

Dec. 21, 1948.

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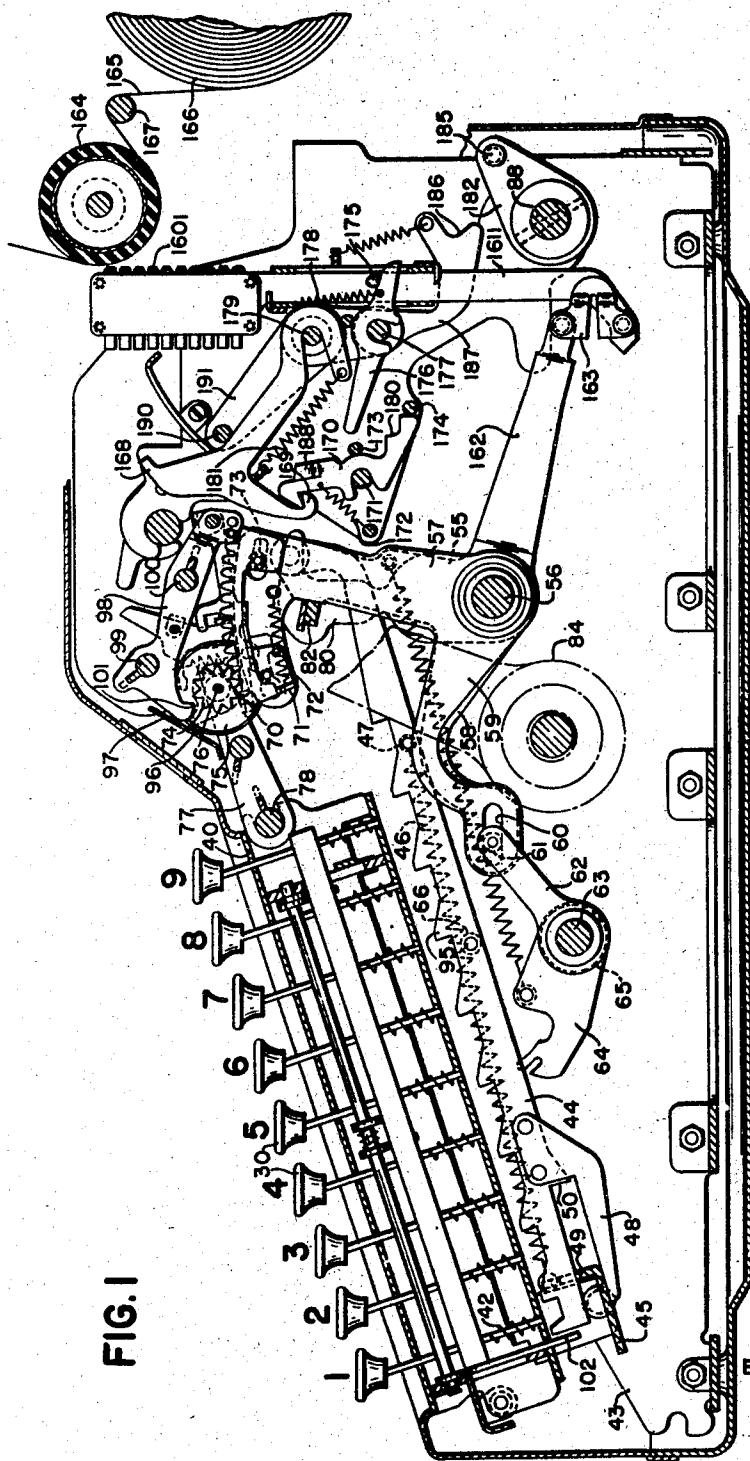
2,457,050

