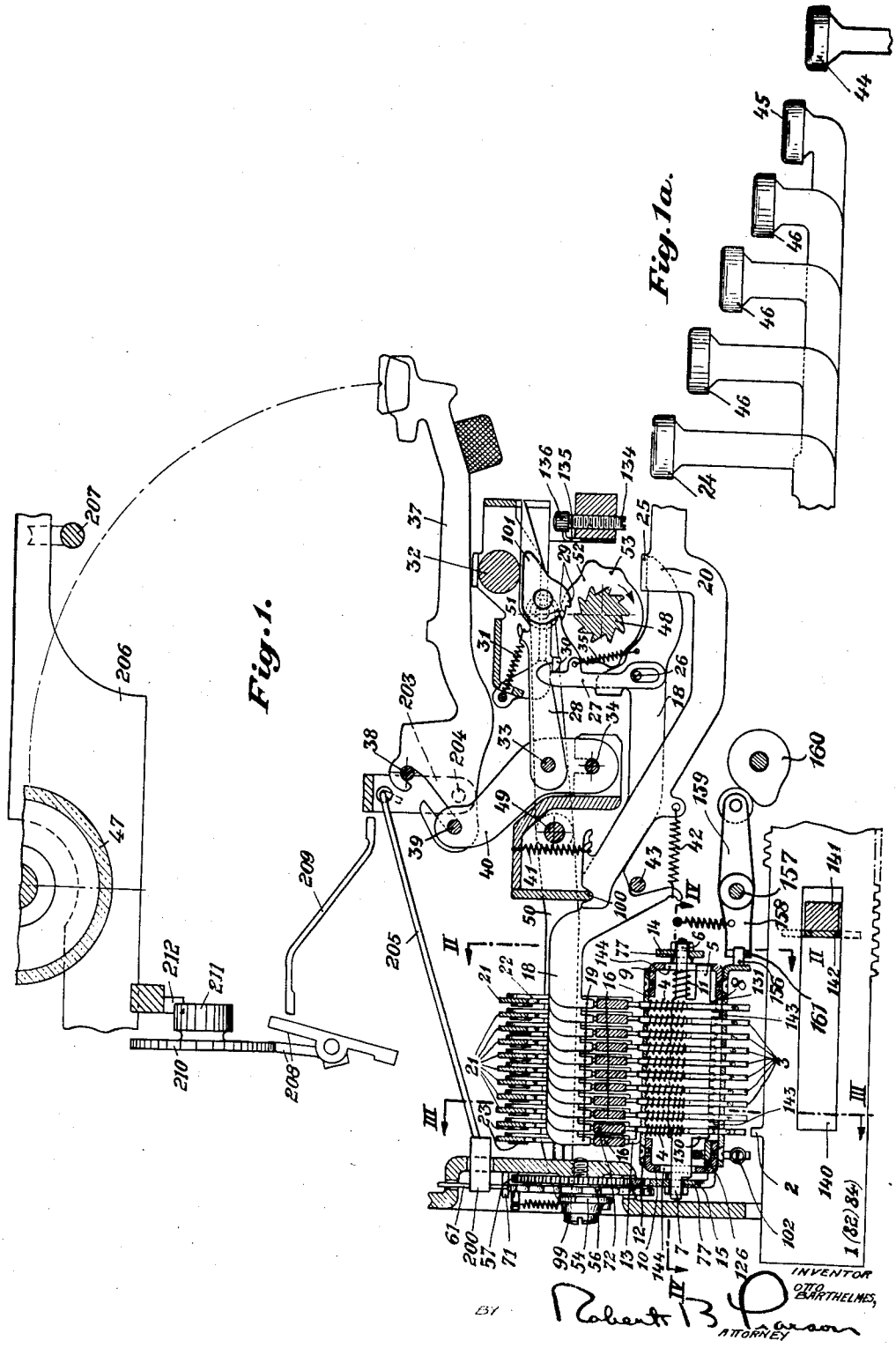
Sept. 28, 1943. O. BARTHELMES 2,330,543

ACCOUNTING MACHINE

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Sept. 28, 1943. O. BARTHELMES 2,330,543

ACCOUNTING MACHINE

Filed July 8, 1940 3 Sheets-Sheet 2

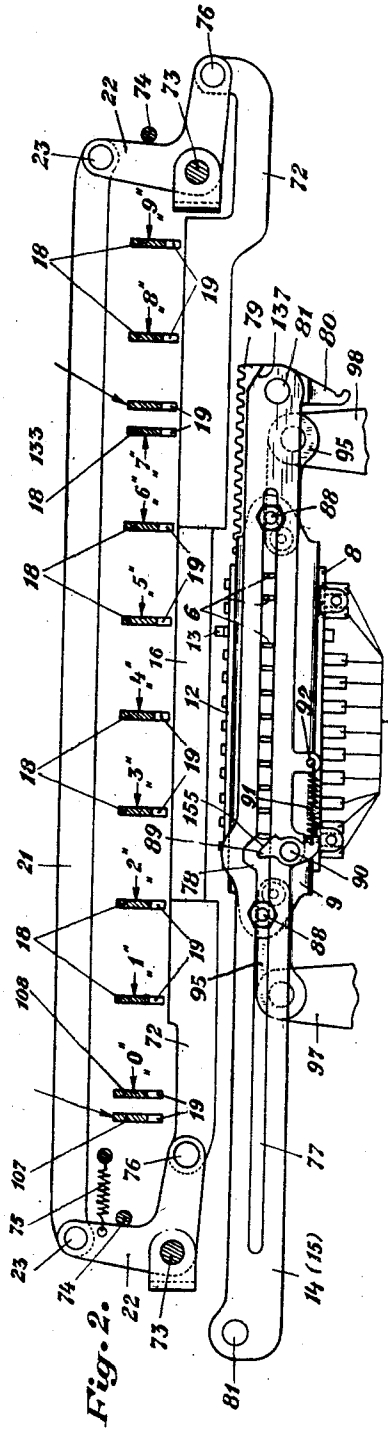


Fig. 2.

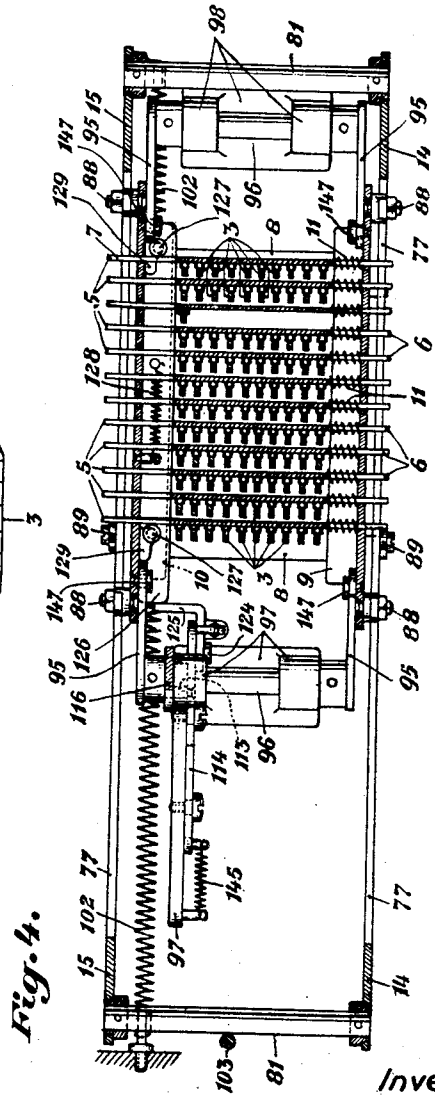


Fig. 4.

