

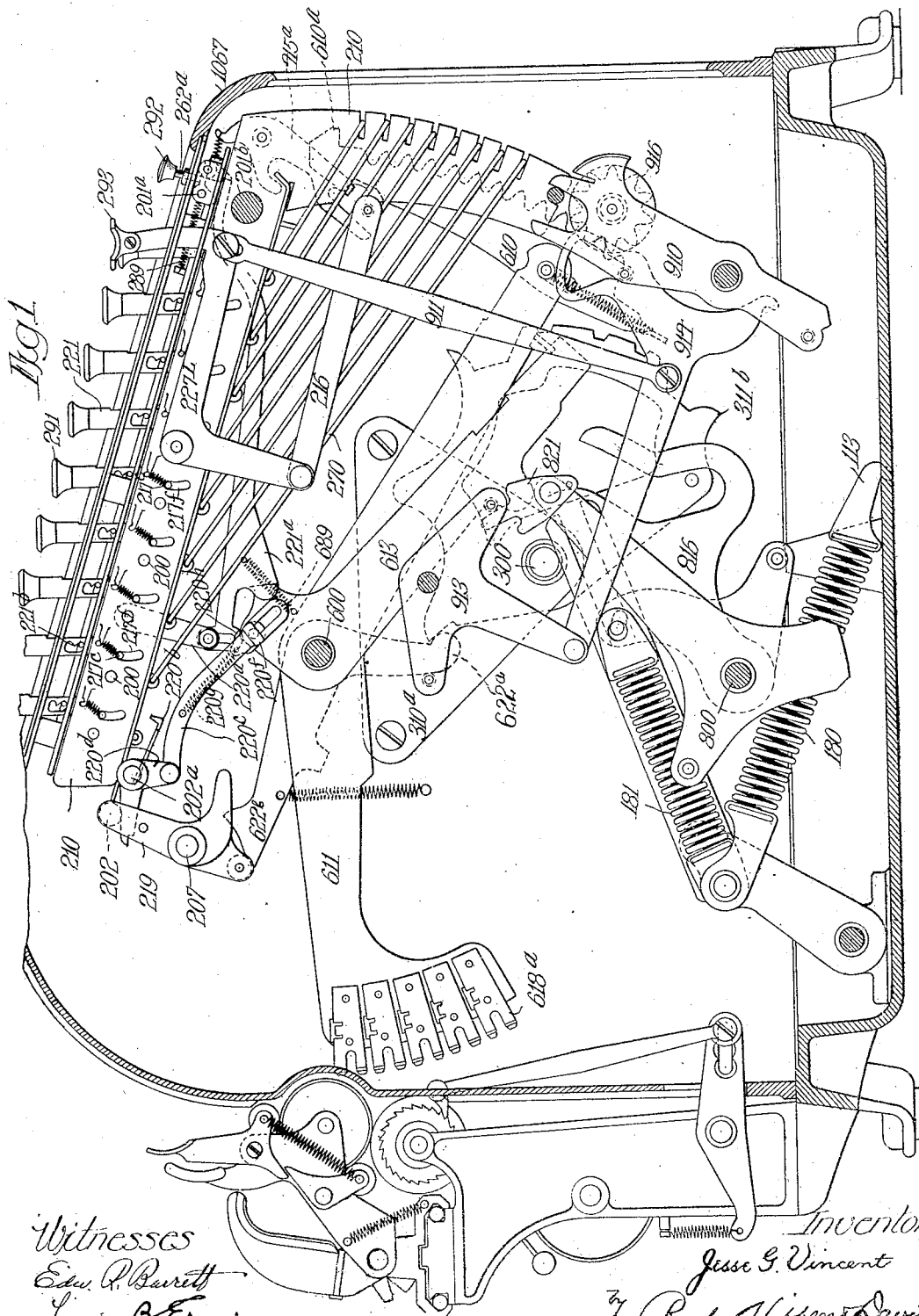
No. 890,945.

PATENTED JUNE 16, 1908.

J. G. VINCENT.
ADDING MACHINE.

APPLICATION FILED JUNE 26, 1906.

5 SHEETS--SHEET 1.



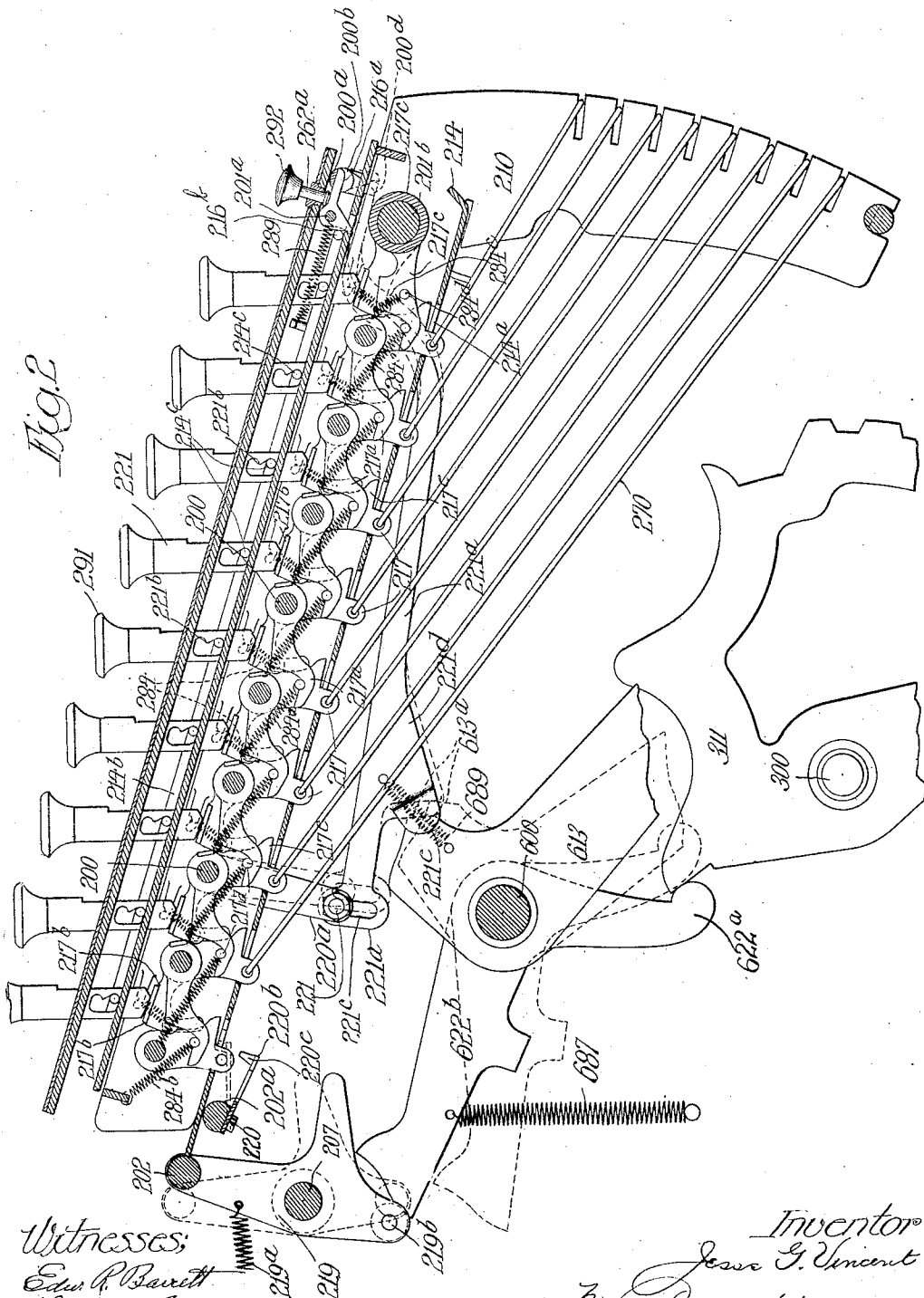
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6 SHEETS--SHEET 2.



