

July 14, 1953

H. M. FLEMING

2,645,418

BALANCE SCHEDULING MEANS FOR LISTING CALCULATING MACHINES

Filed July 6, 1951

8 Sheets-Sheet 1

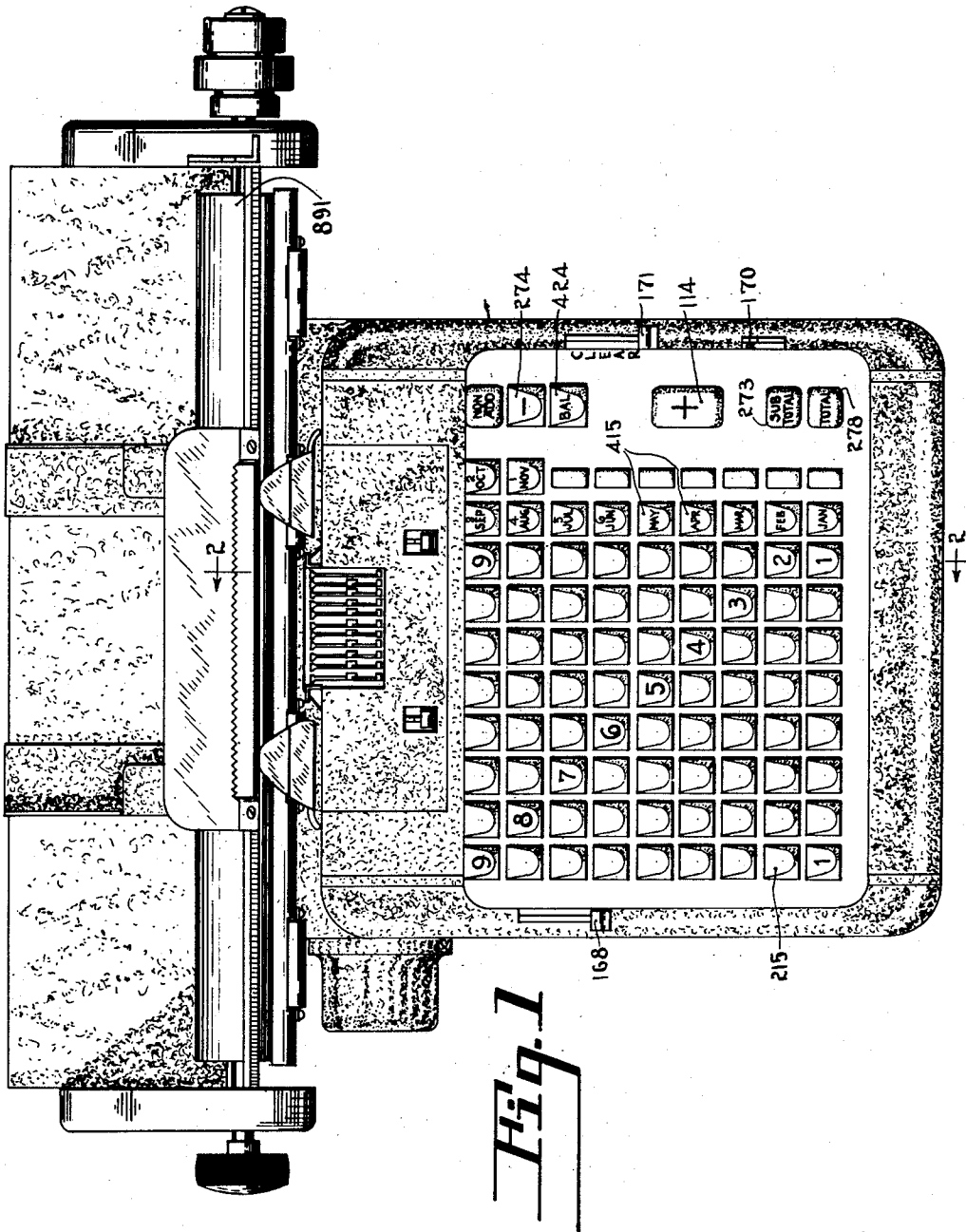


Fig. 1

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8 Sheets-Sheet 2

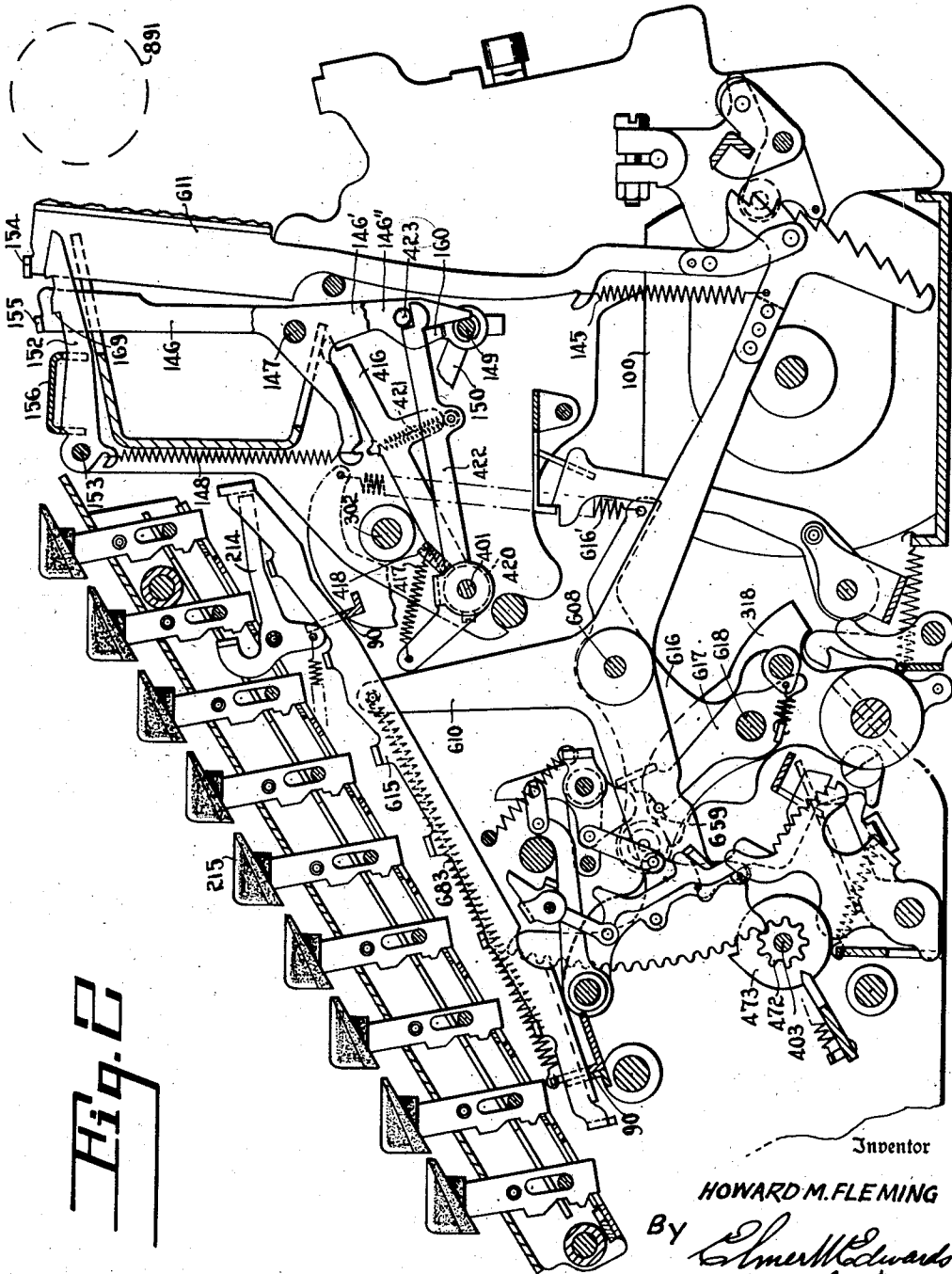


Fig. 2

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8 Sheets-Sheet 3

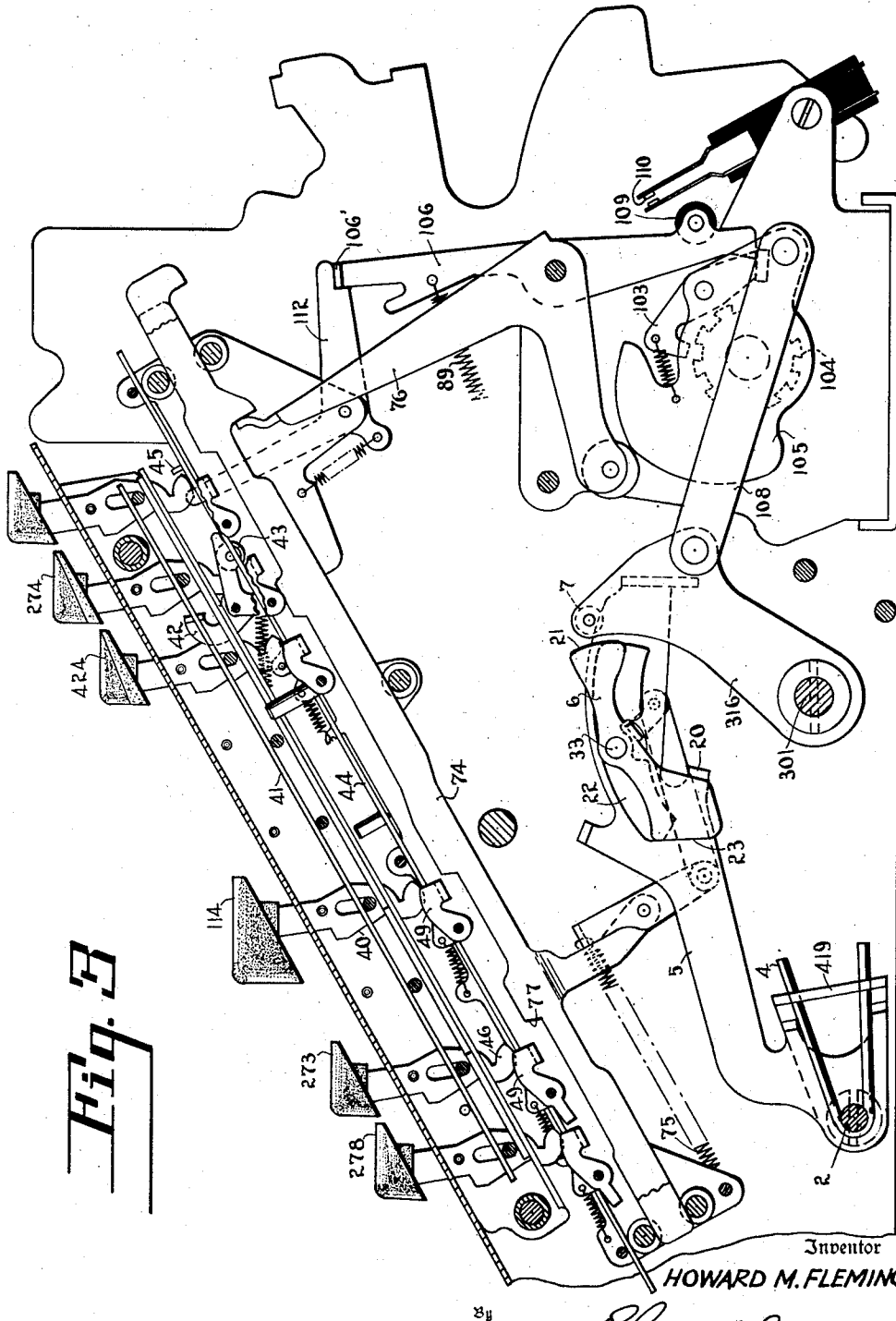


Fig. 3