PRINTING MECHANISM FOR ADDING MACHINES

Original Filed April 3, 1945

4 Sheets-Sheet 1

FIG. 1



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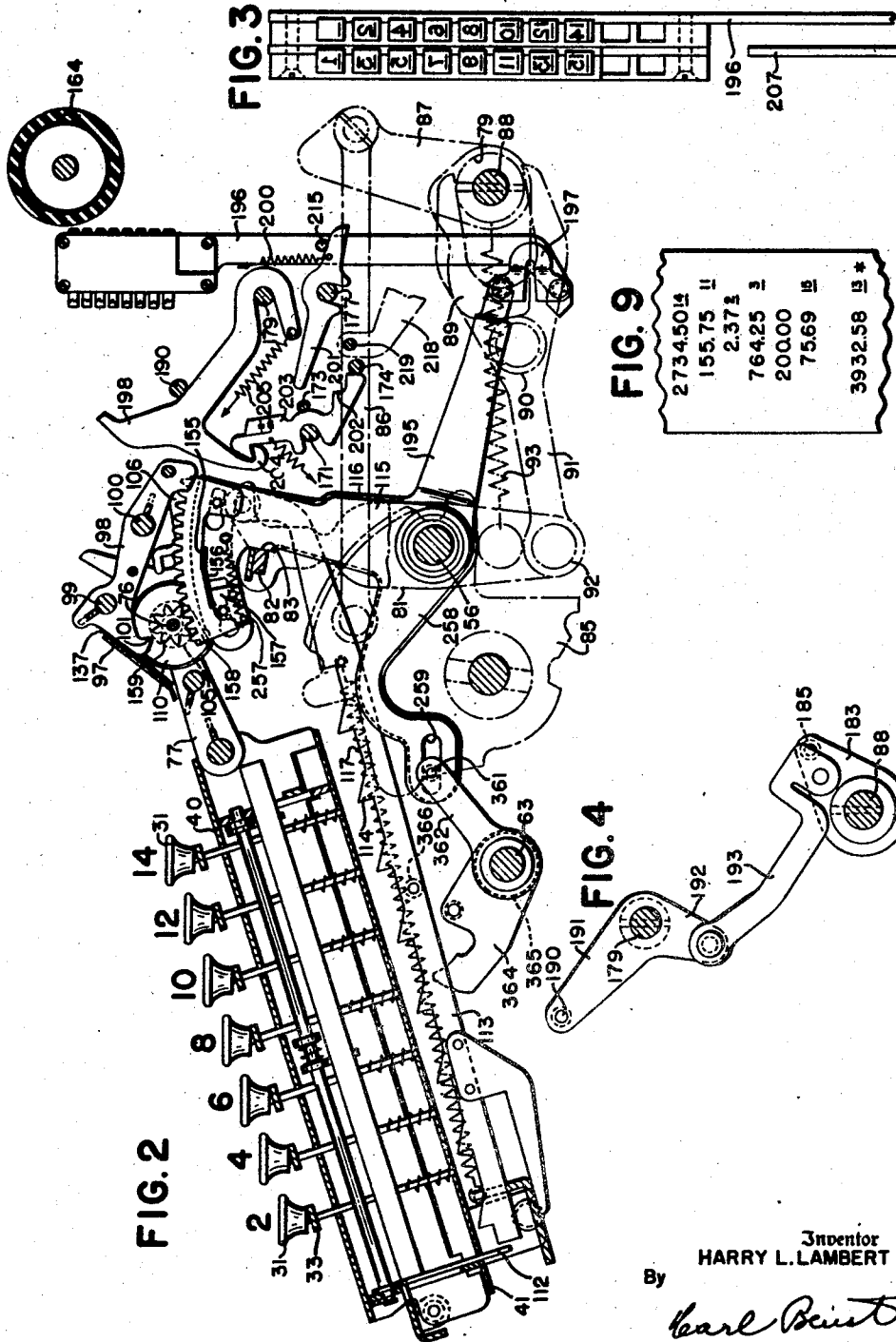
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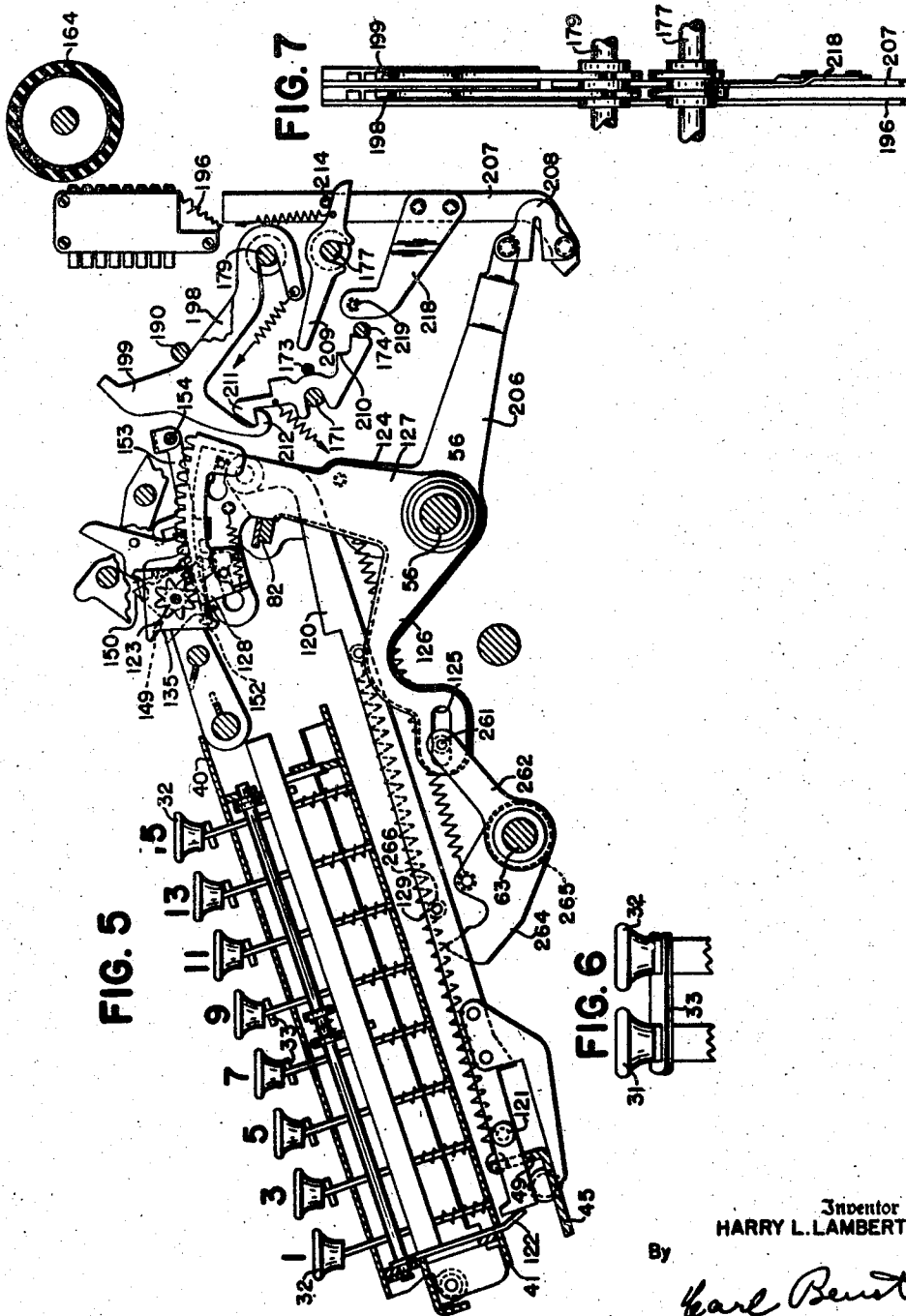
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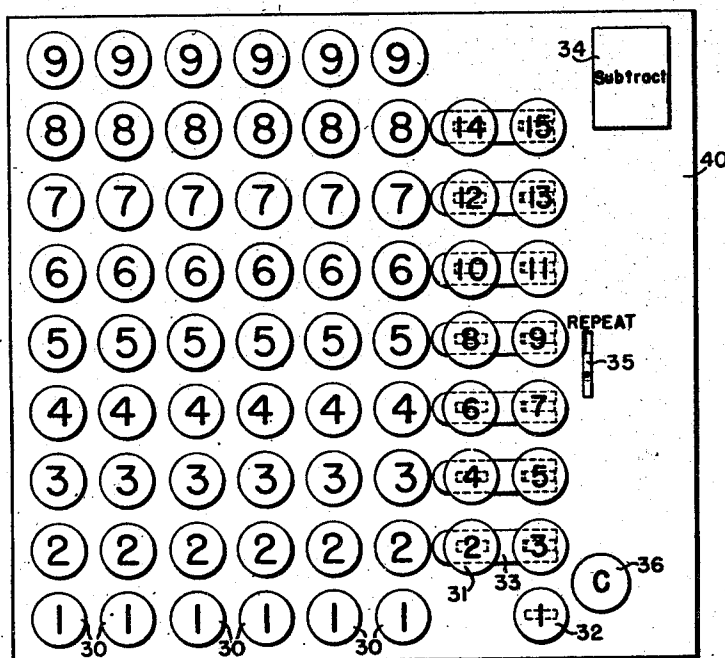
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PRINTING MECHANISM FOR ADDING MACHINES