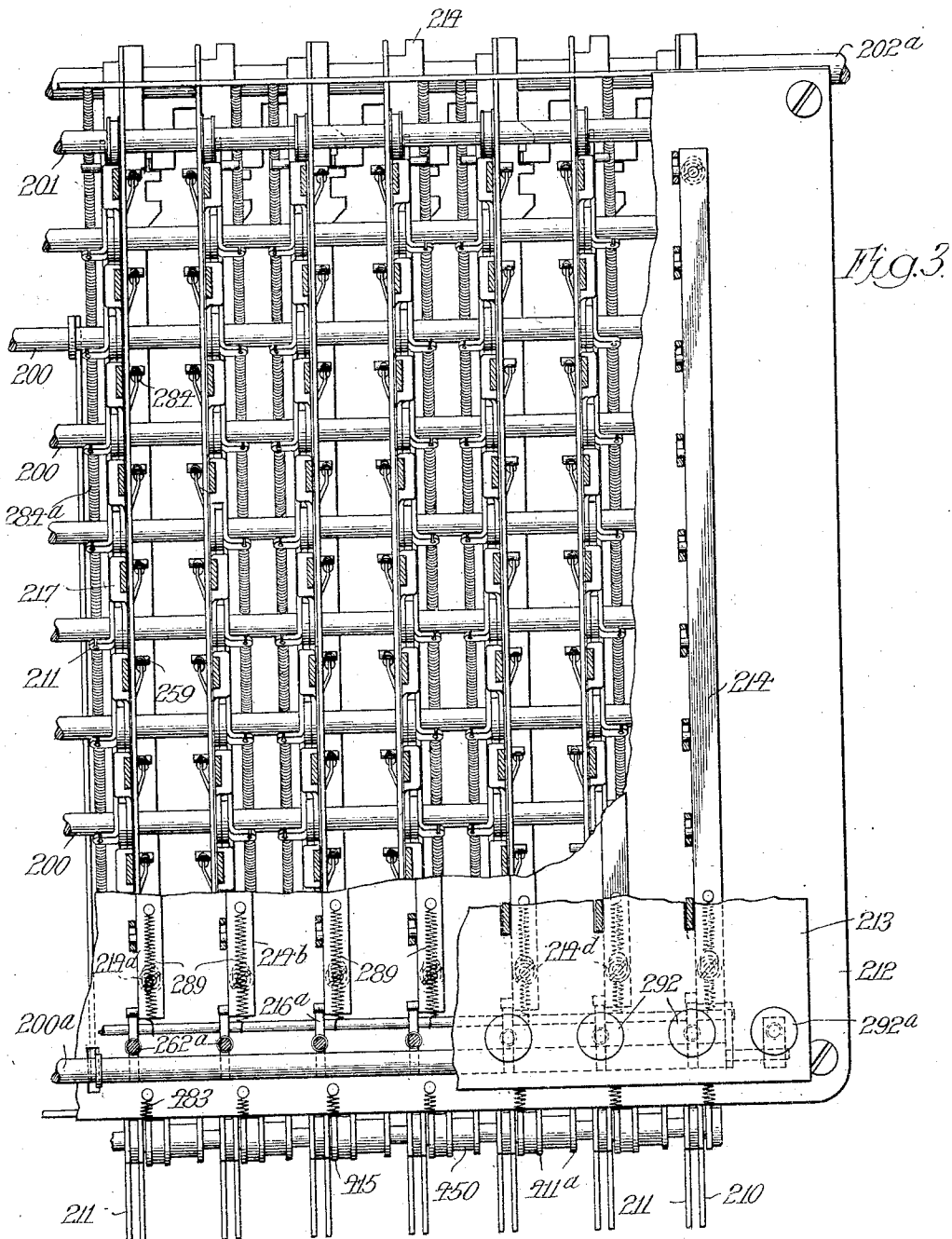
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Witnesses
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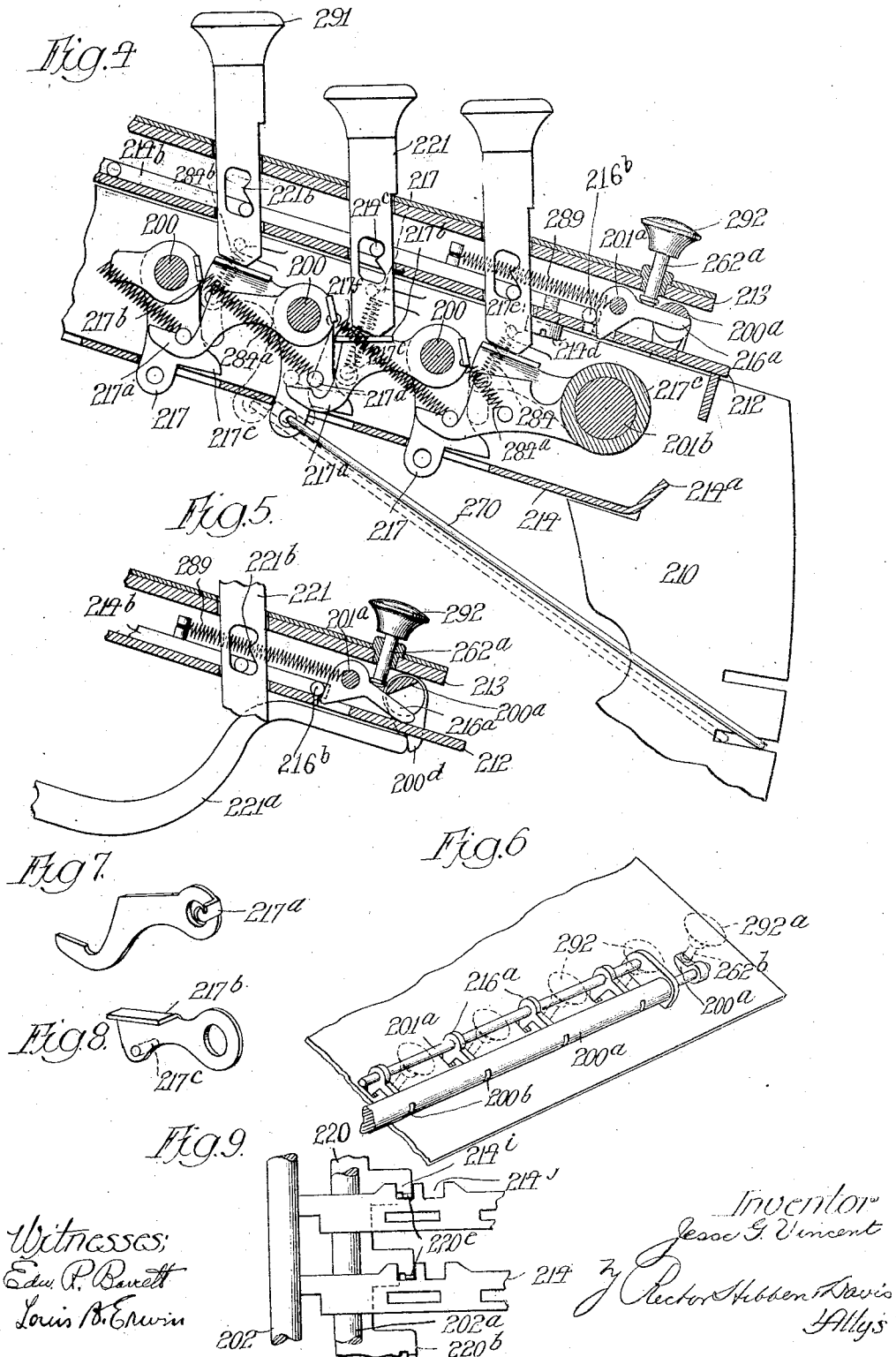
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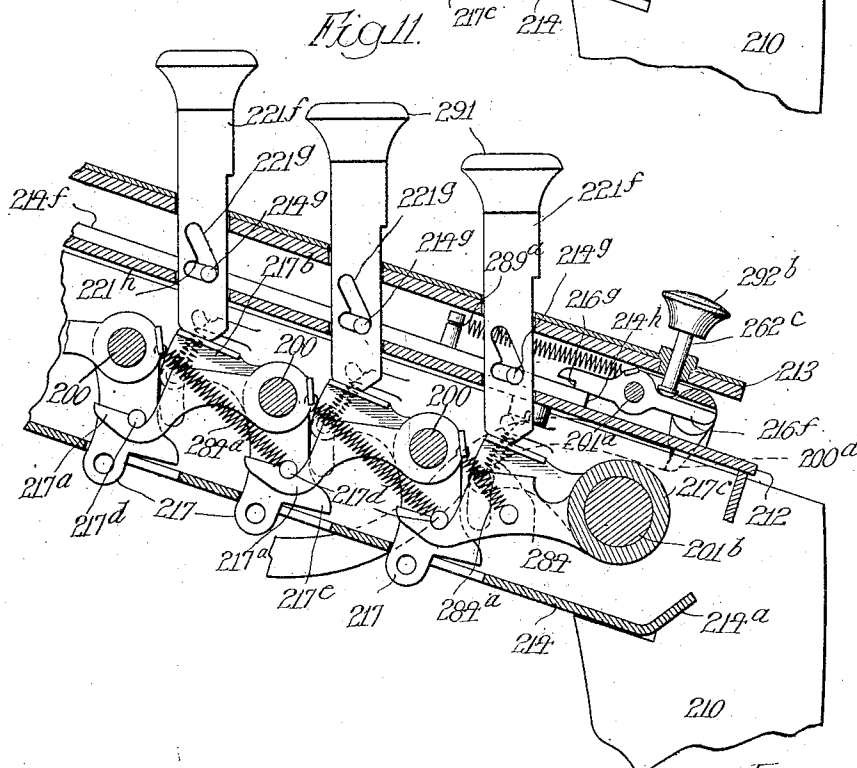
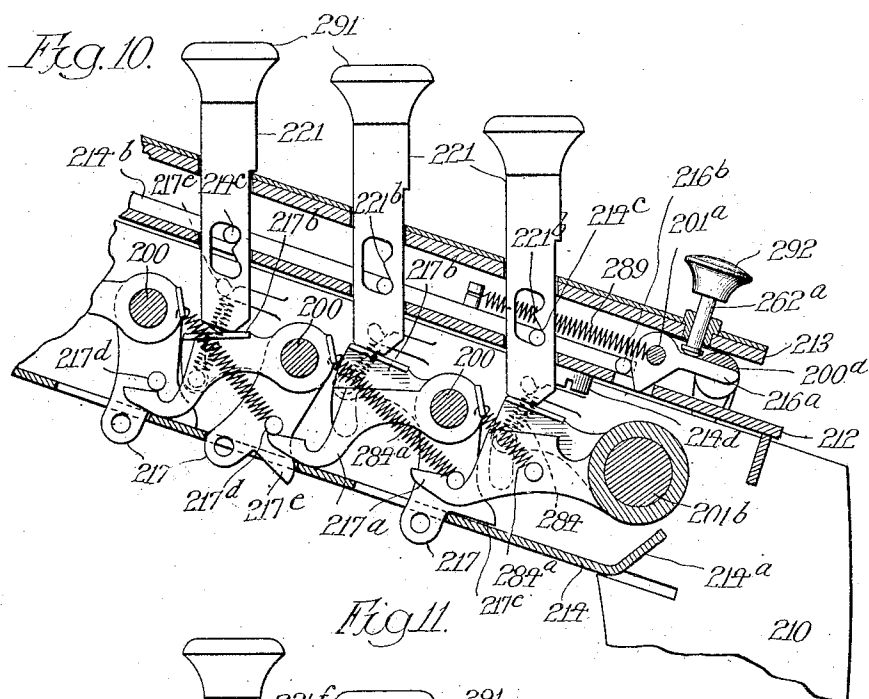
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5 SHEETS--SHEET 5.