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BALANCE SCHEDULING MEANS FOR LISTING CALCULATING MACHINES

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8 Sheets-Sheet 4

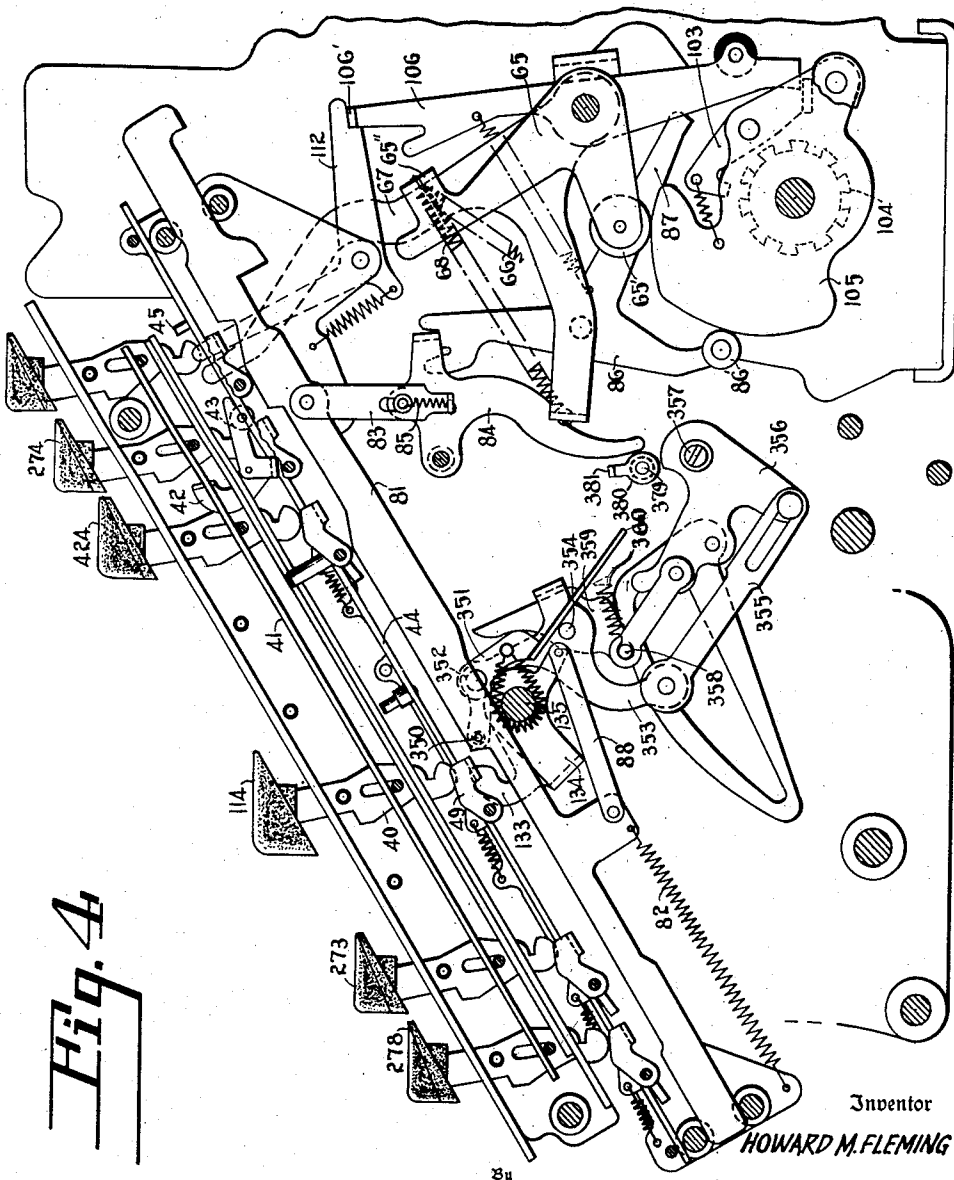


Fig. 4

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BALANCE SCHEDULING MEANS FOR LISTING CALCULATING MACHINES

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Fig. 5

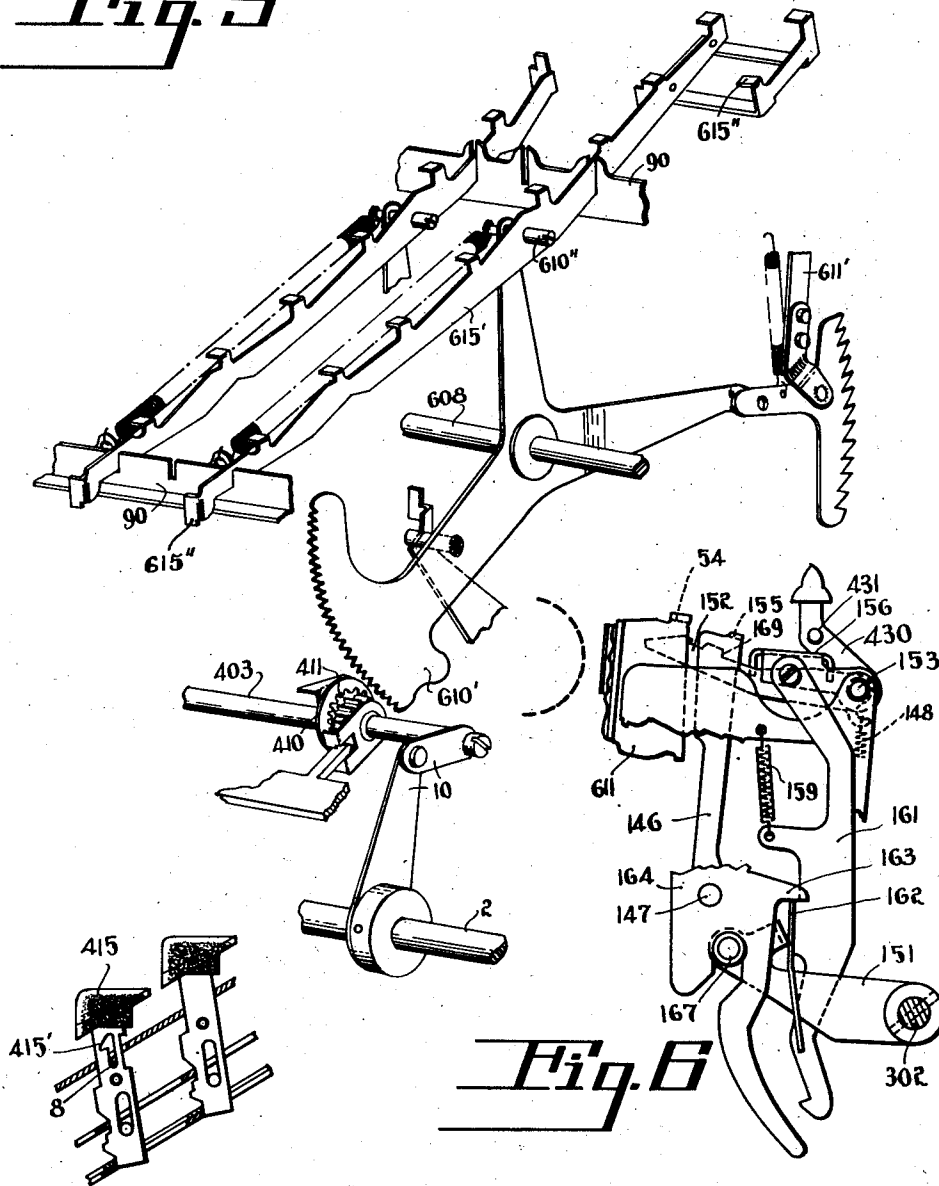


Fig. 6

Fig. 12