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FIG. 8



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PRINTING MECHANISM FOR ADDING
MACHINES

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Register Company, Dayton, Ohio, a corporation
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Original application April 3, 1945, Serial No.
586,361. Divided and this application May 10,
1946, Serial No. 668,749

7 Claims. (Cl. 101—93)

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This invention relates to improvements in adding or calculating machines and particularly to the provision of mechanism for entering fractional amounts into a totalizer and for recording such amounts on record material. The present application is a division of my co-pending application Serial No. 586,361, filed April 3, 1945, and entitled "Calculating machine fractional keyboard control mechanism."

One of the objects of the present invention is to provide a machine for receiving a series of fractional entries and for printing each of these entries on a strip of record material in the order in which they are received.

Another object of the invention is to provide a machine with two rows of type on a single type carrier, a printing hammer for each row, and a selecting mechanism for determining which of the two printing hammers shall be rendered effective during a given operation of the machine.

A further object of the invention is to provide a machine with two rows of type on a single type carrier, a printing hammer for each row, a row of keys for controlling the differential positioning of the type carrier, and a second row of keys for determining which hammer is to be rendered effective during a given operation of the machine.

Still a further object of the invention resides in the provision of a machine having two rows of fractional keys, one row for the even-numbered numerators and one row for the odd-numbered numerators, a type carrier provided with two rows of type, one for the even-numbered numerators and one for the odd-numbered numerators, a printing hammer for each row, a differential mechanism controlled by the even numerator keys for controlling the position of the type carrier, and a hammer selecting mechanism controlled by the odd numerator keys for determining which of the two hammers is to be released during an operation of the machine.