Inventor:
Otto Barthelmes,
Bailey & Parson
Attorneys

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ACCOUNTING MACHINE

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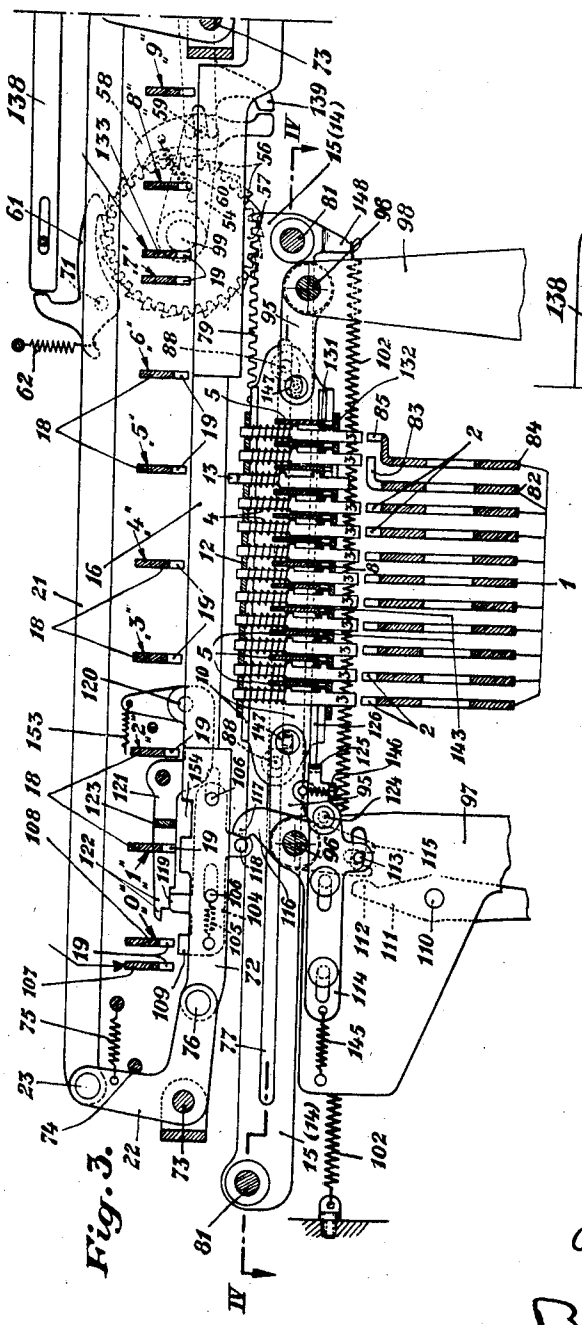


Fig. 3.

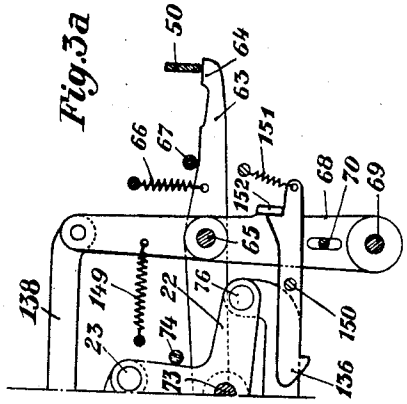


Fig. 3a

Inventor:
Otto Barthelmes,

Bailey & Carson
Attorneys

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UNITED STATES PATENT OFFICE

2,330,543

ACCOUNTING MACHINE

Otto Barthelmes, Zella-Mehlis, Thuringia, Germany; vested in the Alien Property Custodian

Application July 8, 1940, Serial No. 344,418
In Germany July 6, 1939

18 Claims. (Cl. 197—19)

My invention relates to an accounting machine of the type in which a number comprising a plurality of denominations is represented by a set of differential members, for instance, racks and is recorded by a single typewriting unit including a single set of type bars under control of the differential members digit by digit. The typewriting unit is provided with the customary paper carriage advanced step by step under control of an escapement so that the digits of which the number is composed are typed one after the other along a line. Compared with accounting machines of the ordinary type in which all of the denominations of the number are printed simultaneously by a group of type carriers each having a full set of types, the kind of machine to which my invention relates offers the advantage of a material simplification of the printing means since the number of types required is reduced to a minimum irrespective of the capacity of the machine. The elimination of type carriers carrying a full set of type materially reduces the load imposed on the denominational members, such as the racks of the accounting mechanism, so that the mass to be set in motion is minimized, whereby the speed of the accounting operation may be materially increased.

A further advantage resides in the simple possibility of equipping the typewriting unit with letter type bars for typing text in the same line with the numbers at a common printing point.

Moreover, a larger number of carbon copies may be made by the use of a typewriting unit and a better aligriment of the imprints is obtainable.

In prior machines of this kind, however, these advantages are largely offset by the disadvantage that the printing operation requires a longer period of time than in accounting machines in which all of the denominational digits are printed simultaneously. It is the primary object of my invention to so modify machines of the type including a typewriting unit that this disadvantage is compensated.

More particularly, it is the object of my invention to provide storing means into which the figure to be typed is transferred from the differential members and which then control the typewriting unit so that the differential members may continue their computing operation while the typing of the number proceeds.

Further objects are to provide simple storing means for this purpose which are reliable in operation and require but a limited space within the machine; to provide improved timing means for the trying operation ensuring that the next type bar will not be actuated before the preceding type bar has completed its work; to provide simple means for locking the storing elements and for causing the same to actuate the typewriting unit.

My invention is applicable to accounting machines of all kinds, particularly to ten key-controlled machines for all four species of calculation, to cash registers, record card-controlled accounting machines and the like in which a group of denominational members, such as racks, controlling the storing means may represent totals, sub-totals, results, products, items or the like.

A preferred embodiment of my invention is illustrated in the accompanying drawings in which

Fig. 1 is a vertical section through the machine, the frame thereof and the accounting mechanism having been omitted,

Fig. 1a is a continuation of Fig. 1 looking the right.

Fig. 2 is the section taken along line 2—2 of Fig. 1;

Fig. 3 is the section taken along line 3—3 of Fig. 1, the storing mechanism being in its initial position; and

Fig. 3a is a continuation of Fig. 3 looking to the right.

Fig. 4 is the section taken along line 4—4 of Figs. 1 and 3.