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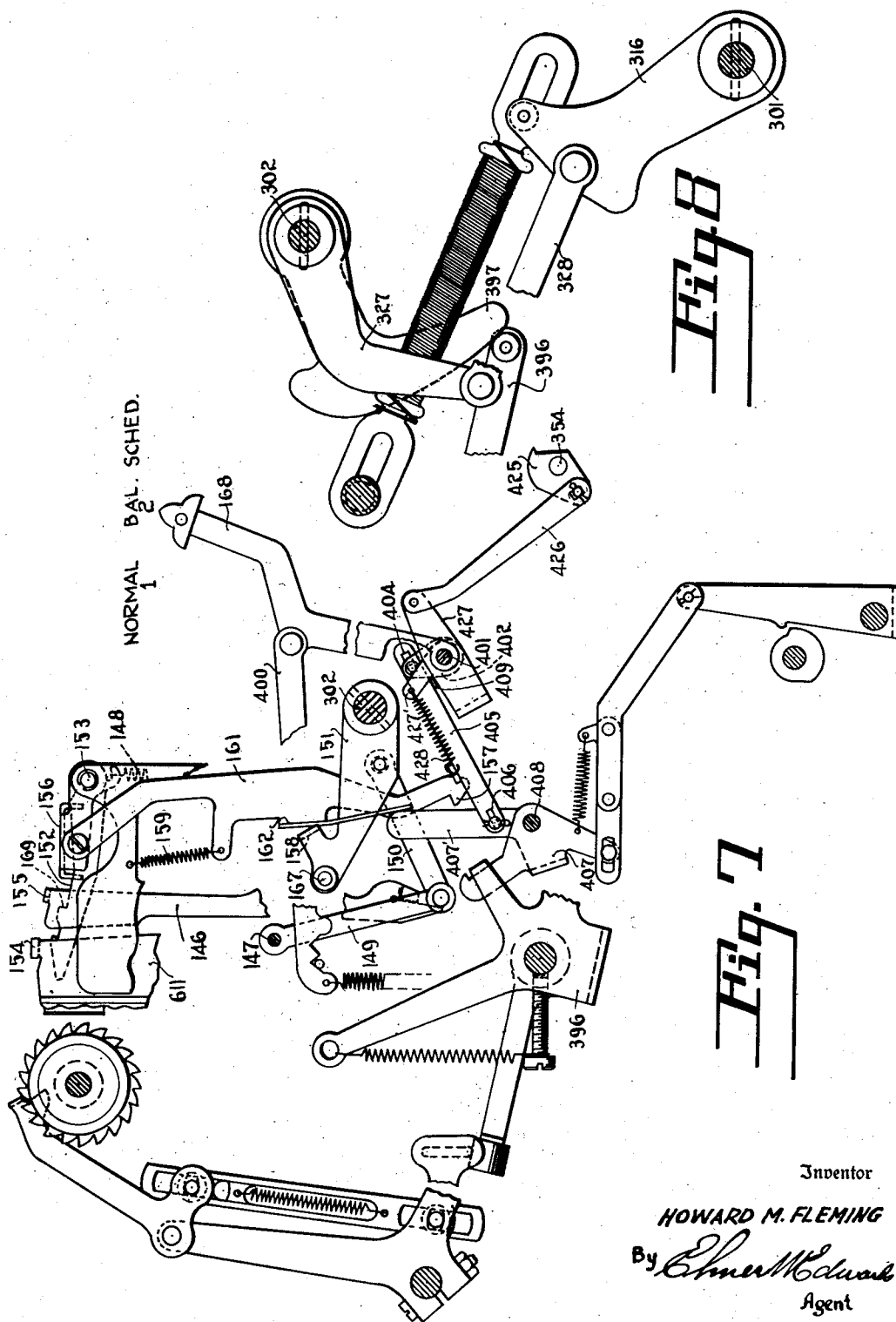
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BALANCE SCHEDULING MEANS FOR LISTING CALCULATING MACHINES

Filed July 6, 1951

8 Sheets-Sheet 6



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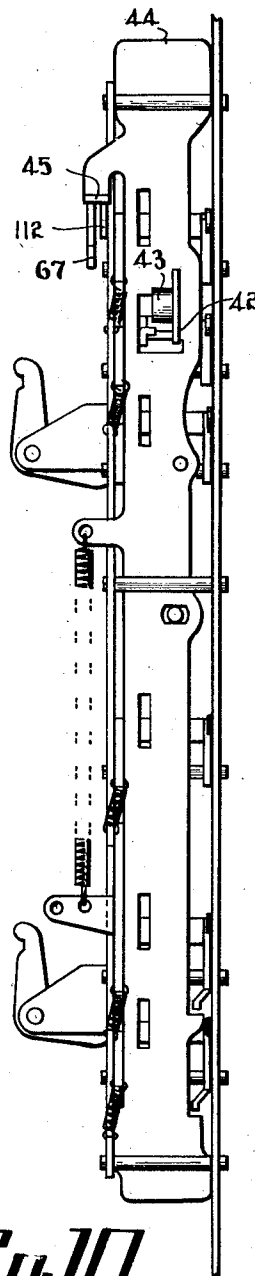
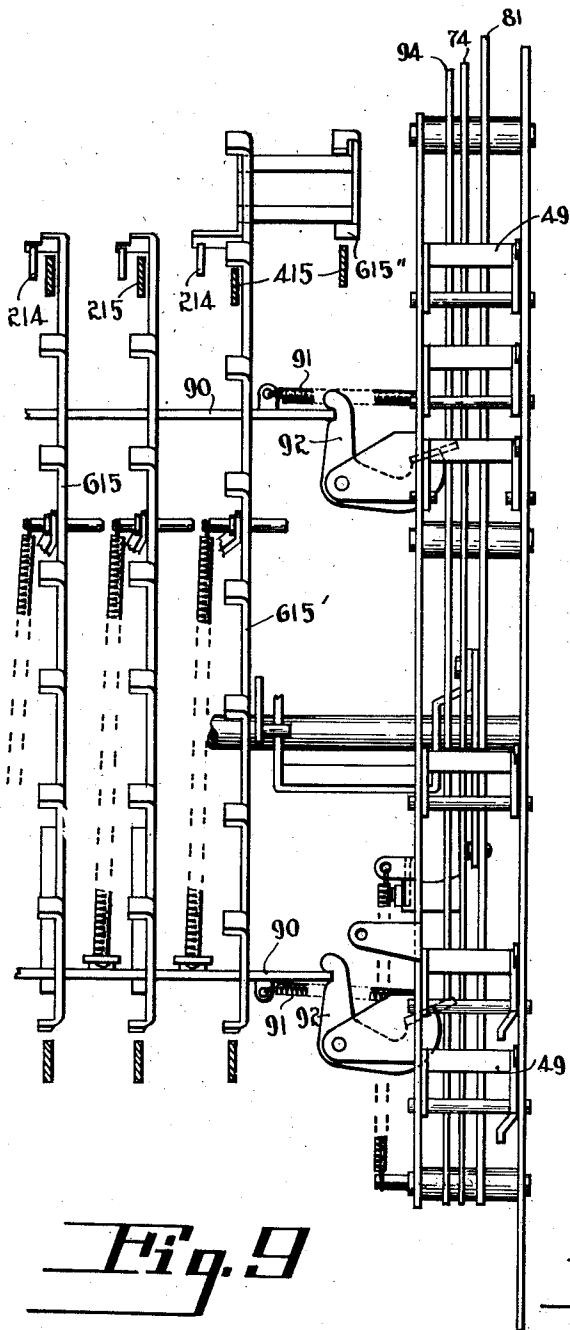
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BALANCE SCHEDULING MEANS FOR LISTING CALCULATING MACHINES