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UNITED STATES PATENT OFFICE.

JESSE G. VINCENT, OF DETROIT, MICHIGAN, ASSIGNOR TO BURROUGHS ADDING MACHINE COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

ADDING-MACHINE.

No. 890,945.

Specification of Letters Patent.

Patented June 16, 1908.

Application filed June 26, 1906. Serial No. 323,474.

To all whom it may concern:

Be it known that I, JESSE G. VINCENT, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Adding-Machines, of which the following is a specification.

The general object of the present invention is to so construct the keyboard or indexing mechanism of an adding and listing machine as to provide for high frequency in fingering. As machines of this character have generally been constructed heretofore, keys are depressed representing the amount to be added or listed or both and these keys maintain an adjustment or positioning of the so-called "indexing", *i. e.*, amount determining devices within the machine, throughout the greater portion of the latter's operation. The most common mode of effecting an operation of such a machine has been for the operator to draw forward a crank handle or lever against spring pressure and then to release the same and permit it to return to normal. During the drawing forward of this crank handle or lever the adding and listing mechanism of the machine assumes an adjustment according to the previous indexing brought about through depression of the amount keys. In this manner type representing the amount to be listed are brought to printing position and the immediate actuators for the accumulator are positioned for adding said amounts upon the restoration of the crank handle to its normal position. It has been customary for the keys to remain depressed until this crank handle or lever is near the end of its return stroke. Hence the operator has been required to await practically the complete return of the crank handle before setting up another amount on the keyboard. Many operators acquire such speed and dexterity as to be ready to set up another amount on the keyboard immediately upon releasing the crank handle at the end of its forward stroke. In hand-operated machines there is thus a period of time when the speedy operator suffers an enforced idleness and it will be obvious that were he permitted to set up another amount immediately upon releasing the crank handle no time would be lost and the amount of work he could perform upon the machine in a given time would be greatly increased. In the hand-operated machine the operator