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

In the drawings:

Fig. 1 is a sectional view of the machine, taken to the right of a whole number key and showing the actuators for entering amounts into the totalizer, together with the printing mechanism.

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Fig. 2 is a sectional view showing the even-numbered numerator fractional amount bank, together with the fractional amount totalizer wheel and the printing mechanism for recording the even-numbered numerators.

Fig. 3 is a rear view of the fractional amount type carrier.

Fig. 4 is a detail view of a part of the hammer control mechanism.

Fig. 5 is a sectional view showing the odd-numbered numerator fractional amount bank, together with the mechanism for selecting one or the other of the fractional amount printing hammers.

Fig. 6 is a detail view showing the means for connecting the odd-numbered and the even-numbered numerator keys together.

Fig. 7 is a front view of the hammer mechanisms for printing the fractional amounts.

Fig. 8 is a diagrammatic view showing the keyboard arrangement of the machine to which the invention is shown applied.

Fig. 9 is a facsimile of a portion of the tape printed by the machine.

GENERAL DESCRIPTION

The invention is shown as applied to an adding machine of the type described in United States Letters Patent No. 1,386,021 and No. 1,386,022, both issued to Heber C. Peters on August 2, 1921, and United States Letters Patent No. 1,854,875, issued to Nelson White on April 19, 1932.

In this class of adding machine, there are provided a series of amount keys or stops for controlling the positions taken up by a series of reciprocating members. Actuated by the latter are the adding racks, which impart movement to the totalizer wheels and the type carriers to position the type in the proper printing position.

In the machines illustrated in the above-mentioned Peters patents, each reciprocating member comprises a stop bar which indexes against the projecting key stem and is connected at its rear end with an L-shaped pivoted lever, the latter carrying at its upper end an adding rack and at its rear end a type bar, these associated elements being adapted to move together as a unit.

In the machine illustrated in the above-mentioned White patent, the adding rack is mounted on an independently pivoted lever adjacent to and separate from the aforementioned L-shaped lever, so that the rack and the type bar need not move as a unit. As is well known, this construc-

tion is provided in machines of the Peters type when the subtracting feature is desired.

As illustrated in the present application, the invention is shown applied to the subtract type of differential mechanism shown in the White patent. However, the invention is not limited to this type of differential construction, since a straight adding differential mechanism, such as that shown in the Peters patent, can be used therewith. The keyboard in the machine as described in the instant application is provided with amount key banks similar to those disclosed in the above-mentioned White and Peters patents. In addition to the regular amount keys, which are arranged in decimal order, the present application illustrates two banks of fraction keys. These two banks of keys are illustrated in the instant machine for adding fractions of one-sixteenth; one bank of keys is provided for entering fractions having odd-numbered numerators, and another bank of keys is provided for entering fractions having even-numbered numerators. The fraction keys are so interconnected on the keyboard that the depression of any odd numerator key, except the "1" key, will also carry with it its adjoining even-numbered numerator key. The construction of the differential mechanism associated with the fraction banks of keys is such that the index member associated with the odd-numbered numerator keys will move only one step when a key in this bank has been depressed, and the index member in the even-numbered numerator bank will move a number of steps equal to the value of the numerator on the key depressed. Thus, for example, if it is desired to enter $\frac{1}{2}$, the "5" key in the right-hand bank is depressed. This key carries with it the "4" key in the second bank. During the operation of the machine, the index member in the right-hand bank moves one step to adjust a four-pointed wheel, which actuates a shutter for a purpose to be described later. This one-step movement of the index member in the right-hand bank also actuates a four-point transfer element, so that, upon the entry of two successive odd-numbered numerators, one is transferred into the fraction dial wheel. The depression of the "4" key in the even-numbered numerator bank will cause the index member associated with this bank of keys to move two steps, thus advancing the fraction dial wheel two steps. If before this entry operation—that is, with the "5" key depressed—the fraction dial wheel were standing at zero, then, upon operation of the machine, the dial wheel will be moved to present the numerals 4 and 5 to the sight opening provided in the machine. At this time, the shutter operated under control of the odd numerator index member will be positioned so that the numeral 5 is in displaying position and the numeral 4 is concealed, thus indicating $\frac{1}{2}$ as have been entered into the totalizer.

The index member of the even numerator differential positions a type carrier to present two numerals to the printing line. A separate printing hammer is provided to print from either one of the two type characters that are presented to the printing line, and the differential mechanism in the odd numerator bank sets up a control member to select one of the two printing hammers to be released to take an impression from the proper one of the type carriers. Thus, when an odd-numbered numerator key is depressed and the machine is operated, the printing hammer for the odd-number type characters on the type bar

is released to take an impression. If no odd-numbered numerator key is depressed, then the printing hammer for printing from the even-numbered type character will be released for operation.

The type characters provided on the type carrier for the fractional amounts show only the numerators with a horizontal line drawn beneath them. The denominator, "16," is not engraved on the type carrier, since it will be understood by the user of the machine that the characters printed in the first column on the record strip represent the fractions for which the machine is built, which, as illustrated in the present machine, are sixteenths.