Before explaining the details of the machine, a brief résumé of its design and function will be given.

The machine which may be an accounting machine or cash register of any desired type or a calculating machine capable of all four species of calculation, is so designed as to represent the figures to be recorded, such as totals, subtotals, results, products or items, by a group of differential members, particularly of racks, each denominational unit of the accounting machine including one such rack. A storing mechanism is coordinated to these racks. The figure set up in the racks may be transferred to this storing unit which is preferably formed by a pin box including a plurality of rows of pins which are individually coordinated to the racks being mounted thereabove. Prior to the typing operation the pin box is lowered to cause the storing pins to engage the racks, whereby the pins corresponding to the digits of the number are lifted and are locked. Then, the pin box is raised to disengage the pins and the racks so that the latter are free

during the following typing operation to perform an independent operation, for instance, a resetting movement or an accounting movement. Hence, the typing operation takes place independently of the computing operation coincidentally therewith so that the extended period of time required to type the figure digit by digit does not necessitate a pause in the operation of the computing mechanism. When the storing device has been set up, a controlling device is put in operation which is driven step by step to establish a cooperative relationship between the typewriting unit and one denominational storing section after the other beginning with the storing section of the highest denomination. This controlling device is preferably operative through the intermediary of the pins lifted to recording position to actuate members selecting the digit type bars of the type-writing unit. The typewriting unit is preferably power-driven by a continuously rotating snatch roller. From this snatch roller the stepwise motion of the controlling device, is derived. These mechanisms will now be described in detail.

The differential members

In the embodiment of my invention illustrated in the drawings, the differential members comprise horizontal racks 1, 82 and 84, a section of which is shown in Fig. 3. These racks serve to actuate a suitable accounting mechanism of any desired kind, such as one or more totalizers. They may be set up from accounting keys 44 in accordance with the items to be introduced into the accounting machine or they may be set up by the totalizers to represent subtotals, products or the like, each rack assuming a position representative of a denominational digit. Each rack has a slot 140 and is slidably guided thereby on a bar 141 attached to the frame of the machine. The racks are kept in spaced parallel relationship by a comb 142 attached to this bar.

The upper edge of each rack 1, 82 or 84 has a projection 2 serving to transfer the digit set up therein to suitable storing means. In the instant case the accounting machine comprises nine denominational units including two units for tenths and hundredths. These two latter denominational units include the racks 82 and 84.

The projections 83 and 85 provided at the upper edges of these racks are offset as shown in Fig. 3 for a purpose to be explained hereinafter.

Storing device

Above the group of racks a storing device in form of a pin box is mounted. The frame of the pin box comprises two superimposed horizontal perforated plates 8 and 12 interconnected by side plates 9 and 10. In the holes of the plates 8 and 12 vertical storing pins 3 are guided. Each denominational unit of the machine includes one row of ten pins 3 positioned above the coordinated rack corresponding to the ten digits. As will appear from Fig. 4, the pins have a flat cross-section each being provided at its right-hand edge with a shoulder 132 which normally rests on the lower plate 8 of the pin box. Between another shoulder provided between the two plates of the pin box and the upper plate 12 thereof a helical spring 4 is inserted surrounding the pin and tending to press the same downwardly.

Each pin is adapted to be locked in lifted position. To this end, locking plates 5 are mounted in the pin box being interleaved with the rows of pins, each locking plate being positioned to the right of the coordinated row of pins with reference to Figs. 2, 3 and 4. Each locking plate is mounted in upright position having downwardly extending projections 143, Fig. 1, normally resting on the plate 8 and a plurality of projections 131 bent towards the left and extending slightly above plate 8. The projections 131 are in registry with the storing pins 3 and adapted to engage below the shoulders 132 thereof. Each locking plate is movable in its longitudinal horizontal direction and is normally urged by a helical spring 11 to a locking position in which its hook-like projections 131 may engage below the shoulders 132 of the storing pins and in which a shoulder 130 of the locking plate contacts with a releasing slide 126. This slide extends horizontally transversely of all of the locking bars and is guided for longitudinal movement on bolts 127 projecting from the bottom of the pin box. As shown in Fig. 4, the bolts 127 extend through cam slots 129 of the slide 126. This has the effect that a displacement of the slide 126 from its initial position towards the right with reference to Fig. 4 causes the slide 126 to push against the shoulders 130 of the locking plates 5 thereby shifting the hook-like projections 131 thereof laterally cut of registry with the storing pins releasing the same. Hence, the slide 126 constitutes a releasing member, whereby all of the pins that may be locked are released at the same time.

Each locking plate 5 has two coaxial longitudinally projecting arms 6 and 7 slidably guided in vertical guide slots 144 of the side plates 9 and 10 of the pin box. By means to be explained hereinafter these arms 6 and 7 may be lifted. By the consequent upward motion of the locking plate such storing pin 3 whose shoulder 132 engages over a hook 131 of the locking plate will be raised while the other storing pins 3 remain in their normal position.

The releasing slide 126 is resiliently held in its resting position by a spring 128, Fig. 4, and may be actuated contrary to the action of this spring by a pawl 125 shown in Figs. 3 and 4 which is pivotally mounted on a horizontal pivot 124 attached to a slide 114. This slide is horizontally guided on a bracket 97 of the frame and is held in normal position by a spring 145. It has a shoulder 146 normally engaged by the pawl 125 under the action of a restoring spring. Moreover, the slide 114 has a pin 113 extending into the path of an arm 112 of a double-armed lever 111 pivotally mounted on a pivot 110 extending from the bracket 97.

The pin box is guided for vertical reciprocation. To this end, its side walls 9 and 10 have projecting bolts 147 (Fig. 4) engaged by slots provided in horizontal arms 95 of two shafts 96 which are journalled in brackets 97 and 98 of the frame. The lower bottom plate 8 of the pin box has a downwardly extending flange at its front from which two horizontal pins 155 project forwardly. In front of the pin box a horizontal shaft 157 is mounted in the frame of the machine having two rearwardly extending arms 156 and a forwardly extending arm 159. While the latter is equipped with a following roller engaging a cam 160, the two arms 156 carry a channel bar 161 engaging over the two pins 156. When the cam 160 revolves, the pin box 8, 19, 12 is reciprocated downwardly from the position shown in Fig. 1 and then upwardly again.

As soon as the differential members 2, 83, 85 have been set up to the figure to be recorded,

the lever 111 is rocked in clockwise direction with reference to Fig. 3. This has the effect of shifting the slide 114 and of pushing the pawl 125 carried thereby against the releasing slide 126, whereby all of the locking plates 5 are released. Therefore, all of the storing pins 3 are returned by their restoring springs 4 to normal position in which their projections 132 engage the bottom plate 8 of the pin box. Then, the cam 160 is rotated in clockwise direction with reference to Fig. 1, whereby the pin box is lowered. During the downward motion of the pin box those storing pins 3 which are in registry with the projections 2, 83 and 85 engage therewith and cannot partake in the continued downward motion of the pin box and of the locking plates carried thereby. In the course of the continued downward motion of the pin box the releasing slide 126 mounted therein will slip off the pawl 25 and is then restored by its spring 128 towards the left with reference to Figs. 2, 3 and 4 so as to release the locking slides 5. Hence, these locking slides will be moved by their springs 11 laterally to the position in Fig. 1 in which their hook-like projections 131 engage below the shoulders 132 of those storing pins 3 as were retained by the differential members. The projections 131 of the locking plates engage above the shoulders 132 of the other pins 3 which partook in the downward motion.