fingers the keys with the same hand which he uses to operate the crank handle and consequently the limitations of frequency of fingering in this type of machine would be entirely removed by releasing the keys and permitting the setting up of a new amount as soon as the crank handle has been drawn to the limit of its forward movement. However, power has been successfully applied to adding and listing machines to relieve the operator of the manual labor incident to the drawing forward of the crank handle against spring pressure and to quicken the operation of the machine. In the power-driven machine the operator is no longer required to use his hand during the forward stroke or preparatory movement of the internal mechanism of the machine, but after setting up the amount on the keyboard has merely to touch a starting button or key which requires but a moment. Thereupon the motor performs the work which was before done by the operator in drawing forward the crank handle. While the application of the motor drive to the machine naturally increased the output by speeding the operation between the setting up of successive amounts upon the keyboard, still the period of enforced idleness for the speedy operator was relatively increased because he would be ready immediately upon touching the starting button or key to set up a new amount upon the keyboard but would be prevented from so doing by reason of the fact that the keys already depressed remained so during the entire operation of the motor upon the mechanism of the machine and, as in the case of the hand operated machine, until near the end of the return stroke or excursion of the driven member corresponding with the crank handle. Hence the requirements of the speediest of operators is not fully satisfied by providing for the setting up of a new amount upon the completion of the forward stroke or excursion of the driven member and to accommodate the machine to the highest speed attainable by the most expert operator it is desirable to provide for the setting up of a new amount just as soon as such an operator can finger the amount keys after touching the starting button or key.

The present invention aims to satisfy all requirements in this regard and, to state its objects more specifically, it is proposed to no longer employ the amount keys as actuators

for the indexing devices, by which is meant the parts determining the extent of movement of the interior mechanism for presenting the type at the printing line and for actuating the accumulator. The amount keys are merely employed to unlock or free such indexing devices and having performed that function may return to normal position. The operating mechanism of the machine itself is employed to cause the actuation of the indexing devices. Thus almost immediately an operation of the machine is under way, accompanied by actuation of the unlocked indexing devices, the operated keys may be released and the keyboard made ready for further fingering. The invention provides for such further fingering taking effect immediately to disable the locks of the indexing devices associated with the keys then operated, whether they comprise any or all of those used in the preceding fingering or others not so used. The key-releasing action being timed to take place at the outset of an operation of the machine and having of course already occurred when the second fingering is done, the keys depressed in the latter performance will remain depressed so as to leave their associated indexing devices unlocked until the first operation of the machine is completed and the second begun.

With the above stated and incidental objects in view, the invention consists in certain novel features of construction and combinations of parts, the essential elements whereof are recited in the appended claims and preferred forms of embodiment of which are described in detail hereinafter and fully illustrated in the accompanying drawings forming part of this specification.

Of said drawings, Figure 1 represents in side elevation the interior mechanism of so much of a familiar type of adding machine as is necessary in order to illustrate the application of the present invention thereto, said figure of the drawings showing the inclosing casing of the machine in section and certain parts exterior thereto in elevation; Fig. 2 represents on an enlarged scale in longitudinal section that part of the machine to which the present invention has most immediate application, viz., the keyboard and parts directly under the same; Fig. 3 represents a fragmentary top plan view of the keyboard, the horizontal plates of which are represented as broken away to disclose parts beneath them and the key stems being shown in cross-section on varying horizontal planes; Fig. 4 is a view corresponding with Fig. 2 but on a larger scale and not illustrating so much of the keyboard mechanism, this view serving more especially to illustrate the changed relation of parts when a key in one of the denominational series has been depressed; Fig. 5 is a longitudinal sectional view of parts appearing at the upper right hand portion of

Fig. 4 but under different conditions; Fig. 6 represents in perspective certain key-releasing devices; Figs. 7 and 8 represent in perspective, details of latching and tappet devices operated by the keys; Fig. 9 is a top plan view of a portion of certain controlling means for the indexing devices; Fig. 10 is a view similar to Fig. 4 but showing a changed relation of parts, viz., that obtaining after one key in a bank or series has been depressed and the operation of the machine started and another key in said bank or series depressed before said operation of the machine is far advanced; and Fig. 11 is a view similar to Fig. 4 but illustrating a modified construction of keyboard.

The invention is shown in the present instance as embodied in an adding and listing machine of the familiar Burroughs type and reference may be had to Patents 504,763 and 505,078 of September 12, 1893, for a full and complete description of such a machine. It is not necessary to a thorough understanding of the present invention that all of the various details of this well known Burroughs machine be set forth, nor the mode of operation of all of the many parts which go to make up such a machine. It will suffice to refer to such of those parts as may be more directly concerned in the carrying out of the present invention. It may be stated furthermore that, while the invention is illustrated as applied to this familiar Burroughs type of machine, it is by no means limited in its application to such a machine, but may as effectively be applied to other types of adding and listing machines.

In the drawings, the reference numeral 300 designates a shaft to which the crank handle is applied when the machine is hand-operated and to which the motor is geared when the machine is power-driven, said shaft in either case having an oscillatory movement. Through suitable connections not necessary to describe, the oscillations of this shaft produce swinging of a frame 613, which normally supports in elevated position a series of arms or levers 611 mounted upon the same shaft 600 as supports said frame, these levers on the forward side of this shaft carrying segmental racks 610 and on the rear side of said shaft carrying segmental series of type 618^a. The latter coöperate with suitable impression means not necessary to describe and the segmental racks 610 coöperate with a counter or accumulator 916 mounted in a rocking frame 910. The timing of engagement between the counter or accumulator and the segmental racks 610 is variously regulated according to whether listing, total printing or subtotal printing is to be accomplished. The instrumentalities employed in this connection are fully described in said Patent No. 504,963. In a listing operation the extent to which the

arms or levers 611 move when the frame 613 lowers is determined by the depression of keys 291, which are arranged in longitudinal rows or banks on top of the machine. Here-
 5 tofore in machines of this type the depression of such keys operated through suitable connections to draw back stop-rods 270 whereby to present stops in the path of shoulders 610^a of the racks 610, the latter being released by
 10 the displacement of latches 415^a,—also effected by the depression of the keys. Neither of these functions is performed by the keys with the present invention embodied in the machine. Of course the stop-
 15 rods must be drawn back to set stops and the latches must be displaced to release the racks, but the present invention provides for these things being done as accompani-
 20 ments to the forward oscillation of the drive-shaft 300. The rods 270 engage loosely at their rear ends in eyes of rock arms 217 hung upon cross shafts or rods 200
 25 below the keys, there being a longitudinal row or series of these rock arms for each row or bank of keys, corresponding in number of
 30 rock arms to a row. The rock arms of each series extend downwardly through slots in a sliding strip or plate 214, which is normally held in a forward position through the abut-
 35 ment against its rear end of a cross rod 202 of a rocking frame comprising side bars 219 mounted upon a cross shaft 207. A spiral spring 219^a tends to draw the said frame rearwardly to the dotted line position shown
 40 in Fig. 2 but is normally prevented from so doing by the interposition of a lever 622^b in front of a roller 219^b mounted upon a depending arm of one of the side bars 219. Said lever 622^b is journaled upon the cross
 45 shaft 600 and has a depending arm 622^a acted upon by the sector 311 which oscillates with the shaft 300. The rearwardly extending portion of the lever 622^b is connected by a spiral spring 687 with a fixed part of the
 50 machine so that as soon as the sector 311 starts forward said lever 622^b will lower and permit the rod 202 to retreat toward the dotted line position in Fig. 2. The rear end of the lever 622^b is cam shaped so as to act
 55 upon the roller 219^b and restore the rocking frame to its normal position when the sector 311 returns to its normal position. As the sliding strips or plates 214 perform the function of holding the stop rods 270 in position
 60 for limiting the drop of the racks 610, it is desirable to lock these strips or plates 214 in the rearward position to which they move when performing said function. It is likewise desirable to lock the strips or plates
 65 under unoperated banks of keys during an operation of the machine. Consequently each strip or plate is formed near its rear end with a lateral extension (Fig. 9) having two locking notches 214ⁱ and 214^j. On a rock
 70 shaft 202^a extending across the machine