DETAILED DESCRIPTION

Keyboard

The keyboard of the machine as illustrated in the present application is provided with six banks of keys 30 for entering amounts into the totalizer in the usual and well-known manner, as shown and described in the above-mentioned patent to White. Just to the right of the units bank of keys 30 is provided a bank of fraction keys 31, which is used to enter all fractions having even numerators. To the right of the bank of keys 31 is provided a bank of keys 32 for entering all fractions having odd numerators. Each of the keys 31 is provided with a plate 33, which is securely fastened to the key stem just beneath the head of the key and which projects to the right and under the head of the adjoining key 32. The plate 33 is slotted at its right end so as to pass freely about the stem of the key 32 so that the key 31 and its associated plate 33 may be depressed without depressing the key 32. However, upon depression of a key 32, the plate 33 is carried therewith, thus depressing the adjoining key 31. The plate 33 thus provides a means whereby, when any one of the odd-numbered numerator keys, except the key representing "1," is depressed, it will carry with it the adjoining even-numbered key having a value one-sixteenth lower than that of the odd-numbered key being depressed.

The usual subtract key 34, repeat lever 35, and correction key 36 are provided on the keyboard of the instant machine. The functions and controls of these three control members are exactly like those illustrated in the above-mentioned White and Peters patents, and therefore no further description of the members is given herein.

The keyboard (Figs. 1, 2, 5, and 8) is provided with a top plate 40 and a bottom plate 41, suitably supported by side frames 43 (one of which is shown in Fig. 1). The top plate 40 is provided with suitable slots through which the keys project and which provide supporting and guiding means for the keys, said keys being arranged to slide in said slots substantially at right angles to the top and bottom plates.

Amount bank—Whole number keys

The construction of the whole number amount banks is like that disclosed in the above-mentioned White and Peters patents. As shown in said patents, each key is provided with a shoulder, against which the upper end of a spring 42 presses to maintain the keys in their undepressed positions. Each bank of keys is also provided with a detent for maintaining a depressed key in its depressed position to maintain the lower end of the depressed key in the path of a shoulder on

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the associated index bar 44 (Fig. 1). A comb 45 acts as a guide for the forward end of the index bar 44. A spring 46, one end of which is attached to the upwardly-extending flange of the comb and the other end of which is attached to a stud 47 on the index bar 44, tends to draw the index bar forwardly. Secured to the side of the index bar 44 is a plate 48, formed to provide a fork which straddles the comb 45 to properly guide the index bar in its different movements. The face 49 of the comb 45 acts as the stop for the index bar when the shoulder 50 on the index bar comes into contact with said face 49 during an operation in which the "9" key is depressed.

The rear end of the index bar 44 is pivoted, by means of a stud, to the upper end of a diverging lever 55, pivotally mounted on a shaft 56. A rack lever 57 is also pivoted on the shaft 56 adjacent the diverging lever 55. The construction of the diverging and rack levers is the same as that shown in the White patent. Each diverging lever 55 includes a forwardly-extending gooseneck arm 58 having at its extremity a slot which is radial with respect to the shaft 56. A similar gooseneck extension 59 on the rack lever 57, having a slot 60 in alignment with the slot in the diverging lever, is provided, and, when the machine is conditioned for adding operations, a stud 61 projects through the slots in the gooseneck arms of the diverging lever and the rack lever to couple them together to move as a unit. The stud 61 is mounted on an arm 62 secured to a hub 65 rotatably mounted on a shaft 63. To this hub 65 is secured the usual complementary arm 64, adapted to cooperate with a stud 66 on the index bar 44 for the purposes of subtracting, as fully shown and described in said White patent.

When the machine is conditioned for subtracting operations, the shaft 63 and the arms 62 and 64 are shifted endwise, in the manner shown in the above-mentioned White patent, to withdraw the stud 61 from the slot in the diverging lever to thereby uncouple the diverging lever from the rack lever for the purposes and functions described in said White patent.

Each rack lever 57 carries at its upper end the usual adding rack 70, step piece 71, and carrying spring 72. The rack 70 is provided with two studs 73, which are free to slide in elongated slots in the rack lever 57. Each rack 70 may mesh with a pinion 74, secured to a registering dial or number wheel 75. The number wheels 75 are all rotatably mounted on a common shaft 76 and are provided with the customary tens transfer control mechanisms. The shaft 76 is carried on a rocking frame 77 pivoted on a shaft 78, so that the pinion 74 may be rocked into and out of mesh with the rack 70 in the proper timing during the machine operation in a well-known manner described in the above-mentioned patents.