Further rotation of the cam 160 elevates the pin box to its initial position. During this upward motion of the pin box the slide 126 mounted thereon engages the pawl 125 from below and rocks the same contrary to the action of its spring about the pivot 124. The lever 111 is returned to its initial position after the pin box has been raised and permits the slide 114 to be restored by its spring towards the left. The pawl 125 carried along by the slide 114 slips off the slide 126 rocking to a position in front thereof in which it is ready to actuate the releasing slide 126 in the following cycle of operation. The pin box has now been returned to the position illustrated in Fig. 3 in which those pins 3 are lifted, however, which correspond to the digits of the figure to be printed.

It will be noted from Figs. 3 and 4 that there is no row of pins above the differential rack 82 since the projection 83 thereof is offset laterally acting on an adjacent row of pins. The space which could accommodate the missing row of pins contains but a single pin 13 serving the purpose of printing a mark, such as a comma or a period at the decimal point between the units digit and the tenths digit. The upper end of pin 13 is offset rearwardly, as will appear from Fig. 1, and bears upon the top plate 12 of the pin box thus holding the pin always in raised position ready to actuate the selecting member coordinated to the type bar for printing the decimal mark.

Device controlling the typewriting unit

Parallel horizontal bars 16, 72 extend above the pin box at right angles to the differential racks 1, 82 and 84. These bars are selecting members which are individually correlated to the type bars. If one of these selecting members is raised, it causes the power-driven mechanism of the typewriter unit to actuate the selected type bar. In Fig. 1 the selecting bar 16 at the rear of the machine is that coordinated to the decimal mark type bar. The adjacent selecting bar 72 is correlated to the zero type bar. As will be explained later, the member 72 is also adapted to space the paper carriage of the typewriting unit without actuating any type bar. The following nine bars 16 are correlated to the type bars of the digits 1 to 9.

Each of these bars is mounted for vertical reciprocation parallel to itself. For this purpose, the ends of each bar are connected with horizontal arms of two bellcranks 22 which are pivotally mounted on shafts 73 attached to the frame of the machine. The upright arms of these bellcranks are interconnected by a connecting rod 21.

The controlling device serves the purpose of successively establishing a cooperative relationship between the set of type bar selecting members 16, 72 and the different denominations of the storing mechanism. I prefer to establish this relationship by lifting the locking plates 5 one after the other beginning with the plate 5 of the highest denomination. Each plate, if lifted, elevates the pin 3 which it locks in lifted position and presses it upwardly against the selecting bar 16 or 72 positioned thereabove, whereby the actuation of a type bar is initiated.

In the present embodiment the device controlling the typewriting unit comprises two horizontal parallel rods 14 and 15 which, as shown in Fig. 4, are interconnected by transverse rods 81 to constitute a rigid frame. The rods 14 and 15 are provided with longitudinal slots 77 having the shape illustrated in Fig. 2. They constitute slidable cams, as will appear hereinafter, and are guided for longitudinal movement on bolts 88 fixed to the side plates 9 and 10 of the pin box and extending through the straight end sections of the slots 77, whereby the rods 14 and 15 are guided on the pin box for transverse motion within the machine. The arms 6 and 7 of the locking plates 5 extend through these slots 77. The upper walls of the slots 77 are recessed at 78 providing inclined shoulders. Suitable means are provided on the rods 14 and 15 to form complemental shoulders acting as cams which upon longitudinal motion of the rods 14 and 15 act on the arms 6 and 7 of the locking plates 5 and lift and lower the same. If the rods 14 and 15 are moved from the position shown in Fig. 2 step by step towards the right, their cam faces will engage and lift the locking plates one after the other beginning with the locking plate of the highest denomination and proceeding towards the locking plate of the lowest denomination. In its initial position the transverse rod 81 of the controlling device abuts against a rigid stop 103 (Fig. 4) attached to the frame of the machine while a restoring spring 102 having its one end anchored to the frame of the machine and its other end attached to a hook 143 of the rod 15 is strained. For the purpose of moving the controlling device step by step, the upper edge of the rod 15 is provided with rack teeth engaging with a gear 57 rotatably mounted on a pivot 99 of the frame of the machine. A ratchet wheel 56 is attached to the gear 57 and is engaged by two pawls, a holding pawl 61 and a ratchet pawl 58. The holding pawl is pivoted on a pin 71 attached to the frame of the machine and is resiliently held in engagement with the ratchet wheel by a spring 62. It has an upper arm extending into the path of a slide 138 which is slidably guided on the frame of the machine by a pin and slot and serves the purpose of releasing the holding pawl 61 when the controlling device is to be returned to its initial position.

The ratchet pawl 58 is pivoted on a pin 59 laterally projecting from a lever 54 which is swingably mounted on the pivot 99 and is connected with the ratchet pawl 58 by a spring 60.

The lever 54 carrying the ratchet pawl can be actuated by the power-driven means actuating the typewriting unit. To this end, the pin 59 is engaged by the bifurcated left arm of a double-armed lever 63. The right-hand arm 64 of this lever can be moved into the path of a horizontal lever 50 extending fore and aft in the machine and rocking about a horizontal shaft 49 fixed to the frame of the machine, as will appear from Fig. 1. The forwardly extending arm of the lever 50 carries a follower 51 which engages a cam 52 and is held in engagement therewith by action of a spring 66 which is expanded between the frame and the arm 64 of lever 63. The cam 52 is fixed on a continuously rotating power-driven shaft provided with longitudinal teeth to act as a snatch roller. The cam is provided with rises 53 of a special profile which will be described later. This cam imparts a rocking motion to the lever 50. As soon as the lever 63 is moved into the path of lever 50, it will actuate the ratchet mechanism and will thus advance the controlling unit step by step to control the typing operation.

The pivot 65 of the lever 63 is carried by an upright arm 68 pivotally mounted on a pin 69 fixed to the frame of the machine and provided with a slot which is engaged by an actuating member 70 of the accounting mechanism. As soon as the storing pin box has reached its upper position under action by the cam 160, the actuating member 70 moves towards the right rocking arm 68 to the position shown in Fig. 3. The means for actuating the member 70 do not form part of my invention and, for this reason, have not been described. As far as my invention is concerned it would not make any difference if the actuating member 70 were operated manually at the proper instant.