Filed July 6, 1951

8 Sheets-Sheet 7



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BALANCE SCHEDULING MEANS FOR LISTING CALCULATING MACHINES

Filed July 6, 1951

8 Sheets-Sheet 8

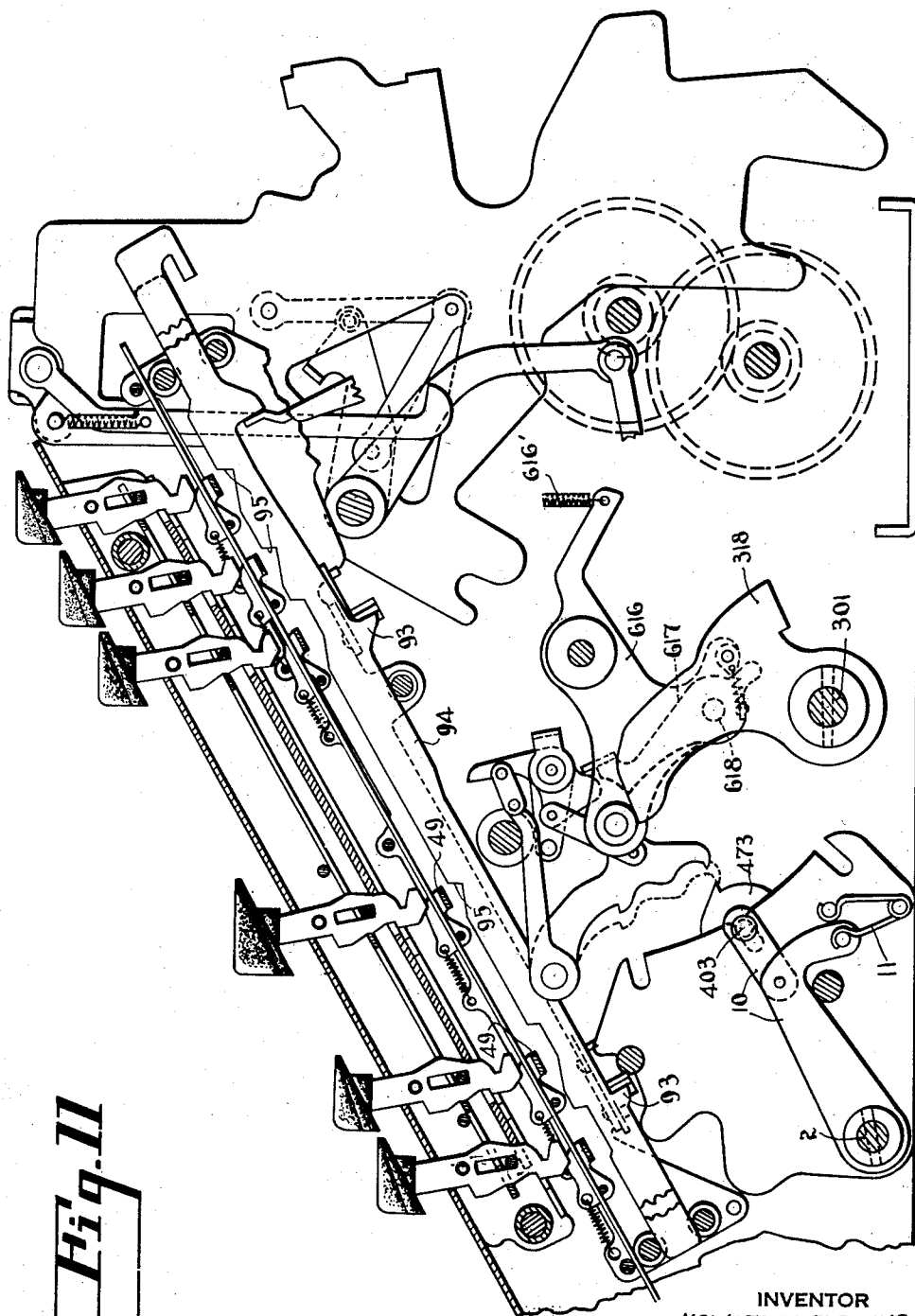


Fig. 11

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UNITED STATES PATENT OFFICE

2,645,418

BALANCE SCHEDULING MEANS FOR LISTING
CALCULATING MACHINESHoward M. Fleming, West Orange, N. J., assignor
to Monroe Calculating Machine Company,
Orange, N. J., a corporation of Delaware

Application July 6, 1951, Serial No. 235,453

8 Claims. (Cl. 235—60.15)

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The invention relates to improvements in listing calculating machines and more particularly to improved means therefor, for the listing of monthly periodical payments, such as personal loans, mortgages and deferred payments for merchandise sold on the installment plan, and in which the month dates of payments due may be progressively listed, together with the amount of the unpaid balances.

Business establishments require various arrangements for listing upon a record sheet the amounts of payments to be made and for scheduling the time periods and balance totals remaining after each payment. In many cases it is required to schedule only the balance totals remaining after each payment along with the month date in which payments are due, while in other instances it is also required that the amount of the monthly payments be listed for each month date in which payments are due. Also, the practice in many places requires that unpaid balances be scheduled accumulatively while in other cases they are to be scheduled as a reducing balance. In all such cases, however, it is required to have the month dates listed in progressive order.

The present invention contemplates novel means adapted to provide, among others, the above features in such manner as to require very little change or additions to the structures provided in accomplishing the usual operations performed upon a listing calculating machine.

One object of the present invention is the provision of means to selectively set a month date control means to any month date starting position and thereafter to schedule the unpaid balances either as accumulative or reducing balances upon a form sheet and in which the month dates will be automatically listed in a forward progressive order under either condition of operation.

The invention also provides means settable to control a listing seriation of month dates in single step order or in a selected plurality of steps. The invention further provides means to advance the month date control member during an operative cycle in which printing is disabled and thereafter to automatically effect printing of the month date during a total taking operation.

Further, the invention accomplishes the above in such manner as to require a minimum of change or added parts by the novel use of those control devices as provided in the machine for performing regular registrations upon the regis-

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ter wheels to cause an advance of the month date control member and to thereafter cause printing of a month date through the use of the regular total taking devices.

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

In the drawings,

Fig. 1 is a diagrammatic plan view of a machine embodying the invention;

Fig. 2 is a section taken substantially on line 2—2 of Fig. 1 showing the keyboard, registering and printing devices;

Fig. 3 is a right hand elevation of parts just inside the right hand frame including the operating keys, the operations control slide and parts operated thereby;

Fig. 4 is a right hand elevation showing the accumulator zeroizing slide and associated total taking mechanism;

Fig. 5 is a right hand perspective of the parts associated with the month date control wheel;

Figs. 6 and 7 are left side elevations of parts associated with control of the printing means;

Fig. 8 is a detail view of a portion of the cyclically operable power devices;

Fig. 9 is a detail plan view of the operation control slides and associated parts;

Fig. 10 is a detail plan view of the clutch release slide; and

Fig. 11 is a right elevation of means for normalizing the date control member and for zeroizing the register.

Fig. 12 is a detail view of certain month date keys.

The invention is shown as applied to a listing adding machine of well known type such as that disclosed in its essential features in U. S. Patent 1,932,013, issued October 24, 1933, to Loring P. Crosman, and as modified by the disclosures of Patents 2,307,669 and 2,330,270 issued to the same inventor on January 5, 1943 and September 28, 1943, respectively.

In so far as it is expedient, the parts hereinafter described which correspond to like parts in the foregoing patents will be similarly numbered and reference is made to these patents for details of construction not completely described in the following specification.

Adding and subtracting

As set forth in the reference patents, amounts set up on digit keys 215 (Figs. 1 and 2) for each denominational order are transferred additively or subtractively upon operation of plus key 114 or minus operating key 274, to a series of accumulator wheels 473 by means of a series of spring operated differential actuators 610 loosely mounted upon a transverse shaft 608. The forward arm of each differential actuator lever 610 is provided with segmental rack teeth, adapted to mesh with the pinions 472 of the series of accumulator wheels 473. Index bars 615 are pivotally connected to the upper arms of levers 610, these index bars being moved, upon counterclockwise rotation of the levers, into engagement with the stems of selectively depressed keys 215. The type bars 611 are pivotally connected to the rearward arms of levers 610, each type bar being provided with a longitudinally disposed series of type representing the digits 0 and 1 to 9.