Two arms 80 (Fig. 1) and 81 (Fig. 2) are pinned to the shaft 56 at each end thereof and support between them a cross bar 82. The cross bar 82 normally engages a flat surface 83 on the diverging and rack levers. The function of the cross bar 82 is to control the time of movement of the diverging and rack levers and their associated index bars. During the forward movement of the operating handle 84 (Fig. 1), the cross bar 82 is moved out of the path of the diverging and rack levers to release them to the action of the springs 46, and the levers are re-

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stored to their normal positions by the return stroke of said handle.

The cross bar 82 is rocked by the operating handle when the latter is first pulled forwardly by a mechanism including a plate 85 (Fig. 2), to which the operating handle 84 is releasably clutched. The plate 84 has pivoted thereto a link 86, which is pivoted at its other end to an arm 87, secured on a shaft 88. Also secured to the shaft 88 is a cam 89, with which a roller 90 on a pitman 91 cooperates. The pitman 91 is pivotally connected to the above-mentioned arm 81 by a stud 92, and the rearward end of the pitman 91 is bifurcated to straddle a hub 79 of the arm 87. A spring 93, having one of its ends attached to a stud on the arm 81 and having its other end anchored on the hub 79, normally maintains the roller 90 in contact with the cam 89.

Rocking movement of the handle 84, through the plate 85, the link 86, the arm 87, and the shaft 88, rocks the cam 89 first counter-clockwise (Fig. 2) and then back in a clockwise direction to its normal position. Counter-clockwise movement of the cam 89 causes the roller 90, under tension of the spring 93, to follow the contour of the cam 89, thus pulling the pitman 91 rearwardly and rocking the arms 80 and 81 counter-clockwise (Fig. 2). Counter-clockwise movement of the cross bar 82 releases the diverging and rack levers for movement by the spring 46. The levers continue to move until a shoulder 95 (Fig. 1) of the index bar strikes the end of a depressed key. The shoulders 95 are so arranged on the index bar 44 in relation to the keys 30 that the index bar and the rack lever will move an extent commensurate with the value of the depressed key.

After the rack levers are positioned under control of the depressed key, the totalizer frame 77 is rocked to lower the register pinions into engagement with the racks 70, whereupon the cam 89, acting against the roller 90, cams the pitman 91 and the arms 80 and 81, together with the cross bar 82, to rock the latter clockwise (Fig. 1) to restore the rack levers to their normal positions. During this return movement of the rack lever, the amount represented by the depressed key is entered into the registering pinion 74 and is indicated on the registering dials 75 through a sight opening 96 provided in a plate 97 carried by the totalizer frame 77.

The forward end of a plate 98, adjacent each totalizer pinion 74 and supported by rods 99 and 100, has an alining tooth 101 formed thereon, with which the totalizer pinion engages when the totalizer is rocked out of engagement with the rack 70 to maintain the pinion and the registering dial in proper alinement while disengaged from the adding rack. The rods 99 and 100 are supported by the side frames 43.

The usual zero stop pawl 102 (Fig. 1) is provided to arrest the index bar 44 and the rack lever in the zero position when no amount key 30 is depressed. Depression of any key 30 in the amount bank moves the zero stop pawl out of the path of the end of the index bar 44 to release the index bar to the action of the spring 46 in the manner shown and described in the above-mentioned patents.

Amount bank differential—Fraction banks

The construction of the banks of keys for entering the fractional amounts is similar in all respects to the construction of the amount banks described above for the whole number key banks.

The present machine is constructed to enter fractions in steps of one-sixteenth, and two banks of keys are used to enter all of the fractional amounts. The registering dial 110 is differentially positioned under control of the keys 31 (Fig. 2) and is divided into eight sections, each section having two numerals, which may be positioned opposite the sight opening in the plate 97. A shutter 137 is provided and assumes one of two positions in order to conceal one of the numerals positioned opposite the sight opening.

Fraction differential mechanism—Even-number numerators

The differential mechanism for entering the even number numerators into the registering dial 110 is shown in Fig. 2. Depression of a key 31 (Fig. 2) withdraws the zero stop pawl 112 from the path of the index bar 113 and moves the end of the depressed key into the path of the appropriate shoulder 114 on the index bar 113. A spring 117 constantly urges the index bar 113 toward the front of the machine.

The index bar 113 is pivotally connected to a diverging lever 116, pivoted on shaft 56. The diverging lever 116 is provided with a forwardly-extending arm having a radial slot in alignment with a radial slot 259 in a forwardly-extending arm 258 on a rack lever 115 pivoted on shaft 56 adjacent the diverging lever 116. A stud 361 is carried by an arm 362, secured to a hub 365 rotatably mounted on the shaft 63. This hub 365 also has secured to it the usual complementary arm 364 to cooperate with a stud 366 on the index bar 113 for subtract purposes. This stud 361 enters said radial slots and couples the levers 115 and 116 together and is disengaged from the lever 116 during subtracting operations. The rack lever 115 has slidably mounted, near its top, a rack 158, meshing with a pinion 159 on shaft 76. The pinion 159 is secured to the side of the fraction registering dial 110.

