement of the arm, the rod being so situated in respect to the arm that it is moved by the arm during the return movement thereof to restore the indexing mechanism, and a disengaging member situated so as to be moved by the arm during the last increment of its return movement, and adapted to disengage the rod from the arm.

OSCAR J. SUNDSTRAND.