below the strips or plates 214 there is secured a plate 220 formed with a series of forwardly projecting arms 220^b, one for each strip 214, said arms having upstanding fingers 220^c at their forward ends for engagement with
 75 the notches 214ⁱ and 214^j. The shaft 202^a (Fig. 1) carries a depending arm 220^d at one end, to which is jointed a link 220^e having a slotted forward end engaging a pin 220^f upon an upward extension of one of the side
 80 bars of the frame 613. A spring 220^g tends to draw the link 220^e forward and thereby press the fingers 220^c upwardly against the strips 214, but in the normal position of parts the pin or stud 220^f prevents the
 85 spring 220^g from performing this function. However, upon the lowering of the frame 613 the stud or pin 220^f is advanced and the spring 220^g then acts to engage said fingers 220^c with the strips 214, said spring being
 90 connected at one end to the link and at the other to a collet 220^h surrounding the pin 220^f. In banks where no key has been depressed said fingers will engage the rear-
 95 most notches 214ⁱ, whereas in banks where keys have been depressed said fingers will engage the foremost notches 214^j, there being a rearward movement of the strip 214 below any bank of keys in which one is de-
 100 pressed, and such movement being to the extent of the distance between the notches 214ⁱ and 214^j. The locking of the strips is maintained until near the close of an operation, when the stud or pin 220^f, acting
 105 against the rearward end of the slot in the link 220^e, will cause the shaft 202^a to be rocked in a direction to disengage the fingers 220^c from the strips or plates 214. The forward upturned ends 214^a of the latter engage with the latches 415^a in a well known man-
 110 ner to bring about the displacement of the said latches and release of the racks 610 whenever the strips 214 move rearwardly as the result of depression of amount keys.

The rock arms 217 are formed with for-
 115 wardly projecting shoulders 217^c and the widened part of each rock arm occasioned by this formation is longitudinally co-extensive with the slot 214^a, through which a portion of this rock arm extends. The rock arms nor-
 120 mally back up against the rear ends of the slots 214^a and the shoulders 217^c are spaced to a slight extent from the plane of the upper surface of the strip obviating undue friction thereon. The rock arms are locked at the
 125 limit of their forward movements by a series of latches, eight of which 217^a are journaled upon shafts 200 and the ninth of which 217^c is journaled upon a cross shaft 201^b at the front part of the machine. Each of these
 130 latches consists of a rearwardly extending arm notched to engage a pin 217^d projecting from one side of that rock arm which the latch locks. The rock arms are swung rear-
 135 wardly and the latch arms upwardly by 130

means of spiral springs, eight of which 284^a serve both of these functions, each being connected at one end to a pin 217^d and at the other end to the rear part of a latch arm, as shown in Figs. 2, 4, 10 and 11. Of course under this arrangement there is no latch arm for the spring of the rearmost rock arm to connect with and consequently that spring 284^b is simply connected to a fixed part of the frame work. Correspondingly, there is no rock arm for the spring of the foremost latch to connect with, and that spring 284^c is connected with a pin 284^d on said latch, which spring at its other end is connected with the forward part of the latch just in front.

The above described latches are designed to be displaced by the amount keys 291, but the latter do not act directly upon latches as it is not necessary that the latter partake of the full movement of the keys. The stems of the latter rest upon lateral lips or flanges of tappet arms 217^b journaled upon the shafts 200 and 201^b. These tappet arms have laterally projecting pins 217^c, which engage curved slots 217^e, in rearward extensions of the well known division plates 210. Spiral springs 284 connect the pins 217^c with tangs 217^e of said division plates and hold up the tappet arms, consequently elevating the amount keys. The lateral lip of the tappet arm is normally spaced from the upper edge of the latch so that there is a certain amount of lost motion between these two parts. This arrangement is employed because only slight downward movement of the latch is necessary to disengage it from the rock arm pin 217^d, whereas a greater extent of movement of the key itself is desirable for securing its coöperation with detent devices now to be described.

Each key stem is formed with an aperture having a cam edge 221^b and a sliding strip 214^b is arranged alongside of each series of keys, said strip having laterally projecting lugs 214^c occupying the apertures of the key stems. The cam edge 221^b is of such a character as to move said detent strip rearwardly upon depression of a key through its action upon the lug 214^c. Continued depression of the key causes the high part of the cam edge to pass the lug, whereupon the latter may move forwardly over the cam point and prevent return of the key (Fig. 4). A spiral spring 289 draws the detent strip 214^b forward, said spring being secured at one end to said strip and at the other end to a cross rod or shaft 201^a. The latter has journaled upon it a series of bell crank levers 216^a, each comprising a downwardly extending V-shaped portion engaging a stud 216^b upon one of the detent strips 214^b, and a forwardly extending arm occupying a slot 200^b in the under side of a rock shaft or rod 200^a. There is of course one of the bell crank levers for each

detent strip and it will be obvious that downward movement of the forwardly extending arms of these bell cranks will result in a rearward thrust of their downwardly extending portions against the detent strips, whereby the latter will be caused to release any depressed keys. The slots 200^b terminate in straight line top portions engaging the forwardly extending arms of the bell cranks 216^a so that rocking of the shaft 200^a will cause depression of said arms of the bell cranks. At one end this rock shaft has an arm 200^d against which abuts the forward end of a bar 221^a, which curves downwardly and then extends rearwardly terminating in a vertically slotted portion swung from an arm 220^a which is journaled upon one of the cross shafts 200. Said arm 220^a carries a pin or bolt 221 which engages the slot 221^c of said bar 221^a and the latter is formed with a depending portion 221^b providing a vertical shoulder which is presented to a similar shoulder 613^a of one of the side bars of the frame 613. A spiral spring 221^e holds the bar 221^a rearwardly as the machine stands normally but immediately upon an operation of the machine being started the shoulder 613^a thrusts the bar 221^a forward so that very soon after the machine is started the detent strips 214^b will be operated to release the depressed keys 291. The shoulder 613^a passes by the downward extension 221^d of said bar and when the frame 613 rises the slot 221^c provides for the upward extension of said frame passing by the downward extension of the bar and re-assuming its normal position back of the shoulder of said downward extension.