A spring 149 tends to restore arm 68 to its initial position but the arm is arrested against the action of the spring by a latch 136 mounted on a pin 150 attached to the frame of the machine and subject to a spring 151 causing the latch to snap behind an ear 152 of the arm 68 as soon as the same is brought to the position shown in Fig. 3. The rod 138 mentioned hereinabove and serving to disengage the holding pawl 61 for the resetting of the storing mechanism is linked to the upper end of arm 68. Moreover, the bifurcated arm of the lever 63 has a downward extension 139 located adjacent to the lower arm of the ratchet pawl 58.

When the controlling device performs the last step of its intermittent motion, its transverse rod 81 will engage a slanting face provided on the end of latch 136 camming the same upwardly and thus disengaging it from the arm 68. Consequently, the arm is rocked by its spring 149 in anti-clockwise direction with reference to Fig. 3 thus performing three functions: First, the holding pawl 61 is disengaged by the rod 138. Secondly, the bifurcated arm of lever 63 slides on the pin 59 until its projection 139 engages the ratchet pawl 58 rocking the same to disengaged position. Hence, the controlling device is no longer arrested by its ratchet mechanism and is returned by its spring 102 to the initial position shown in Fig. 4. Thirdly, the arm 64 of the lever 63 is withdrawn from the path of the continuously oscillating lever 50 and will cease to operate until arm 68 is rocked again to the position shown in Fig. 3.

By deriving the operation of the ratchet mechanism for the stepwise motion of the controlling device from the same shaft 43 which actuates the type bars 37 of the typewriting unit, proper actuation of the selected type bar is ensured before the controlling device proceeds to its next position. If desired, means may be provided which positively prevent the controlling device from continuing its stepwise movement before the actuation of the selected type bar has taken place. To this end, a lock may be provided preventing the holding pawl 61 from engaging the ratchet wheel until the selected type bar 37 has struck the paper platen 47 and has actuated the universal bar controlling the paper carriage escapement of the typewriting unit in the customary manner. The lock which is diagrammatically represented in Fig. 1 by the rectangle 200, is released by the universal bar of the typewriting unit. If the type bar fails to operate properly, the holding pawl 61 is kept out of engagement with the ratchet gear permitting the controlling device upon downward motion of the ratchet pawl 58 to return to the left under action of its restoring spring 102. Hence, on the following step the controlling device will act again on the same locking plate 5 attempting to operate the type bar a second time. This attempt will be repeated until the type bar is properly actuated and permits the associated universal bar to release the holding pawl 61 for engagement.

The customary universal bar which is actuated by the type levers 37 just before the same strike the paper platen 47 is diagrammatically indicated at 203. It is mounted in such a manner as to be rockable about pivots 204 and is connected with the lock 200 by a pull rod 205. When the universal bar 203 is rocked, it will, therefore, disengage the lock releasing the pawl 61 for engagement with the ratchet 56.

The platen 47 is mounted on the conventional paper carriage 206 mounted to travel on suitable rails, such as 207. The letter-feed travel of the carriage is controlled by the usual mechanism comprising escapement dogs 208 cooperating with an escapement wheel 210 driven by a pinion 211 running in mesh with a carriage rack 212. The escapement pawls 208 are adapted to be actuated by the universal bar 203 through a suitable push link 209. Hence, actuation of the universal bar 203 has the dual function of letter-spacing the carriage 206 of the typewriting machine and of releasing the pawl 61 for engagement with the ratchet wheel 56.

It is desirable that the sliding cams 14, 15 should be disabled when returning to the initial position under action of the spring 102. For this purpose, the cam face 155 of each sliding cam may be formed by a wipe pawl 89 pivotally mounted on a pin 90 projecting from the rod 14 or 15 and held by a spring 91 in the normal position shown in Fig. 3 is which an ear of the wipe pawl engages a projection of the sliding rod. When the sliding rods return to the left, the pawl is free to rock in clockwise direction contrary to the action of its spring 91 anchored to a pin 92 of the rod 14 or 15. The springs 91 are so dimensioned that their effect cannot overcome the combined power of the springs 4 acting on the storing pins. Therefore, the wipe pawl 89 is unable to lift the locking plates during the return motion of the slidable cams.

The fact that the stepwise motion of the con-

trolling device is derived from the continuously rotating shaft 48 guarantees that within the period between two consecutive steps, the power-driven shaft may perform an angular motion sufficient for actuating the selected type lever. Experience has shown that half a revolution is sufficient for this purpose. For this reason, the cam 53 is provided with two high spots. Each of these high spots is formed with two rises connected by an intermediate dwell. The first rise produces the first half step of the controlling device and the second rise completes the step. During the first half step, the wipe pawl 89 will lift the locking plate 5 which it engages. As soon as it stands below this locking plate, the dwell of the cam engages the follower of lever 50 holding the same temporarily in elevated position for a period sufficient to initiate the type bar actuation. Upon expiration of this period only the second rise of the cam 53 becomes effective and further moves the pawl 89 past the locking plate 5 allowing the same to drop to normal position. Thus, the interruption of the stepwise motion ensures proper actuation of the type bar in a manner now to be described.

Typewriting unit

The typewriting unit is well known in the art and, therefore, need not be described in detail. For the same reason, I have not shown the type bar basket mounted therebelow and containing the pivot wire 38 on which the type bars 37 are journalled.

The type bars are actuated from a power-driven continuously revolving snatch roller 48. To this end, an actuating lever 40 is coordinated to each type lever. It is mounted on a pin 34 attached to the frame of the machine and its upper end carries a laterally projecting pin 39 engaging a cam slot of the type bar. Clockwise rocking of lever 40 about its pivot 34 will actuate the type bar. For rocking lever 40 an arm 28 is hinged thereto at 33 and is provided with a head positioned above the snatch roller 48. A spring 31 tends to hold arm 28 in resting position against a stop bar 32. Arm 28 has a lateral ear 30, however, at which it may be pulled downwardly. If that happens, teeth 29 provided at the bottom of its head will come to engagement with the rotating snatch roller and arm 28 will be pulled forwardly thereby, thus actuating the type bar. Just before the type bar strikes the paper platen, a projection 101 of the head of arm 28 will engage an adjustable stop 136 in the course of its forward movement. As a result, the arm 28 continuing its forward movement under the momentum of the actuated type bar will slide on the stop 136 being cammed upwardly until it disengages the snatch roller. When the type bar rebounds from the paper platen, the arm 28 will be returned by its spring 31 to the illustrated position.

For the purpose of accurate adjustment, the stop 136 is provided with a threaded stem 134 and is held in adjusted position by a resilient detent 135 attached to the frame bar in which the threaded stem 134 is screwed. The resilient detent 135 engages serrations of the stop 136 holding the same in adjusted position.

The ear 30 of the arm 28 is engaged by a pawl 27 which in its turn is connected with a lever 18 by a slot, a pin 26 and a spring 35. The lever 18 is pivotally mounted on a frame bar 100 being kept in engagement therewith by a spring 41 and has a rearward arm extending above the coordinated selecting bar 16 or 72, and has a lower tooth 19 directly above the selecting bar. When the lever 18 assumes its normal position shown in Fig. 1, it engages the coordinated selecting bar under the action of a spring 42. When the lever 18 is rocked, it pulls pawl 27 and arm 28 down, whereby the type bar is actuated.