A spring 257, one end of which is anchored to a flange on a plate 157, secured to the side of the rack 158, normally maintains a flange 156 on the rack 158 in contact with a flange 155 of a transfer trip arm 153 (Fig. 5). When the flange 156 is in contact with the flange 155, the rack 158 is held in its normal position, and, when the flange 155 is withdrawn from the path of the flange 156, the spring 257 moves the rack 158 one step relatively to the rack lever 115, for a purpose described later.

Operation of the machine with a key 31 depressed and the consequent counter-clockwise movement of the bar 82 releases the rack lever 115 and the diverging lever 116, together with the index bar 113, to the action of the spring 117. When the index bar 113 is arrested by the depressed key, the rack lever 115 is in a position corresponding to the value of the depressed key. In this instance, each key progressively represents two sixteenths, and therefore, even though the registering dial 110 moves only one step when actuated by the rack lever 115, the amount represented will be increased by two sixteenths for each unit of movement of the index bar 113, as represented by the various keys 31.

In all other respects, the construction and operation of the differential mechanism controlled by the keys 31 are the same as described above for the differential mechanism operated under control of the keys 30.

Fractional differential mechanism—Odd-number numerators

The differential mechanism associated with the keys 32 (Fig. 5) differs from the above-described differential mechanisms in that the depressed keys do not arrest the movement of an index bar 120 associated therewith. The index bar 120 is provided with a stud 121, which projects to its right, and, when the index bar is released by depression of any key 32 and the consequent removal of a zero stop member 122, the stud 121 engages the face 49 of the comb 45. The extent of movement given to the index bar 120 when moving from the position shown in Fig. 5 to the position in which the stud 121 engages the face 49 is equal to one step of movement, or, that is to say, an extent sufficient to rotate a registering pinion 123 (Fig. 5) one-eighth of a rotation. Thus it is clear that, no matter which key 32 is depressed, the registering pinion 123 will rotate only one-eighth of a rotation. This step of rotation is transmitted from the index bar 120 to the registering pinion 123 by means including the rack lever 127, which lever is pivoted on the shaft 56 adjacent to a diverging lever 124. The index bar 120 is pivoted to the diverging lever 124, which is provided with a radial slot into which a stud 261 on an arm 262 projects. This arm 262 is secured to a hub 265, rotatably mounted on the shaft 63, and has secured to it a complementary arm 264 to cooperate with a stud 266 on the index bar 120 for subtract purposes in the usual manner. The stud 261 also projects into a radial slot 125 in an arm 126 of the rack lever 127 to couple the levers together. The rack lever 127 carries an actuating rack 128 similar in all respects to the actuating rack 70 described in connection with the differential mechanism in Fig. 1. The index bar 120 is actuated by a spring 129, when released by the bar 82, and, when moved until the stud 121 is arrested by the face 49 of the comb 45, carries the levers 124 and 127, together with the rack 128, forwardly. During this time, the pinion 123 is disengaged from the rack 128, and, after the rack is positioned, the pinion 123 is again moved into engagement with the rack 128. Thereafter, the bar 82 returns the levers 124 and 127 to their normal positions, and, in so moving, the rack 128 rotates the pinion 123 one-eighth of a revolution.

The registering pinion 123, instead of being secured to a registering dial like the dial 75 (Fig. 1), is secured to a four-point disc 135 (Fig. 5). The four-point disc 135 is arranged to actuate, or position, the shutter 137 in a manner not shown herein but completely shown and described in my co-pending application Serial No. 586,361, filed April 3, 1945. For each operation of the disc 135, the flash moves from one position to the other to expose alternate numerals on the dial 110. Hence, the positioning of the shutter 137 is such that, when the amount standing on the dial 110 is an odd number, the odd-number numeral will be exposed, and, when the amount standing on the dial 110 is an even number, the even-number numeral will be exposed through the sight opening.

The mechanism for advancing the registering dial 110 one step for every two steps of movement of the disc 135 includes a four-point camming member 150 (Fig. 5). Each point on this camming member acts to trip a mechanism similar to the usual tens transfer mechanism commonly used. The four points on the cam mem-

ber 150 are so arranged that, when it becomes necessary to advance the dial 110 by reason of advancing the pinion 123 two steps, one of the camming points 151 engages a flange 152 on the transfer arm 153 to rock it on a pivot 154. Such rocking of the arm 153 lowers the flange 155 out of the path of the shoulder 156 of the plate 157, mounted on the actuator rack 158 in the differential mechanism shown in Fig. 2. The actuator rack 158 meshes with the pinion 159 of the registering dial 110. Lowering of the flange 155 into the path of the shoulder 156 results in the actuator rack 158 moving one step in the adding direction to advance the dial 110 one step.