The digit keys 215 which have been depressed to represent a value are latched in position with the bottoms of their stems lying in the path of movement of the stop lugs of the related bars 615, allowing such bars to advance a distance proportional to the value of the key, upon operation of the machine. Depression of a digit key will also remove a column latch 214 from the path of movement of its related stop bar 615, these latches preventing movement of a stop bar and lever 610 in any column in which no key is depressed.

Each of the racks 610 is held in its normal clockwise position against tension of its respective spring 683, by a stud 659 fast in said racks and having engagement with a series of dogs 617 pivotally mounted upon a transverse rod 618 supported within a rocker frame 616 loosely mounted on the shaft 608 (Figs. 2 and 11).

A rock shaft 301 (Fig. 3) is oscillated by means of an electric motor 160 (Fig. 2) connected through suitable gearing and clutch means 193—104 (Fig. 3) with a rock arm 316, fast with shaft 301 by means of a connecting rod 108 so that as a crank arm 105 is rotated by the motor shaft 301 will be oscillated.

Rock shaft 301 is provided with cam means 318 (Figs. 2 and 11) for governing the movement of frame 616. As shaft 301 is rotated forwardly cam 318 will permit frame 616 under influence of spring 615' to be rocked counterclockwise and any of the levers 610 which have been released by the depression of digit keys 215 will be allowed to rotate under influence of their springs 683 until they are stopped by the lugs of bar 615 contacting with the stems of the depressed keys. Upon rearward return movement of shaft 301 the cam 318 will restore frame 616 and the dogs 617 will return the operated levers 610 to normal position. This excursion of the levers 610 serves to register amounts set in the keyboard upon one or more accumulators 473 and to set up a similar amount on the printing line of the type bars.

Release of clutch pawl 103 is effected upon depression of any of the motor keys, the stems of which are provided with a cam surface 40 (Figs. 3 and 4) acting upon depression of a key to move a slide 41 forwardly, thereby operating a bell crank lever 42, raising roller 43 of said lever out of engagement with a suitable opening in a spring operated slide 44. Slide 44 is provided with a lug 45, which upon depression of an

operating key and subsequent forward operation of slide 44 engages the upper arm of a pivoted latch 112, thereby releasing said latch from clutch control lever 106, whereupon said lever will be moved counterclockwise by its spring 89 and an insulation roller 109 on said lever will act to close a switch 110 in the circuit of the electric motor. In this movement, the lower end of lever 106 will be disengaged from the tail of the spring urged clutch pawl 103 and allow said pawl to fall into engagement with the driving clutch member 104 to effect a machine cycle of operation.

During a cycle of operation the wheels of the accumulators 473, if engaged, are rotated subtractively upon the forward stroke or additively upon the return stroke of the actuators 610, there being an actuator lever 610 and an associated accumulator wheel for each order provided in the machine, the timed meshing and unmeshing of the accumulator gears being controlled as follows, and as more fully described in U. S. Patent 2,055,623, granted September 29, 1936, to Loring P. Crosman and entitled "Calculating Machine" to which reference is made for more detailed description.

As shown (Fig. 2), the accumulator pinions 472 stand normally in mesh with the segment gears of actuators 610, the accumulator shaft 403 being mounted in guide slots (Fig. 11) of the machine frame so that the accumulator assembly may be moved radially of the actuators, to mesh and unmesh the pinions 472. Shaft 403 is adjusted by means of toggle linkage 10, one member of which is fast upon a rock shaft 2. The linkage is held in either of two adjusted positions by a toggle spring 11. Fast upon shaft 2 is a plate 419 (Fig. 3), having yieldable spring connection 4 with an arm 5 provided with a lateral flange 22. Pivoted at 33 upon said arm is a cam switch 6 which, with flange 22 of arm 5, lies in the plane of a roller 7 fixed upon lever 316.

In additive operations roller 7 will contact cam surface 21 of switch 6 and thereafter with the rear end of flange 22, whereby arm 5 will be raised, thus rocking shaft 2 and linkage 10, to unmesh the pinions 472 of the accumulator before the actuators are allowed to move. During the continued forward movement of actuators 610, arm 5 will be held in raised position by engagement of roller 7 with the lower surface of flange 22. At the end of the forward stroke, roller 7 will lift the forward end of switch 6 away from a lug 20 of arm 5, and will thereafter move out of contact with the switch, which will return under influence of a spring 75 into normal relation with the arm. Upon the return stroke of the operating mechanism, roller 7 will engage a cam surface 23 of switch 6, restoring arm 5 and the parts 419, 10, and 403 to original position, remeshing the pinions 472 with the segments 610 to effect the registration.

The forward movement of slide 44 to engage the clutch 103—104 also serves to lock any of the operating control keys in their depressed position, by engagement of said slide with a shoulder 46 of the key stems, thus holding the key in depressed position until restoration of slide 44, as hereinafter explained. Near the end of a cycle of operation of the machine, slide 44 is restored to disengage the clutch and restore the various control elements to normal position. For this purpose an anti-friction roller 65' mounted on a lever 65 (Fig. 4) will be engaged by a cam projection of plate 105, and rocked clockwise

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against tension of a spring 66 secured at one end to lever 65 and at its other end to a fixed framing of the machine. A pivoted lever 67 has yieldable connection with lever 65 through means of a spring 68, lever 67 extending upwardly and into the path of movement of the lug 45 of slide 44. Displacement of lever 65 by the cam edge of plate 105 will therefore retract slide 44 to its normal position of rest thereby unlocking the operation keys and permitting roller 43 to again fall into latching engagement with said slide.

In the above described restoral of slide 44 the projection 45 will permit latch 112 to fall and rest upon the projection 106' of latch 106. Near the end of the clockwise movement of lever 65 a projection 65'' thereof engages and rocks lever 106 into the path of movement of clutch pawl 103 to disengage said pawl from driving member 104, whereupon latch 112 reengages projection 106' terminating the cycle of operation.

Each numeral wheel unit is connected to the higher order numeral wheels by well known tens transfer mechanism of the "crawl" carry type, such as described in U. S. Patent 1,828,180, issued to Clyde Gardner on October 20, 1931.

Printing

Printing is effected during a cycle of operation upon a record sheet which is inserted around the usual platen 891 mounted within the framing of the carriage in the well known manner. The digit type is solidly set in the type bars 611, and these type bars are normally held in forward position substantially spaced from the platen 891 by means of springs 145 (Fig. 2). Adapted for engagement with the forward face of each type bar 611 is a hammer 146, mounted upon a shaft 147 fixed in the machine frame. The hammers are operated by means of their respective springs 148, and are normally held tensioned by means of a bail 149, suspended from shaft 147 and connected by a link 150 with a rock arm 151 (Fig. 7). Arm 151 is fast upon a shaft 302 upon which is also fast an arm 327 (Fig. 8) having link connection 328 with the motor driven arm 316. Thus, upon motor operation, and during the counterclockwise rotation of frame 616, shaft 302 will be rocked counter-clockwise (Figs. 6 and 7) and bail 149 moves forward slowly permitting any of the hammers 146 which are to be inactive relative to printing to rotate gradually therewith in a clockwise direction until the type bars 611 are forced to a position wherein the type at the printing line will be closely adjacent to the surface of platen 891. Bail 149 is held in this position during the printing operation, effective in the active orders as hereinafter described, and is subsequently returned to restore the hammers to normal position. This is the entire operation of any of the hammers 146 located in columns to the left of those wherein keys 215 have been depressed.

Action of the hammers 146 in the active columns is controlled as follows:

A series of latches 152 (one for each hammer 146) is provided, the latches being pivotally mounted upon a shaft 153 fixed in the machine framing, and being urged counterclockwise to latching position by the springs 148, which connect the latches 152 and the hammers 146. Each latch 152 lies beneath a lug 154 of the related type bar 611, and in the normal position of rest of the type bars the latches are held out of engagement with lugs 155 of the hammers by means of a bail 156 supported from shaft 153 and extending across the top edge of the latches. Pivotally se-

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cured to the left end of bail 156 is a downwardly extending arm 161 (Fig. 6) provided with a laterally extending lug 162 underlying the projection 163 of a lever 164 loosely mounted upon the left end of shaft 147. Lever 164 is provided with a cam slot embracing a roller 167 fast to the arm 151 secured to the power operated shaft 302 and is adapted in its normal position of rest to hold bail 156, and thereby latches 152 in depressed position.