The first rise of the cam 53 is so correlated to the teeth of the snatch roller 48 that it will step forward the controlling device and will thereby cause depression of a lever 18 at the instant at which the lower tooth 29 just passes an interdental space of the snatch roller 48 so that it may fully engage the same.

The levers 18 may be rocked alternatively either by the selecting members 16, 72 or by manually operable key levers. The key levers 24 are likewise mounted on the frame bar 100 being held in engagement therewith by springs 41. They are provided with lateral ears 25 which engage over forward arms 20 of the levers 18. Hence, the keys will remain at rest when the levers 18 are rocked by the controlling device.

Moreover, a space key 45 is provided carried by a key lever likewise mounted on the bar 100. This space key lever is adapted to rock a lever 107 (Fig. 3) which is similar to the levers 18 extending above the selecting bar 72 and being provided with a tooth 19 thereabove. Oscillation of lever 107, however, will not cause any type bar to be actuated but will actuate the escapement of the paper carriage, whereby the paper platen 47 will be spaced one step in a known manner.

Mechanism for preventing zero printing at the left of the highest significant digit

Means are provided for preventing the printing of zeros at the left of the highest significant digit. For this purpose, a slide 104 is shiftably mounted on the selecting bar 72 for the actuation of the zero type bar and of the spacing member 107. The slide 104 is provided with a projection 109 which may be selectively brought to registry either with the lever 108 actuating the "0" type lever or with the spacing member 107.

The slide 104 is horizontally guided on the selecting bar 72 by pins 106 and slots and is resiliently held in its normal position shown in Fig. 3 by a spring 105. In this position the projection 109 of the slide 104 is located below the actuating lever 108 of the "0" type bar. When the selecting bar 72 is lifted during the typing operation which is the case at those denominational units in which the zero storing pin is lifted, the power actuation of the zero type bar is tripped. At the beginning of the typing operation, however, the slide 104 is in abnormal left position in which its projection 109 is positioned below the spacing lever 107. In this position, it is locked by a pivotal locking frame 121. This frame comprises two side plates rockably mounted on pins 120 of the frame of the machine at both sides of the group of selecting bars 16, 72 and interconnected by a transverse bar 123. A spring 153 is attached to an upwardly extending arm of the frame 121 and tends to swing the same downwardly.

It will be remembered that the slide 114 carries a pin 113 and is shifted towards the right with reference to Figs. 3 and 4 when the storing pin box is being set up. This pin 113 engages the lower bifurcated arm 115 of a lever 116 freely swingable on the shaft 96 and provided with an upper arm 117 engaging a projecting pin 118 of the slide 104 from the right.

Hence, the slide 104 is shifted to its abnormal

left-hand position coincidentally with the setting of the pin box. A shoulder 122 of the locking frame 121 will then engage behind the projection 119 of the slide 104 and will arrest the same in abnormal position. This has the effect that in the subsequent typing operation the space member 107 will be actuated whenever a zero storing pin 3 lifts the selecting bar 72, so that the paper carriage of the typewriting unit will be spaced without any printing operation. As soon, however, as the controlling device encounters a locking plate locking a pin representing a significant digit, one of the selecting members 16 will be lifted and will engage the transverse bar 123 of the locking frame 121 releasing the same so that the slide 104 may return to the position shown in Fig. 3. Any subsequent actuation of the selecting bar 72 by a zero pin 5 will result in an actuation of the zero type bar since the selecting bar 72 will now raise the lever 108.

The selecting bar 72 is recessed below the transverse rod 123 as shown at 154 and, therefore, cannot release the locking frame 121.

Mode of operation

The operation is as follows: During the accounting operation the cam 160 is in the position shown in Fig. 1 and permits the pin box to remain in its upper position. As soon as a figure has been set up in the racks 1, 82 and 84 and is to be recorded, the lever 111 is rocked by suitable means (not shown) in clockwise direction. Then, the cam 160 is rotated to lower and to lift the storing device, whereupon lever 111 is returned to initial position. By this operation the denominational digits of the figure are transferred into the storing device. At the same time, the slide 104 of the selecting member 72 is set to its space member actuating position. Substantially at the instant at which lever 111 is returned to its normal position, the arm 68 is rocked from its normal position to its operative position shown in Fig. 3 in which it is locked by the latch 136. This operation initiates the stepwise motion of the controlling device. This stepwise motion is produced by oscillation of the ratchet pawl 58 derived from the continuously rotating power-driven shaft 48. The stepwise motion of the slidable cams 14, 15 will successively lift the locking plates 5. Since the projection 131 of each locking plate engages below the shoulder 132 of the pin 3 corresponding to the digit set up, it lifts such pin and presses it against the selecting bar 16 or 72 thereabove. This bar in its turn rocks the lever 18 or 108 or 107. Consequently, a spacing operation takes place or the arm 28 of the associated type bar will be pulled down and will be engaged and actuated by the snatch roller 48 actuating the type bar 37. At any half revolution of the snatch roller 48 the controlling device is moved one step and one type bar is actuated. After all of the type bars corresponding to the pins 3 and 13 have been actuated successively, at last that of the lowest denomination, the bar 31 of the controlling device releases the latch 136 allowing arm 68 and the controlling device to return to their initial position. They will remain in this position until the next typing operation is required.

I have not shown any means for actuating the lever 111, the member 70 and the cam 160; but, as stated hereinabove, these means do not form part of the present invention. In fact, it would not make any difference with regard to the functions described hereinabove if these elements were moved by hand.

While I have described a preferred embodiment of my invention I wish it to be clearly understood that the same is not limited to the details thereof but is capable of numerous modifications within the scope of the appended claims.

What I claim is:

1. In an accounting machine, the combination comprising a plurality of denominational units each including a differential member and a storing device movable into engagement with said differential member to be set up in accordance with the value represented by the position thereof and movable out of engagement with said differential member, a single typewriting unit including a single set of type bars and a single set of type bar selecting members, a controlling device cooperatively coordinated to said typewriting unit and said storing devices and adapted to cause one of said storing devices at a time to actuate one of said type bar selecting members, while said storing devices are out of engagement with said differential members, and means for moving said controlling device to successive engagement with said storing devices, whereby the digits set up in said denominational units are typed successively by said typewriting unit under control of said storing devices.

2. In an accounting machine, the combination comprising a plurality of differential members each representing a digit by its position, a pin box having a plurality of rows of pins, one row for each of said differential members, means for bringing said pin box and said differential members into and out of mutual engagement to set up the pins in accordance with the value represented by said differential members, a single typewriting unit including a single set of type bars and a single set of type bar selecting members, a controlling device adapted to cause the set pin of one of said rows at a time to actuate one of said set of type bar selecting members, while said pin box is out of engagement with said differential members, and means for moving said controlling device to successive engagement with said rows of pins, whereby the digits set up therein are typed successively by said typewriting unit.