It will now be seen that the amount keys perform only the function of unlocking the indexing devices comprising the rocking arms 217 and the stop rods 270. No movement of the latter devices is caused by the depression of the amount keys, for although these devices are thereby freed from the restraint of the latches, their springs remain inactive so long as the sliding strips or plates 214 are held to their forward positions. They are firmly so held in the manner hereinbefore described, so that no movement whatever of the said indexing devices can take place prior to the machine's being set in operation. Inasmuch as the keys are no longer relied upon to produce movement of the indexing devices or to hold the same in set position, it will be obvious that the keys need remain depressed only until in the operation of the machine the pins 217^d of the rock arms have escaped past the notches of the latches. It will furthermore be seen that the moment this stage in the operation is reached the indexing devices are entirely beyond the control of the keys and do not rely in the least upon the same to maintain their controlling position with reference to the adding and

listing mechanism. So the keys can be and are released at an early stage in an operation of the machine and other keys thereupon depressed unlatch their rock arms which remain unlatched, so that upon a second operation of the machine the second set of indexing devices unlatched will move to set position. The operation in this regard is illustrated in Fig. 10, where the parts are shown positioned as they would be when the operation of the machine was under way, the second key in the bank having previously been depressed and the third key having thereafter been depressed. As heretofore stated, the contour of the rock arms is such that in normal position their shoulders 217^c are spaced away from the plane of the upper surface of the sliding strip 214. As the parts are shown in Fig. 10, this sliding strip has moved rearwardly so that with the exception of the first unlatched rock arm this strip has passed below the several shoulders 217^c of the rock arms but the latter will still be spaced as before from the upper surface of the strip. Therefore upon depression of an amount key other than the one first depressed, immediately following the release of the latter, the rock arm associated with the key last depressed will be unlatched and will immediately move forward to the slight extent permitted by the space between its shoulder 217^c and the upper surface of the strip 214. As the parts are illustrated in Fig. 10, the left hand rock arm has been so unlatched and will be seen to have retreated slightly until its shoulder has come against the surface of the strip. This slight movement of the rock arm has no necessary function in connection with its unlatching or its being maintained unlatched. It simply occurs because, as before stated, the rocking arms are moved forward by the strip 214 far enough to relieve the latter of any friction which might otherwise result from the shoulders 217^c being normally in contact with the upper side of the strip. Of course this last depressed key is held down by reason of the engagement of the lug 214^c on the detent strip 214^b with the upper part of the cam aperture in the key stem so that the latch remains in its displaced position throughout the continuing operation of the machine. Hence the restoration of the strip 214 to its forward position at the conclusion of the machine's operation, although it has the effect of restoring the rock arm to its normal position, does not have the effect of re-latching it for the latch is still held depressed. In the ensuing operation of the machine this rock arm will of course be swung rearwardly as the strip or plate 214 is permitted to retreat and consequently the pin 217^d will again escape the notch of the latch before the latter is released by the rearward thrust of the detent strip 214^b.

The operation will be more or less apparent from what has already been set forth, but may perhaps be recapitulated to advantage. The normal condition of the machine is that represented in Figs. 1 and 2, the amount keys being all elevated, the rock arms and their stop rods in advanced position, the latches engaged with the studs or pins on said rock arms and the slide strips 214 held in advanced position by the cross rod 202 of the rocking frame at the rear of the machine. The lock plate 200 occupies its lower position disengaged from said strips and the thrust bar 221^a is retracted. Fig. 4 represents in full lines the condition of the parts associated with the second key in the series when that key has been depressed. This action results in depressing the tappet arm 217^b until its lateral lip comes upon the top edge of the latch arm 217^a and when in the depression of said latch arm together with the tappet arm thus disengaging the notch of the latch arm from the pin or stud 217^d of the rock arm 217. No movement of the rock arm ensues because of the back stop afforded by the rear end of the slot in the strip 214 through which said rock arm extends. The depression of the key caused its internal cam edge 221^b to thrust the detent strip 214^b rearwardly against the stress of its spring 289 until the high part of said cam edge passed by the pin or lug of said detent strip. The spring 289 then of course drew the detent strip forward again carrying its lug 214^c over the cam point and thus latched the key in its depressed position. The dotted line illustration in Fig. 4 represents the change in position of the indexing devices which takes place when the machine is set in operation. As soon as the sector 311 starts forward, which is immediately the shaft 300 is set in motion, the lever 622^b moves downwardly and the rocking frame 219—202 is free to retreat under the impulse of its spring 219^a so that the sliding strip 214 yields to the pressure of the unlatched rock arm against the rear end of its slot. The rearward swing of the rock arm which then ensues carries its shouldered portion into the slot of the strip so that said slot is practically filled by the rock arm and consequently there can be no return of the rock arm independently of the strip. At the same time the latter locks all the other rock arms from rearward movement except to the slight extent heretofore explained, which is of course insufficient to draw the stop rod 270 to set position and indeed has no effect upon the latter owing to the loose connection between it and the lower end of the rock arm.

Now it will be seen that as soon as the rock arm has advanced far enough to prevent re-engagement between its stud or pin 217^d and the notch of the latch arm the latter may be released without in the least disturbing the indexing operation. This release of the

latch follows very closely upon the start rearward of the strip 214. As soon as the machine is started the thrust bar 221^a is set in motion in the manner hereinbefore described and the resultant rocking of the shaft 200^a quickly displaces the detent strip 214^b (Fig. 5) thereby releasing the depressed key. The frame shoulder 613^a thereupon wipes past the shoulder of said thrust bar so that the latter may be retracted and the detent strip 214^b restored to normal position as soon as the key has risen. The operation of the machine proceeds and the indexing stop is set with the key released and this stop acts just as in previous Burroughs machines to limit the drop of the accumulator rack 610 which is unlatched in the course of the rearward movement of the sliding strip 214. When the latter has reached its rearmost position one of the fingers 220^a of the lock plate 200 enters the notch 214ⁱ of said strip. As heretofore explained, this lock plate is thrown upward against the strips 214 through its spring connection with the frame 613 and the fingers 220^a enter the notches 214ⁱ of all the detent strips 214 which coöperate with banks in which keys have been depressed. The detent strips 214 which coöperate with banks in which no keys have been depressed do not, of course, move rearwardly. Fingers of the lock plate, however, enter the notches 214ⁱ of such detent strips so that all the strips are positively locked while the operation of the machine is being controlled by the indexing devices.

The dotted line position of rock arm shown in Fig. 4 is illustrated in full lines in Fig. 10, where the key which unlatched this rock arm is shown as having been released. It will be seen that the stud or pin 217^a of the rearwardly rocked arm 217 still bears upon the straight edge of the latch arm so that the latter is prevented from rising and upon restoration of the rock arm to normal position will reengage the same.

The key having been released and restored to normal position as illustrated in Fig. 10, said key or any other key may be immediately depressed without waiting for the operation of the machine to conclude. The depression of another key results in its tappet and latch arms being depressed and the key being latched down as in the first instance and as illustrated in Fig. 10. The operation of the machine not having proceeded beyond the stage at which the detent strip 214 is in its rearward position, a portion of that strip is interposed beneath the shoulder 217^a of the rock arm thus unlatched and the latter only partakes of the slight movement which brings its shoulder 217^a against the strip. As the operation of the machine proceeds of course the detent strip 214 is restored to its normal position by the operation of the rock frame rod 202 and so both of the unlatched

rock arms will be restored to their normal positions. It will be noted, however, that the key of the first unlatched rock arm has been released and consequently its latch stands ready to reengage this rock arm the moment the latter reaches normal position. However, the key of the other unlatched rock arm has not been released and so when this rock arm reaches normal position it cannot be reengaged by its latch. Upon now immediately again operating the machine this second unlatched rock arm will move rearwardly carrying the detent strip with it and swinging into the slot of the latter the same as did the first unlatched rock arm and the operation will proceed as before. In case the same key which was first depressed is again depressed in the setting up of a new amount before the first operation of the machine is concluded, there will not of course be the disengagement of the latch above described because this latch is still disengaged and held depressed. The key will however, be caught and held in its depressed position so that upon restoration of the rock arm to normal position at the conclusion of the machine's operation it will not be relatched but will again move rearward when the second operation of the machine commences.