During counter-clockwise movement (Fig. 6) of shaft 302 previously described, arm 151 will be rocked downwardly and roller 167 will impart a counterclockwise motion to cam lever 164 to release bail 156, permitting said bail to be rocked upwardly under influence of a spring 159, and the latches 152 will also be permitted a limited upward movement, under influence of their respective springs 148 until stopped by engagement with the projections 154 (Fig. 2) of the related type bars 611. Upon rotation of an actuator 610, however, and consequent displacement of a type bar 611, the lug 154 of said bar will be moved upwardly away from its related latch 152 which latch will thereupon continue further its upward movement until stopped by engagement with the lug 155 of its related hammer, in which position a shoulder 169 of latch 152 is in the path of movement of lug 155 of the hammer. The engagement of latches 152 with lugs 155 is timed to occur before any substantial movement of the hammers is allowed by bail 149, previously described.

Arm 161 is provided with a depending hook 157 (Fig. 7) adapted when the machine is used for normal adding listing operations (as determined by the setting of a manually adjusted lever 168 hereinafter described), to be engaged near the extreme forward movement of the actuator drive by a lug 158 of arm 151 and depress bail 156, thereby releasing latches 152 from engagement with the hammers 146. Thereupon hammers 146 will be violently operated by their springs 148, imparting sufficient momentum to the type bars 611 to insure printing engagement of the type with the record sheet.

In order to effect printing of zeros by the type bars to the right of those displaced by the actuators 610, the value printing hammers are provided with the usual overlapping tails 160 (Fig. 2) which serve to hold in spring charged condition the hammers located to the right of one secured by its latch. In other words, a latch 152, upon movement of bail 156, will release its related hammer 146, and all hammers lying to the right thereof, for printing operations as more fully shown and described in the reference patents.

Suitable line spacing means, operable by reciprocatory movement of an arm 396 (Fig. 7) having drive connections 397 with the power shaft 302 (Fig. 8) are also provided as fully set forth in reference Patent 1,915,296.

Total and sub-total

As well known and fully set forth in the reference patents, in machines of this type, totals are printed by first disengaging the actuators 610 (Fig. 2) from their column latches 214 and thereafter from the frame 616 by tripping dogs 617 in successive order from right to left, allowing the racks to move subtractively under influence of their springs 683 to rotate the accumulator wheels to zero, in which position the wheels are held by engagement with appropriate stops. Following this, the cycling of the machine will effect operation of the printing means

at the end of the forward stroke of the operating means and thereafter frame 616 will pick up and return the actuators to normal position. Successive release of the racks 610 is essential because of the character of the tens transfer mechanism employed between the accumulator wheels, i. e., the "crawl" carry type, wherein every unit of movement of a lower order wheel transmits one tenth of a unit of movement to the next adjacent higher order wheel. Therefore, in zeroizing as each lower order wheel is returned to 0 it will subtract from the higher order wheel the fractional movement previously transmitted.

The above and other special functions are effected upon depression of the total key 278, under control of various spring slides 74, 81, and 94 (Figs. 9 and 10) lying beneath pivoted bails 49, depressible by their related machine operating key to control the extent of forward movement of said slides as will now be described.

Depression of total key 278 will release slide 44 (Fig. 3), which overlies slides 74, 81, and 94, to start motor operation, as previously described for the other keys and will permit a full movement of the slide 74 (Fig. 3) to set the operation control means 6 for subtractive operation, that is to say, the accumulator pinions 472 will be left in mesh during the zeroizing operation, and will be unmeshed before the additive stroke of the actuators 610 is effected.

In the present instance, it is desired to effect the various adjustments of the controlling mechanisms by power from the motor, and consequently upon depression of the total key the clutch will be allowed a limited driving movement, during which the stop bars 515 will be moved laterally free of the column stops 214, as described more fully later, and then the motor operation will be interrupted to give time for the completion of the zeroizing operation, at the conclusion of which the clutch will be reengaged and the cycle of operation completed. For this purpose, a slide 81 (Fig. 4), which is blocked against operation when bails 49 related to other operating keys are depressed, will be allowed to operate, i. e., move forward, upon depression of the total key, under influence of spring 82. Slide 81 is pivotally connected with a link 83 having pin and slot engagement with a latch 84.

Forward movement of slide 81 is effected simultaneously with forward movement of an arm 76 (Fig. 3), oscillated during each cycle of operation of crank arm plate 105, and link 83 is moved downwardly, tensioning a spring 85 which then tends to move latch 84 clockwise about its pivotal support. The free end of latch 84, however, engages a spring pressed arm 86, pivoted upon the machine frame and having an anti-friction roller 86' engaging the cam edge of plate 105. During the first part of the cycle of operation the roller 86' of arm 86 will ride to and beyond the high point of the plate 105 as the latter rotates, rotating arm 86 clockwise and allowing latch 84 to fall into a notch formed in the upper end of said arm, to maintain the arm in rocked position. A rearward extension 87 of arm 86 is thus held by latch 84 in the path of rotary movement of the clutch pawl 103. Engagement of the pawl with extension 87 serves to disengage the pawl from the driving member 104 of the clutch and to hold it in disengaged position.

The slide 81 also has link connection 88 with an arm 134, pivoted upon a transverse rod 135 mounted in the right and left machine frames

and provided with a finger 133 which is brought during movement of slide 81 into contact with a stud 350 fixed in a lever 351 fulcrumed at 352 upon a support arm 353 pivotally mounted on a shaft 354 supported within suitable fixed framing of the machine.

Lever 353 has link connection 355 with an arm 356 pivotally mounted at 357 to the fixed framing of the machine and which constitutes one arm of a toggle means, the other end of which has pivotal connection at 358 with an arm 359 pinned fast to the shaft 354.

Engagement of finger 133 with stud 350 will impart clockwise movement to lever 353 about shaft 354, and through link connection 355 also imparts a rearward movement to toggle 356 sufficient for a suitable spring 360 to complete the rearward movement thereof and in so doing impart a counter-clockwise movement (Fig. 4) to the shaft 354. Counter-clockwise movement of shaft 354 effects operation of the successive zeroizing devices, in the manner as fully set forth in Patent 2,261,341 issued November 4, 1941, to Loring P. Crosman, and is thereafter restored following the printing operation at the end of the forward stroke of a machine cycle.

When the highest order accumulator wheel is rotated to its zero position said zeroizing means imparts clockwise movement (Fig. 4), through suitable link connection (not shown), to a transverse shaft 379 upon the right end of which is an arm 380. Arm 380 is provided with a projection 381 adapted in said movement to engage the lower end of latch 84 and rock said latch out of restraining engagement with arm 86. Arm 86 is thereupon rocked counterclockwise by its spring 85 out of engagement with clutch pawl 103 permitting said pawl to reengage clutch member 104 to restart the interrupted cycle and effect a printing operation in the manner as previously described.

As more fully set forth in reference Patent 2,330,270, in order that the keyboard may be free for the setting up of an item during any portion of the totaling operation, the index bars 615 are designed to be shifted laterally out of position of engagement with the key stems as follows:

The index bars 615 are supported near their ends in sliding plates 90 (Figs. 2, 5, and 9) urged toward the right side of the machine by springs 91. The ends of the bars are engaged by a pair of bell crank levers 92, these levers being provided with shoulders engaging projections 93 of the slide 94 (Fig. 11). Slide 94 lies parallel to the slides 74 and 81, and is likewise reciprocated by the operation of lever 76, being moved toward the front of the machine under influence of the springs 91. In add, subtract, and non-add operations, bails 49 of the add, subtract, and non-add keys are depressed into position in front of suitable notched shoulders 95 cut in the slide 94, to prevent operation thereof. Normally, the lever 76 (Fig. 3) through slide 94, will serve to hold the index bars 615 in normal relation to the digit keys 215 and to the zero latches 214 as seen in Fig. 9. Upon forward movement of lever 76 and slide 94 therewith, springs 91 will move plates 90 and index bars 615 toward the right, out of position of contact with the keys and also out of contact with the zero latches 214. The plates 90 operate individually, so that there can be no jamming of the parts due to twisting action.

Sub-total key 273 operates precisely in the

manner of total key 218, except that slide 74 (Fig. 3) is held in a partially operated position by engagement of the bail 49 related to the sub-total key with a shoulder 77 of the slide. Thus, switch 6 is held in position for a non-add operation whereby the total subtracted from the accumulator wheels is restored thereto during the return stroke of the operating mechanism, all as well known in the art and described in the reference patents.

Balance scheduling operations

As illustrative of one form of work to which the invention is adapted, it is desired in a contract or loan having equal monthly payments to list first the monthly payments in one column of the record form and thereafter to schedule the unpaid balances in a second column as a reducing balance.

Example: Contract of \$144.00 starting in May, payable in 12 monthly installments of \$12.00 each.

With reference to Fig. 7, lever 168 is fast upon the left end of a transverse shaft 401 supported within the machine framing and is adjusted manually to either of two positions for controlling normal listing operations or balance scheduling operations. A suitable spring tensioned click 400 serves to hold lever 168 in either adjusted position. Also fast upon said shaft is an arm 402 having pin and slot connection 404 with a link 405, connected at its opposite end by pin and slot connection 406 with lever 407, fulcrumed upon a rod 408. Arm 402 in the rearward normal operations setting position of lever 168 engages with a projection 409 of link 405 and holds said link in its rearward position, thereby also holding lever 407 rocked in a position counter-clockwise of that shown in Fig. 7. An upwardly extending arm 407' of lever 407 has engagement with an extension of the projection 162 of arm 161 and in the counter-clockwise position of lever 407 arm 161, under influence of its spring 159, will be positioned so that hook 157 will lie in the path of movement of the projection 158 of rock arm 151.