3. In an accounting machine, the combination comprising a plurality of differential members each representing a digit by its position, a pin box having a plurality of rows of pins in registry with said differential members, one row for each of said differential members, means for reciprocating said pin box towards and away from said differential members into and out of engagement therewith to set up the pins in accordance with the value represented by said differential members, a single typewriting unit including a single set of type bars and a single set of type bar selecting members extending above said pin box at right angles to said differential members, a controlling device adapted to reciprocate the set pin of one of said rows of pins at a time towards and away from said set of type bar selecting members, while said pin box is out of engagement with said differential members, and means for moving said controlling device to successive operative positions with regard to said rows of pins, whereby the digits set up therein are typed successively by said typewriting unit.

4. In an accounting machine, the combination comprising a plurality of denominational units each settable to represent a digit, a single

typewriting unit of the kind equipped with a single set of type bars, with a paper carriage, with a carriage escapement, and with a power-driven member for actuating said type bars, a device adapted to cause one of said denominational units at a time to control said typewriting unit to type the digit set up in said denominational unit, driving means for moving said device to successive engagement with said denominational units, and means driven by said power-driven member independently of said escapement and actuating said driving means.

5. In an accounting machine, the combination comprising a plurality of differential members each representing a digit by its position, a pin box having a plurality of rows of pins in registry with said differential members, one row for each of said differential members, a plurality of locking plates mounted in said pin box and interleaved with said rows of pins and adapted to lock the same in actuated position, means for reciprocating said pin box towards and away from said differential members into and out of engagement therewith to set up the pins in accordance with the value represented by said differential members, a single typewriting unit including a single set of type bars and a single set of type bar selecting members extending above said pin box at right angles to said differential members, a controlling device adapted to reciprocate one of said locking plates at a time towards and away from said set of type bar selecting members causing the pin locked by said plate to actuate one of said selecting members, while said pin box is out of engagement with said differential members, and means for moving said controlling device to successive engagement with said locking plates, whereby the digits set up in said rows of pins are typed successively by said typewriting unit.

6. In an accounting machine, the combination comprising a plurality of differential members each representing a digit by its position, a pin box having a plurality of rows of pins in registry with said differential members, one row for each of said differential members, a plurality of locking plates mounted in said pin box and interleaved with said rows of pins and adapted to lock the same in actuated position, each of said locking plates being movable within said pin box in the direction of said pins to lift the same and at right angles to said pins to release the same, means for reciprocating said pin box towards and away from said differential members into and out of engagement therewith to set up the pins in accordance with the value represented by said differential members, a single typewriting unit including a single set of type bars and a single set of type bar selecting members extending above said pin box at right angles to said differential members, a controlling device adapted to lift one of said locking plates at a time towards said set of type bar selecting members causing the pin locked by said plate to actuate one of said selecting members, while said pin box is out of engagement with said differential members, means for moving said controlling device to successive engagement with said locking plates, whereby the digits set up in said rows of pins are typed successively by said typewriting unit, and a releasing member mounted in said pin box and movable to engage said locking plates to shift the same to releasing position in which all of the locked pins are released.

7. In an accounting machine, the combination comprising a plurality of differential members each representing a digit by its position, a pin box having a plurality of rows of pins in registry with said differential members, one row for each of said differential members, a plurality of locking plates mounted in said pin box and interleaved with said rows of pins and adapted to lock the same in actuated position, means for reciprocating said pin box towards and away from said differential members into and out of engagement therewith to set up the pins in accordance with the value represented by said differential members, a single typewriting unit including a single set of type bars and a single set of type bar selecting members extending above said pin box at right angles to said differential members, a slidable cam mounted on said pin box and movable at right angles to said pins and to said differential members, said slidable cam being adapted to reciprocate one of said locking plates at a time towards and away from said set of type bar selecting members causing the pin locked by said plate to actuate one of said selecting members, while said pin box is out of engagement with said differential members, and means for moving said slidable cam to successive engagement with said locking plates, whereby the digits set up in said rows of pins are typed successively by said typewriting unit.

8. In an accounting machine, the combination comprising a plurality of differential members each representing a digit by its position, a pin box having a plurality of rows of pins in registry with said differential members, one row for each of said differential members, a plurality of locking plates mounted in said pin box and interleaved with said rows of pins and adapted to lock the same in actuated position, means for reciprocating said pin box towards and away from said differential members into and out of engagement therewith to set up the pins in accordance with the value represented by said differential members, a single typewriting unit including a single set of type bars and a single set of type bar selecting members extending above said pin box at right angles to said differential members, a slidable cam mounted on said pin box and movable at right angles to said pins and to said differential members, said slidable cam being adapted to reciprocate one of said locking plates at a time towards and away from said set of type bar selecting members causing the pin locked by said plate to actuate one of said selecting members, while said pin box is out of engagement with said differential members, means for moving said slidable cam to successive engagement with said locking plates, whereby the digits set up in said rows of pins are typed successively by said typewriting unit, means for restoring said slidable cam, and means for disabling its camming action on said locking plates during its return.

9. In an accounting machine, the combination comprising a plurality of differential members each representing a digit by its position, a pin box having a plurality of rows of pins in registry with said differential members, one row for each of said differential members, a plurality of locking plates mounted in said pin box and interleaved with said rows of pins and adapted to lock the same in actuated position, means for reciprocating said pin box towards and away from said differential members into and out of

engagement therewith to set up the pins in accordance with the value represented by said differential members, a single typewriting unit including a single set of type bars and a single set of type bar selecting members extending above said pin box at right angles to said differential members, a slide mounted on said pin box and movable at right angles to said pins and to said differential members, wipe pawls pivotally mounted on said slide and having cam faces adapted to reciprocate one of said locking plates at a time towards said set of type bar selecting members causing the pin locked by said plate to actuate one of said selecting members, while said pin box is out of engagement with said differential members, means for moving said slide to successive engagement of said wipe pawls with said locking plates, whereby the digits set up in said rows of pins are typed successively by said typewriting unit, and means to restore said slide, the wipe pawls wiping past said locking plates during the return of said slide.

10. In an accounting machine, the combination comprising a plurality of denominational units each settable to represent a digit, a single typewriting unit of the kind equipped with a single set of type bars, with a paper carriage, with a carriage escapement, and with a power-driven shaft for actuating said type bars, a device adapted to cause one of said denominational units at a time to control said typewriting unit to type the digit set up in said denominational unit, a ratchet mechanism for moving said device stepwise to successive engagement with said denominational units, a cam on said power-driven shaft, and means driven by said cam independently of said escapement and actuating said ratchet mechanism.

11. In an accounting machine, the combination comprising a plurality of denominational units each settable to represent a digit, a single typewriting unit of the kind equipped with a single set of type bars with a paper carriage, with a carriage escapement, and with a power-driven shaft for actuating said type bars, a device adapted to cause one of said denominational units at a time to control said typewriting unit to type the digit set up in said denominational unit, a ratchet mechanism for moving said device stepwise to successive engagement with said denominational units, a cam on said power-driven shaft, means driven by said cam independently of said escapement and actuating said ratchet mechanism, and means operable by said device upon completion of its stepwise movement and adapted to disable and release said ratchet mechanism to permit the return of said device to initial position.