It will be seen that the keyboard thus far described is of the so-called "flexible" variety, for having depressed one key in a bank another may be immediately depressed and the first will be thereby released. In Fig. 11 the so-called "locked" variety of keyboard is illustrated, the depression of a key in this construction operating to lock all the other keys in the bank so that no other can be depressed until the operation of the machine has started or else the special key release brought into play. The key stems 221ⁱ in this modified construction each have an angular slot 221^s comprising an oblique portion and a transverse portion. The pins or lugs 214^g of the detent strip 214ⁱ occupy these angular slots and upon depression of one key the forward side of the oblique portion of its slot, acting upon the pin or lug within the slot, thrusts the detent strip rearwardly thereby carrying the other pins or lugs into the rear parts of the transverse portions of the slots in the other key stems so that the latter will be locked against downward movement. The pin or lug in the slot of the depressed key occupies the upper portion of the oblique part of said slot and the key is held depressed by the engagement with the front end of the detent strip 214ⁱ of a shoulder 216^s on a lever 216ⁱ journaled upon the cross rod 201^a and engaging the rock shaft 200^a in the same manner that the previously described bell crank lever 216^a engages said rock shaft. The rest of the construction illustrated in Fig. 11 is the same as that shown in the previous figures and the opera-

tion of the parts is practically the same. It will be seen that upon the forward thrust of the bar 221^a as in the operation previously described the resultant rocking of the shaft 200^a will tilt the lever 216^f and thereby release the detent strip 214^f. The spring 289^d which draws the detent strip forward is in this modification connected also to the lever 216^f in such manner as to rock the forward end of the latter downwardly and bring about the engagement thereof with the front end of said detent strip when the latter is moved rearwardly by the depression of a key.

In order to provide for releasing a depressed key in the flexible keyboard construction without using another key in the bank for this purpose, as may be done by tapping such other key, release buttons 292 are employed, the same having stems 262^a mounted to slide through suitable bushings in the top plate of the machine at the front thereof. Each button rests upon the top of the forwardly extending arm of the bell crank lever 216^a which operates the detent strip 214^b. To provide for simultaneous release of any number of depressed keys where the entire amount set up on the keyboard is to be effaced, a separate button 292^a is employed, (Figs. 3 and 6) the same having a stem 262^b sliding through the top plate of the machine and resting upon an arm 200^d of the shaft 200^a. It will be seen that by depressing this button 292^a said shaft will be rocked and all of the bell crank levers thereby actuated to thrust the detent strips 214^b rearwardly and release any depressed keys. Practically the same construction is used with the locked keyboard of Fig. 11, buttons 292^b being employed with stems 262^c which bear upon the forward ends of the levers 216^f.

It will now be seen that the constructions above described are thoroughly capable of performing the objects primarily stated. It is to be particularly noted that, unlike all principles of operation heretofore resorted to in an effort to accomplish the same general result, the present invention removes entirely from the keys the duty of moving the indexing devices to set position and confines their function to the mere unlatching or unlocking of the indexing devices, the indexing movement of the latter being entirely produced through operation of the machine. Thus the indexing movements become entirely automatic and finger pressure is no longer relied upon to produce such movements. This has the advantage of producing a keyboard of extremely light touch which of itself promotes speed of fingering. It follows that in the power driven machine, where the present invention will doubtless be found most useful, exertion on the part of the operator is reduced to the minimum, inasmuch as the only manual labor consists

in lightly touching the keys for an unlatching process merely followed by the light touching of a starting button or key.

What is claimed is:

1. In a machine of the character described, the combination with accounting mechanism of normally locked amount determining means for variously limiting the extent of movement thereof, keys for unlocking the said means and means coming into play in subsequent operation of the machine to cause the unlocked amount determining means to take up effective position.

2. In a machine of the character described, the combination of normally locked amount determining means, keys for unlocking the same, and means coming into play in subsequent operation of the machine to cause the unlocked amount determining means to take up effective position; with provisions for unlocking amount determining means during such operation of the machine and for preventing relocking of amount determining means so unlocked during said operation of the machine in preparation for a second operation thereof.

3. In a machine of the character described, the combination of normally locked amount determining means, keys for unlocking the same, means for temporarily holding such keys in operated position, means coming into play in subsequent operations of the machine to cause the unlocked amount determining means to take up effective position, and means coming into play at an early stage of such subsequent operation of the machine to release the operated keys and permit operation of others.

4. In a machine of the character described, the combination of normally locked amount determining means, keys for unlocking the same, means for temporarily holding such keys in operated position, means coming into play in subsequent operation of the machine to cause the unlocked amount determining means to take up effective position and means coming into play at an early stage of such subsequent operation of the machine to release the operated keys; with provisions for preventing relocking of amount determining means unlocked during said operation of the machine in preparation for a second operation thereof.

5. In a machine of the character described, the combination with accounting mechanism of normally restrained and locked amount determining means for variously limiting the extent of movement thereof, keys for unlocking the said means, and means coming into play in subsequent operation of the machine to first release said amount determining means from restraint and then restore the same to normal.

6. In a machine of the character described, the combination of normally restrained and

locked amount determining means, keys for unlocking the same and means coming into play in subsequent operation of the machine to first release said amount determining means from restraint and then restore the same to normal; with provisions for preventing relocking of amount determining means unlocked during said operation of the machine in preparation for a second operation thereof.

7. In a machine of the character described, the combination of normally restrained and locked amount determining means, keys for unlocking the same, means for temporarily holding such keys in operated position, means coming into play in subsequent operation of the machine to first release said amount determining means from restraint and then restore the same to normal, and means coming into play at an early stage of such subsequent operation of the machine to release the operated keys and permit operation of others.

8. In a machine of the character described, the combination of normally restrained and locked amount determining means, keys for unlocking the same, means for temporarily holding such keys in operated position, means coming into play in subsequent operations of the machine to first release said amount determining means from restraint and then restore the same to normal, and means coming into play at an early stage of such subsequent operation of the machine to release the operated keys; with provisions for preventing relocking of amount determining means unlocked during said operation of the machine in preparation for a second operation thereof.

9. In a machine of the character described, the combination of normally locked stop setting means, keys for unlocking the same and means coming into play in subsequent operation of the machine to cause the unlocked stop setting means to take up effective position.

10. In a machine of the character described, the combination of normally locked stop setting means, keys for unlocking the same, and means coming into play in subsequent operation of the machine to cause the unlocked stop setting means to take up effective position; with provisions for preventing relocking of stop setting means unlocked during said operation of the machine in preparation for a second operation thereof.

11. In a machine of the character described, the combination of normally locked stop setting means, keys for unlocking the same, means for temporarily holding such keys in operated position, means coming into play in subsequent operations of the machine to cause the unlocked stop setting means to take up effective position, and means coming into play at an early stage of such subsequent

operation of the machine to release the operated keys.

12. In a machine of the character described, the combination of normally locked stop setting means, keys for unlocking the same, means for temporarily holding such keys in operated position, means coming into play in subsequent operations of the machine to cause the unlocked stop setting means to take up effective position and means coming into play at an early stage of such subsequent operation of the machine to release the operated keys; with provisions for preventing relocking of stop setting means unlocked during said operation of the machine in preparation for a second operation thereof.

13. In a machine of the character described, the combination of normally restrained and locked stop setting means, keys for unlocking the same, and means coming into play in subsequent operations of the machine to first release said stop setting means from restraint and then restore the same to normal.