During normal adding listing operations therefore, projection 158 engages hook 157 thereby depressing arm 161 and the bail 156 to release latches 152 and effect operation of the printing hammers in the manner as previously described.

This would be the operation wherein an amount representing a monthly payment (in the present example, \$12.00) is set up on the keyboard and repeatedly accumulated while being successively listed in a column upon the record form.

Well known repeat, non-repeat means, under control of a manually settable lever 170, Fig. 1, is provided for disabling the automatic keyboard clear means to prevent a clearing and consequent resetting of the keyboard between each listing operation. Thus operating key 114 in the present instance will be held by the operator for twelve machine cycles of operation.

Loosely mounted upon the right hand end of the register shaft 403 (Fig. 5) is a month printing control wheel 410 provided with a twelve tooth pinion 411 adapted for engagement with a spring actuated lever 610', similar to the actuator levers 610, and also loosely mounted upon shaft 608.

The rearward arm of lever 610' has pivotal connection with a type bar 611' provided with a

longitudinally disposed series of type representing the months from Jan. to Dec. An elongated pin 610'' is fast to the upper arm of lever 610' and provides for both a laterally slidable and a pivotal connection of said lever with an index bar 615', said bar being slidably supported within the support plates 90 previously described. Bar 615' has eleven projections 615'' adapted for cooperation with the stem of any selectively depressed month key 415 to limit a forward movement of lever 610' during operative cycles of the machine, in the manner as fully set forth for the actuator levers 610 of register wheels 473.

There are eleven month date keys 415, similar to the digit keys 215, bearing the designations Jan. to Nov. and the numbers 1 to 6 reading from November back to June as shown in Fig. 1. For the 12th; i. e., December month, no steps of movement are imparted to actuator lever 610'; therefore, no key is necessary for the month of December.

It will be obvious that depression of a month key coincident with a start of the final listing cycle will cause adjustment of the month control wheel 410 during the final listing cycle of operation to a desired month starting position, as determined by the selected month key.

Special means to be described are provided, however, to prevent a printing of the month date during the adding listing operations.

Near the right end and loosely mounted upon shaft 401 of setting lever 168 is a rearwardly extending arm 416 (Fig. 2) having spring connection 417 with a spring stud 418 projecting from a collar 420 fast upon shaft 401. In the rearward, adding, listing, position of setting lever 168 arm 416 is rocked to a position clockwise of that illustrated in Fig. 2 and will engage a pin (not shown) secured in the month printing hammer 146' to block a printing movement of said hammer.

Arm 416 has yieldable spring connection 421 with a second arm 422 mounted loosely upon shaft 401 and adapted in the adjustment of arm 416 to be moved into and out of engagement with a pin 413 of the printing hammer 146'' (broken away) related to the usual plus, minus, total symbol printing type member. Thus a setting of arm 416 by movement of lever 168 to "normal" position will permit of an operation of the usual symbol printing hammer 146'' and will block operation of the month printing hammer 146' while adjustment of lever 168 to "Balance Schedule" position serves to prevent operation of the usual symbol printing means and permits of operation of the date month printing means.

The twelve monthly payments of \$12.00 having thus been accumulated and listed and the month date control wheel now set to a starting month position, the paper support carriage is then shifted to the "Balance" column and the first posting line brought back to the printing position preparatory to scheduling the unpaid balances.

Lever 168 (Fig. 7) is now moved forward to "Balance Schedule" position, during which movement arm 402 through link 405 and lever 407 will adjust hook 157 forwardly out of the path of movement of lug 158 to disable operation of bail 156 and thereby prevent an operation of any of the printing hammers.

Reducing balance scheduling operations are performed by alternate use of a (BAL) key 424 (Fig. 1) and the minus key 274. Balance key 424

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is a duplicate sub-total key, positioned for convenient operation adjacent to the minus key 274 and adapted upon depression to cause a sub-total operation as in the manner previously described for sub-total key 273.

In the present instance, however, the means previously described for zeroizing the right hand register wheel 473 is now applied to normalizing the month date wheel 410 and the successive action of the totalizing devices thereafter zeroizes the register wheels 473 as described.

Means are provided whereby an operation of the total taking devices will re-adjust hook 157 to re-enable the printing means so that a printing of the unpaid balance and of the related month dates may be effected during balance scheduling cycles of operation.

Secured to shaft 354 (Fig. 7) is an arm 425 having link connection 426 with a bail 427 loosely mounted upon shaft 401 and having an upwardly extending arm 427' engaging projection 409 of link 405. Link 405 is urged forwardly by means of a spring 428 connected at one end to arm 427 and at the opposite end to a suitable lug of link 405. As heretofore described, during totalizing operations, the shaft 354 is first caused to be rocked in a clockwise direction (Fig. 7), and thereafter is restored following release of the printing means. Clockwise movement of shaft 354, through arm 425, link 426, bail 427, and link 405, rocks lever 407 and arm 407' to release lever 161 for movement by spring 159 to thereby re-adjust hook 157 to effective position for engagement by lug 158. During operation of rock arm 151 in balance scheduling cycles of operation lug 158 engages hook end 157 to depress bail 156 and release latches 152 to effect a sub-total value printing operation as heretofore described and to also print therewith the starting month date as set up in the control wheel 410. Following the printing operation the shaft 354 will be restored to normal position as in the manner previously described and hook 157 is moved out of cooperative relation with lug 158 to again render the printing means ineffective. At the completion of the above operations the record sheet will read as follows:

Balance	Due	Payment	Date Paid
\$144.00	May	\$12.00 12.00 12.00 12.00 12.00 12.00 12.00 12.00 12.00 12.00 12.00	

The balance of \$144.00 remains stored in the register wheels 473 and the month date wheel 410 remains set to the "May" month date starting condition.

In the illustrated example the month date printing is to progress one month at a time; therefore, the date key marked

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Nov.

is now depressed, during which setting the depressed starting month key MAY is automatically restored in the usual manner, well known for flexible keyboards.

A subtractive cycle of operation initiated by de-

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pression of minus key 274 will now subtract \$12.00 from the \$144.00 stored in register wheels 473, in the well known manner previously described, during which operation the hook end 151 remains in the miss position relative to projection 158 and consequently no printing action will occur.

During the subtractive cycle of operation, the projection 615' (Fig. 5) related to the

1
Nov.

key will provide for eleven steps of forward movement to the bar 615'. Twelve steps of movement of bar 615' is required to impart a complete cycle of rotation of month wheel 410; therefore, at the completion of the subtractive cycle of operation wheel 410 will have been rotated in a clockwise direction (Fig. 5) 1/12 of a revolution, or one step less than a complete cycle of rotation. At the end of each subtractive cycle of operation, therefore, wheel 410 will stand indexed in a counter-clockwise direction one step further from the initially set "May" month starting position. Thus during alternate subtract and sub-total operations, wheel 410 is indexed one step during each of the subtractive cycles of operations and will adjust type bar 611' in the subsequent sub-total cycles of operations to control a printing of the month symbols in consecutive monthly sequence, from the selectively set starting month position. At the completion of the scheduling operations the record sheet will appear as follows:

Balance	Due	Payment	Date Paid
144.00	May	12.00	
132.00	June	12.00	
120.00	July	12.00	
108.00	Aug.	12.00	
96.00	Sept.	12.00	
84.00	Oct.	12.00	
72.00	Nov.	12.00	
60.00	Dec.	12.00	
48.00	Jan.	12.00	
36.00	Feb.	12.00	
24.00	Mar.	12.00	
12.00	Apr.	12.00	

So that the register wheels 473 will be cleared and the month date control wheel restored to normal position at the end of the scheduling operation, the final scheduling operation (12th in the cited example) is made with the total key 278, in preference to the balance key, the totalizing devices operating in the well known manner previously described.

In the event the operator does not depress the total key to initiate the final scheduling operation, it will be necessary to clear the machine by a subsequent total taking operation before scheduling another contract. To clear the machine without effecting a printing on the record form, however, a lever 430 (Fig. 6) pivotally mounted upon the right hand end of shaft 153 is provided. Secured in lever 430 is a pin 431 overlying the bail 156 and by manually holding lever 430 rearwardly during the clearing operation pin 431 will hold bail 156 in depressed position to prevent the engagement of latches 152 with the printing hammers. Thus the hammers will be permitted to move forward slowly to their ineffective printing position during the machine cycle of operation so that no printing action will take place, as previously described.