12. In an accounting machine, the combination comprising a plurality of denominational units each settable to represent a digit, a single typewriting unit of the type equipped with a single set of type bars, with a paper carriage, with a carriage escapement, and with a power-driven shaft for actuating said type bars, a device adapted to cause one of said denominational units at a time to control said typewriting unit to type the digit set up in said denominational unit, a ratchet mechanism including a ratchet pawl for moving said device stepwise to successive engagement with said denominational units, a cam on said power-driven shaft, a lever driven by said cam and reciprocating said ratchet pawl, and means operable by said device upon completion of its stepwise movement and adapted to disengage said ratchet pawl to permit the return of said device to initial position and adapted to simultaneously disable said lever to discontinue the reciprocation of said ratchet pawl during said return.

13. In an accounting machine, the combination comprising a plurality of differential members each representing a digit by its position, a pin box having a plurality of rows of pins in registry with said differential members, one row for each of said differential members, a plurality of locking plates mounted in said pin box and interleaved with said rows of pins and adapted to lock the same in actuated position, means for reciprocating said pin box towards and away from said differential members into and out of engagement therewith to set up the pins in accordance with the value represented by said differential members, a power-driven typewriting unit including a power-driven shaft and a single set of type bars and a single set of type bar selecting members extending above said pin box at right angles to said differential members, a slidable cam mounted on said pin box and movable at right angles to said pins and to said differential members, said slidable cam being adapted to reciprocate one of said locking plates at a time towards and away from said set of type bar selecting members causing the pin locked by said plate to actuate one of said selecting members, while said pin box is out of engagement with said differential members, a rotary cam on said power-driven shaft, a ratchet mechanism including a ratchet pawl for moving said slidable cam stepwise to successive engagement with said locking plates, and means operable by said rotary cam and adapted to reciprocate said ratchet pawl, said rotary cam being formed with a dwell causing said ratchet pawl to pause on its operative stroke upon arrival in a position in which said slidable cam has advanced a locking plate towards said set of type bar selecting members.

14. In an accounting machine, the combination comprising a plurality of denominational units each including a differential member and a storing device movable into engagement with said differential member to be set up in accordance with the value represented by the position thereof and movable out of engagement with said differential member, a single typewriting unit composed of a set of type bars, of a single set of type bar selecting members including a zero type bar selecting member, of a space member and of power-driven means adapted to be controlled by any one of said selecting members and adapted to actuate a type bar, a controlling device cooperatively coordinated to said typewriting unit and said storing devices and adapted to cause one of said storing devices at a time to actuate one of said type bar selecting members while said storing devices are out of engagement with said differential members, and means for moving said controlling device to successive engagement with said storing devices, whereby the digits set up in said denominational units are typed successively by said typewriting unit, said zero type bar selecting member carrying a movable part adapted to alternatively select the zero type bar or said space member.

15. In an accounting machine, the combination comprising a plurality of denominational units each including a differential member and a storing device movable into engagement with said differential member to be set up in accordance

with the value represented by the position thereof and movable out of engagement with said differential member, a single typewriting unit composed of a single set of type bars including a zero type bar, of power-driven means for the actuation of a selected type bar, of a single set of type bar selecting members including a special member, of a space member and of adjustable means coordinated to said special selecting member and causing the same to alternatively select said zero type bar or said space member for actuation, a controlling device cooperatively coordinated to said typewriting unit and said storing devices and adapted to cause one of said storing devices at a time to actuate one of said type bar selecting members, while said storing devices are out of engagement with said differential members, means for moving said controlling device to successive engagement with said storing devices, whereby the digits set up in said denominational units are typed successively by said typewriting unit, means for normally setting said adjustable means to the space-member selecting position, and means controlled by any one of the other type, bar selecting members and adapted to set said adjustable means to its zero type bar selecting position.

16. In an accounting machine, the combination comprising a plurality of differential members each representing a digit by its position, a pin box having a plurality of rows of pins in registry with said differential members, one row for each of said differential members, a plurality of locking plates mounted in said pin box and interleaved with said rows of pins and adapted to lock the same in actuated position, each of said locking plates being movable within said pin box in the direction of said pins to lift the same and at right angles to said pins to release the same, means for reciprocating said pin box towards and away from said differential members into and out of engagement therewith to set up the pins in accordance with the value represented by said differential means, a single typewriting unit composed of a single set of type bars including a zero type bar, of power-driven means for the actuation of a selected type bar, of a single set of type bar selecting members including a special member extending above said pin box at right angles to said differential members, of a space member and of adjustable means coordinated to said special selecting member and causing the same to alternatively select said zero type bar or said space member for actuation, a controlling device adapted to lift one of said locking plates at a time towards said set of type bar selecting members causing the pin locked by said plate to actuate one of said selecting members, while said pin box is out of engagement with said differential members, means for moving said controlling device to successive engagement with said locking plates, plates, whereby the digits set up in said rows of pins are typed successively by said typewriting unit, a releasing member mounted in said pin box and movable to engage said locking plates to shift the same to releasing position, in which all of the locked pins are released, a member coordinated to said adjustable means and adapted to normally set the same to the space member selecting position and to simultaneously operate said releasing member, and means controlled by any one of the other type bar selecting members and adapted to set said adjustable means to its zero type bar selecting position.

17. In an accounting machine, the combination comprising a plurality of differential members each representing a digit by its position, a pin box having a plurality of rows of pins, one row for each of said differential members, means for bringing said pin box and said differential members into and out of mutual engagement to set up the pins in accordance with the value represented by said differential members, a single typewriting unit including a single set of type bars and a single set of type bar selecting members, a controlling device adapted to cause the set pin of one of said rows at a time to actuate one of said type bar selecting members, while said pin box is out of engagement with said differential members, and means for moving said controlling device to successive engagement with said rows of pins, whereby the digits set up therein are typed successively by said typewriting unit, said pin box being equipped with a pin for actuation of one of said selecting members coordinated to a type bar having a decimal mark type.

18. In an accounting machine, the combination comprising a plurality of denominational units each including a differential member and a storing device movable into engagement with said differential member to be set up in accordance with the value represented by the position thereof and movable out of engagement with said differential member, a single typewriting unit composed of a set of type bars, of power-driven means for actuating a selected type bar, of a set of keys and of a set of type bar selecting members each type bar being alternatively selectable by one of said keys or by one of said selecting members, a controlling device cooperatively coordinated to said typewriting unit and said storing devices and adapted to cause one of said storing devices at a time to actuate one of said type bar selecting members, while said storing devices are out of engagement with said differential members, and means for moving said controlling device to successive engagement with said storing devices, whereby the digits set up in said denominational units are typed successively by said typewriting unit under control of said storing devices.

OTTO BARTHELMES.