14. In a machine of the character described, the combination of normally restrained and locked stop setting means, keys for unlocking the same and means coming into play in subsequent operation of the machine to first release said stop setting means from restraint and then restore the same to normal; with provisions for preventing relocking of stop setting means unlocked during said operation of the machine in preparation for a second operation thereof.

15. In a machine of the character described, the combination of normally restrained and locked stop setting means, keys for unlocking the same, means for temporarily holding such keys in operated position, means coming into play in subsequent operations of the machine to first release said stop setting means from restraint and then restore the same to normal, and means coming into play at an early stage of such subsequent operation of the machine to release the operated keys.

16. In a machine of the character described, the combination of normally restrained and locked stop setting means, keys for unlocking the same, means for temporarily holding such keys in operated position, means coming into play in subsequent operations of the machine to first release said stop setting means from restraint and then restore the same to normal, and means coming into play at an early stage of such subsequent operation of the machine to release the operated keys; with provisions for preventing relocking of stop setting means unlocked during said operation of the machine in preparation for a second operation thereof.

17. In a machine of the character described, the combination of spring-drawn stop-setters, spring-drawn latches for locking

the same, keys for displacing the latches, detents for latching said keys, means holding said stop setters to normal position independently of the latches, and means coming into
 5 play in subsequent operations of the machine to restore the key detents to normal position and to release the unlocked stop setters.

18. In a machine of the character described, the combination of spring-drawn
 10 stop-setters, spring-drawn latches for locking the same, keys for displacing the latches, detents for latching said keys, means holding said stop setters to normal position independently of the latches and means coming into
 15 play in subsequent operation of the machine to restore the key detents to normal position and to release the unlocked stop setters; with provisions for disabling the latches by keys depressed during said operation of the machine in preparation for a second operation
 20 thereof.

19. In a machine of the character described, the combination of spring-drawn stop-setters, spring-drawn latches for locking
 25 the same, keys for displacing the latches, detents for latching said keys, means holding said stop setters to normal positions independently of the latches, said means when displaced limiting movement of subsequently
 30 unlocked stop setters and means coming into play in subsequent operation of the machine to restore the key detents to normal position and to release the unlocked stop setters.

20. In a machine of the character described, the combination of spring-drawn
 35 stop-setters, spring-drawn latches therefor, depressible keys to displace the latches, detents for the keys, detainers for the stop-setters, operating mechanism for the machine,
 40 and means controlled thereby for causing displacement of the detents and the detainers.

21. In a machine of the character described, the combination of spring-drawn
 45 stop-setters, spring-drawn latches therefor, depressible keys to displace the latches, detents for the keys, detainers for the stop-setters, locks for the detainers, operating mechanism for the machine, and means controlled
 50 thereby for causing displacement of the detents and the detainers and actuating the lock for the latter.

22. In a machine of the character described, the combination of spring-drawn
 55 stop-setters, including rocking shouldered members, spring-drawn latches therefor, depressible keys to displace the latches, detents for the keys, detainers for the stop-setters, operating mechanism for the machine,
 60 and means controlled thereby for causing displacement of the detents and the detainers; the latter when displaced presenting abutments to the shoulders of the rocking members of the stop-setters.

65 23. In a machine of the character de-

scribed, the combination of spring-drawn stop-setters, including rocking shouldered members, spring-drawn latches therefor, depressible keys to displace the latches, detents for the keys, detainers for the stop-set-
 70 ters, in the form of sliding apertured strips or plates through which the said rocking members extend, operating mechanism controlled thereby for causing displacement of the detents and the detainers; the latter when dis-
 75 placed presenting abutments to the shoulders of the rocking members of the stop-setters.

24. In a machine of the character described, the combination of spring-drawn
 80 stop-setters, spring-drawn swinging latches therefor, depressible keys to displace the latches, detents for the keys, detainers for the stop-setters, operating mechanism for the machine, and means controlled thereby for
 85 causing displacement of the detents and the detainers.

25. In a machine of the character described, the combination of spring-drawn
 stop-setters, including rocking shouldered
 90 members, spring-drawn swinging latches therefor, depressible keys to displace the latches, detents for the keys, detainers for the stop-setters, operating mechanism for the machine, and means controlled thereby
 95 for causing displacement of the detents and the detainers.

26. In a machine of the character described, the combination of spring-drawn
 stop-setters, including rocking shouldered
 100 members, spring-drawn swinging latches therefor, depressible keys to displace the latches, detents for the keys, detainers for the stop-setters in the form of sliding apertured strips or plates through which the said
 105 rocking members extend, operating mechanism for the machine, and means controlled thereby for causing displacement of the detents and the detainers.

27. In a machine of the character de-
 110 scribed, the combination of spring - drawn stop - setters, spring - drawn latches therefor, spring - drawn tappets for the latches, depressible keys bearing on the tappets, detents for the keys, detainers for the stop-
 115 setters, operating mechanism for the machine, and means controlled thereby for causing displacement of the detents and the detainers.

28. In a machine of the character de-
 120 scribed, the combination of spring - drawn stop - setters, spring - drawn swinging latches therefor, spring - drawn swinging tappets for the latches, depressible keys bearing on the tappets, detents for the keys, detainers for
 125 the stop - setters, operating mechanism for the machine, and means controlled thereby for causing displacement of the detents and the detainers.

29. In a machine of the character de- 130

scribed, the combination of spring - drawn stop - setters, including rocking shouldered members, spring - drawn swinging latches therefor, spring - drawn swinging tappets for the latches, depressible keys bearing on the tappets, detents for the keys, detainers for the stop - setters, operating mechanism for the machine, and means controlled thereby for causing displacement of the detents and the detainers; the latter when displaced presenting abutments to the shoulders of the rocking members of the stop - setters.

30. In a machine of the character described, the combination of spring - drawn stop - setters, including rocking shouldered members, spring - drawn swinging latches therefor, spring - drawn swinging tappets for the latches, depressible keys bearing on the tappets, detents for the keys, detainers for the stop-setters in the form of sliding apertured strips or plates through which the said rocking members extend, operating mechanism for the machine, and means controlled thereby for causing displacement of the detents and the detainers; the latter when displaced presenting abutments to the shoulders of the rocking members of the stop-setters.

31. In a machine of the character described, the combination of spring - drawn stop - setters, spring - drawn swinging latches therefor, depressible keys to displace the latches, detents for the keys, detainers for

the stop - setters, operating mechanism for the machine, and means controlled thereby for causing displacement of the detents and the detainers, said means comprising a spring-drawn rocking member abutting the detainer-strips.

32. In a machine of the character described, the combination of normally locked amount determining means, detainers therefor, depressible keys for unlocking said means, detents for the keys, operating mechanism for the machine, means controlled thereby for causing displacement of the detainers, and a thrusting member actuated by said operating mechanism at the outset of the operation to displace the detents and release the keys.

33. In a machine of the character described, the combination of normally locked determining means, detainers therefor, depressible keys for unlocking said means, detents for the keys, operating mechanism for the machine, including a vibratory member, means controlled by said operating mechanism for causing displacement of the detainers, and a thrusting member actuated by the vibratory member of said operating mechanism at the outset of the operation to displace the detents and release the keys.

JESSE G. VINCENT.

Witnesses:

R. S. MIELERT,
ALVAN MACAULEY.