It may be that by agreement scheduled unpaid balances are to be reduced by payments made

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only every other month, in which case the key marked

$\frac{2}{\text{Oct}}$

would be depressed in lieu of the

$\frac{1}{\text{Nov}}$

key. This would permit a ten-step movement of actuator 615' which has the effect of indexing the month wheel two steps forwardly for each operation. Quarterly payments would require use of the key marked

$\frac{4}{\text{Aug}}$

to limit movement of actuator 615' to eight steps which effects a forward indexing of wheel 410 four steps each operation, etc. Thus, the rate by which wheel 410 is caused to be indexed forwardly in a reducing balance scheduling operation may be determined by a selection of the appropriate key 415.

It is also desirable first to list the deposits or payments in a column and thereafter to schedule the balances on an accumulative basis, as distinguished from a reducing balance schedule.

This is accomplished in the present invention by an alternate use of the balance key 424 with the plusbar 114, in which the operation is similar to that as described for a reducing balance schedule. The totals which were accumulated upon wheels 473 during the process of listing the payments, however, will first be cleared from the register wheels by a total key operation in a listing of the amount of the loan upon the record sheet prior to the start of a scheduling operation. Thereafter, the carriage is placed in the balance column position and a starting month is set up on the month keys 415 and entered upon wheel 410 by a plus bar cycle of operation in the manner as heretofore described.

During each accumulative balance scheduling cycle of operation, the register wheels 473 are now operated in an additive instead of a subtractive direction as was described for the reducing balance scheduling operations. The present invention, however, provides that the scheduling of the month dates shall progress in a forward sequence (Jan. to Dec.) in either form of operation. This is accomplished in accumulative balance scheduling cycles of operations by the use of the month date keys to limit the forward movement of lever 610' while the control wheel 410 remains out of engagement with the actuator lever 610'. As previously described, in additive cycles of operation, shaft 403 is moved to bring register wheels 473 into engagement with racks 610 prior to a return movement of said racks, and date control wheel 410 moving with shaft 403 also engages rack 610' to be subsequently indexed in a counter-clockwise direction (Fig. 5) in the return movement of said rack in accordance with the depressed month key.

During the balance scheduling sub-total operations, which may be initiated by depression of either balance key 424 or the sub-total key 273, therefore, amounts accumulated upon register wheels 473 are listed as accumulative balances together with their progressively listed related month dates, the various operating and printing control devices functioning in the manner as heretofore described in connection with reducing balance scheduling.

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The arrangement of successively alternately indexing the month date control wheel in accordance with a selected month date key which remains set during adding or subtractive cycles of operation together with a control by said wheel for adjusting the printing type during the totalizing operations requires that actuating lever 615' for control wheel 410 be free to move during totalizing operations without conflict with any depressed month date key 415. In the present invention, this is accomplished by mounting lever 615' within the laterally shiftable support plates 90 and providing a sliding engagement of bar 615' with a pin 610'' of lever 610'.

As in the manner earlier set forth, during a totalizing operation, the plates 90 will move laterally toward the right and will carry bar 615' therewith out of register with the stem of any depressed key 415 before a forward movement of the bar 615' takes place and are thereafter restored following the return movement of said bar.

At the completion of a balance scheduling operation, the keys 215 and 415 may be cleared by means of a manually operated clearing lever 171 (Fig. 1) in well known manner preparatory to setting up a new contract.

In most cases payments are made on a regular monthly basis. However, it may be required that a contract be made with someone whose income is seasonal and, by agreement, no payment is to be made during certain months. Under such conditions, the month control wheel may be indexed to the next payment period by taking advantage of the previously described ability to progress the month date wheel for various pluralities of steps of progression. Also, in reducing balance scheduling, since the maximum movement of eleven steps of actuator lever 610' is provided to progress the date wheel in single steps of progression, and a progression in plural steps requires a lesser amount of movement of lever 610', it is possible to selectively set the

$\frac{1}{\text{Nov.}}$

key and lock said key in depressed position during operations in which any other month date key 415 is being utilized.

It will be recalled that keys 415 include well known means whereby a setting of one key will release any other depressed key. Therefore, in order to avoid a restoral and the consequent re-setting of the key

$\frac{1}{\text{Nov.}}$

in completing the schedule, said key is provided with a notch 415' (Fig. 12) adapted when the key is depressed and moved rearwardly to engage with the keyboard plate rod 8 and thereby latch the key in depressed position. A depressed key 415 may be restored in the manner usual to flexible keyboards by imparting a partial depression to any other key in the column, but in the above instance the

$\frac{1}{\text{Nov.}}$

key is restored by first imparting a forward movement thereto.

Having now set forth the manner and means whereby a listing calculator is provided with a month date printing control wheel adapted to be indexed as determined by and in accordance with the setting of certain selected month date keys in

such manner that a forward progressive sequence of indexing thereof is maintained under control of the devices for effecting and coincident with both an additive or a subtractive cycle of operation performed upon the value register wheels, also whereby said control wheel will thereafter adjust the type printing means coincident with a subsequent totalizing operation for printing of the month dates in a forward sequential order, what I claim is:

1. In a machine of the class described, the combination of a totalizer including a shaft upon which totalizer wheels are mounted, a plurality of actuator racks and related differential stop bars associated therewith adapted to enter amounts additively or subtractively into the totalizer wheels, cyclic operating means and printing devices operable by said means; with a month printing control wheel mounted on the totalizer shaft, a separate actuator rack operable with the first named racks to adjust the month printing control wheel forwardly or reversely, a differential stop bar movable with the separate actuator rack, a plurality of depressible month keys adapted for cooperation with said stop bar to limit the extent of movement of said bar during a cyclic operation to condition the month control wheel to a starting position in accordance with a depressed month key and wherein a subsequent setting of said month keys will act to limit movement of the month rack to control an indexing of the month control wheel in various steps of indexing movement in accordance with the set key in a forward sequence coincident with both additive and subtractive cycles of operations performed upon the totalizer wheels, printing means associated with the month printing control wheel and operable by the cyclic operated printing devices, means for preventing operation of the month printing means upon operation of the cyclic printing devices in said conditioning cycle of operations of the month control wheel, means for rendering said preventing means ineffective and for disabling the cyclic printing means during indexing cycles of operations of the month control wheel, means whereby said month printing control wheel is disassociated from the month indexing control keys in a subsequent cycle of operation and means for automatically re-enabling the cyclic printing devices during said cycle.

2. The invention set forth in claim 1 and having printing means including value type members movable with the amount racks, a type member movable with the month rack having month symbols thereon, printing hammers associated with each of said type members, latches movable to latching position under control of the related displaced type members for holding the related printing hammers in an active condition to effect printing, means operable by the cyclic devices for releasing said latches to permit a printing movement of the hammers, a second latch adapted to prevent said printing movement of the month printing hammer during a release of said first named latches in the conditioning cycle of operation of the month control wheel, means for adjusting said preventing means to ineffective position and for concurrently disabling said release of the first named latches by the said cyclic devices to thereby prevent a printing movement of any printing hammers in the cycles of operations

incident to indexing the month printing control wheel.

3. The invention as set forth in claim 2 and including a hit or miss member in train with the means operable by the cyclic devices for releasing the first named latches, settable means for adjusting the hit or miss member to render the releasing means for said latches effective or ineffective, control means operable with said settable means for conditioning the second latch to permit of an operation of the month hammer while concurrently adjusting the hit or miss member to render ineffective a release of the first named latches and thereby prevent a printing movement of any of the printing hammers.

4. The invention set forth in claim 3 wherein the settable means for adjusting the hit or miss member includes a yieldable connection between said member and the control means for adjusting the said second latch.

5. The invention set forth in claim 4 including total taking devices operable to position the amount type members to printing line position according to the value stored upon the totalizer wheels and to position the month type member according to the displacement of the month control member to bring an appropriate month symbol to the printing line position and means operable by the total taking devices to reset the hit or miss member to position for effecting release of the printing hammers during total taking cycles of operations.

6. The invention set forth in claim 2 including total taking devices, means operable under control of said total taking devices to displace the month type rack out of register with a set month key and to effect a control of said rack by the month wheel in a totalizing operation subsequent to each indexing cycle of operation and means controlled by the total taking devices for automatically re-enabling the printing means to effect a printing of the month dates during said totalizing operations in accordance with control of said month type rack by said month wheel.

7. The invention set forth in claim 5 including a type member bearing total and sub-total symbols and having a printing hammer associated therewith, a latch for said hammer settable by the control means for adjusting the said second latch related to the month date printing hammer in such manner as to prevent movement of the totals printing hammer when enabling the month date printing hammer and vice-versa to effect alternatively a printing of a month date or a total, sub-total symbol.

8. The invention set forth in claim 7 including a manually controlled lever adapted for holding in an ineffective condition the said latches related to holding the printing hammers in position to effect a printing operation, and thereby prevent said printing operation of the hammers.

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