Printing mechanism

Mechanism is provided for entering the various items on a record strip as they are entered into the totalizer. As far as the printing mechanism associated with the whole number banks is concerned, this mechanism is the same as that described in the above-mentioned Peters and White patents. The novel mechanism disclosed herein includes a control for printing the fractions as they are entered under control of the two fraction banks of keys 31 and 32. Described in general terms, the mechanism consists of a type basket having two sets of printing characters, which is adjusted under control of the even-number numerator key bank 31. A control is provided for selectively tripping a hammer to print from the proper one of the two sets of type carriers. If no odd-numbered numerator key 32 is depressed, the even-number character will print, whereas, if an odd-numbered numerator key is depressed, the odd-number hammer will be tripped. The control of the selection of a printing hammer is effected by the movement or non-movement of the index bar 120 (Fig. 5) in the odd numerator key bank 32.

Printing whole number digits

The whole number digits are represented by type carriers 1601 (Fig. 1) carried in a basket mounted on the upper end of a type slide 1611 connected to an arm 162 on the diverging lever 57 by a link 163. Differential movement of the index bar 44 under control of a depressed key 30 positions the arm 162 and the bar 1611 to present a type character commensurate with the value of the depressed key at the printing line opposite the platen 164. The record material 165 is fed from the roll 166 around a guide rod 167 and under the platen 164, and thence past the printing line and out of the machine.

A printing hammer 168 is provided to strike the selected type carrier to impinge the type against a ribbon (not shown), the record material, and the platen to make a printed record.

The hammer 168 is held in cocked position by a hook 169 formed thereon, which is engaged by a pawl 170 pivotally mounted on a shaft 171. A spring 172 normally maintains the pawl 170 in position to latch the printing hammer 168 in its cocked position. A rod 173 acts to hold the trip pawls 170 on the shaft 171, and a rod 174 limits the counter-clockwise movement of the pawl 170 under action of the spring 172. A stud 175 on the slide 1611 normally limits counter-clockwise rotation of a tripping arm 176 mounted on a shaft 177 under action of a spring 178. The arm 176 is rocked bodily around the shaft 179 during a machine operation, to engage its end with a shoulder 180 on the trip pawl 170 to rock the trip pawl clockwise to release the printing hammer. When the type slide 1611 is in the home position, the

hammer will not be released, since the arm 176 is held in such a position that it will not engage the shoulder 180. However, when the type slide 1611 rises, during the machine operation and under control of a depressed key 30, into the "1" position, or higher, the forward end of the arm 176 is lowered into contact with the shoulder 180. If the arm 176 is positioned against shoulder 180, then, on bodily movement of the arm, the pawl 170 is rocked on the shaft 171 to withdraw the hooked end from the hook 169 on the printing hammer, which is thereupon released to the action of the spring 181. The spring 181 thereupon swings the hammer 168 rapidly clockwise to strike the type carrier located at the printing line.

The arm 176 is rocked bodily around the shaft 179 by a pair of arms 182 (Fig. 1) and 183 (Fig. 4). Each of the arms 182 and 183 is provided with a stud 185. When the operating handle 84 is pulled forward and the shaft 88 is rocked counter-clockwise, as described above, the arms 182 and 183 move the studs 185 into contact with shoulders 186 on a pair of arms 187 mounted on the shaft 179. Mounted between the arms 187 is the shaft 177, on which the arms 176 are supported.

Therefore, upon operation of the machine and rocking of the shaft 88 counter-clockwise, the pair of arms 187 carrying the shaft 177 and the arm 176 move forwardly of the machine, and, when the arm 176 is in contact with the shoulder 180, the arm trips the printing hammer 168 by rocking the pawl 170 clockwise until its hooked end is withdrawn from the hook 169 of the hammer.

The stud 175 is so located on the type slide 1611 that the arm 176 is not in position to release the pawl 170 when the type carrier is in either zero position or home position, and therefore zeros are normally not printed. The usual and well-known offset flanges 188 are provided on the pawls 170, which extend behind the next higher order pawls 170, so that zeros may be printed in lower denominational orders whenever the pawl 170 of a higher order denomination is released and no keys are depressed in said lower order denominations.

A rod 190, carried between two arms 191 secured to the shaft 179 (see also Fig. 4) is provided for restoring the tripped printing hammers 168 near the end of the machine operation. The right-hand arm 191, when the machine is viewed from the front, is provided with a depending arm 192 connected to a link 193 connected to the arm 183 on the shaft 88. At the beginning of the machine operation, when the shaft 88 is rocked counter-clockwise (Fig. 4), the arm 183, through the link 193, the arm 192, and the pair of arms 191, moves the rod 190 clockwise away from the printing hammers. This permits the operation of the printing hammers in the manner described above. Near the end of the machine operation, when the arm 183 is restored to its initial position, the rod 190 is restored to the position shown, by the link 193, the arm 192, and the pair of arms 191. During this restoring movement, the rod 190 picks up all of the tripped hammers and restores them to their home or initial positions, wherein they are again latched by the pawls 170.

Printing fractions

The type basket, differentially positioned under control of the keys 31, is provided with two sets of type carriers, as shown in Fig. 3. These type carriers are positioned under control of the de-

pressed keys 31, through the diverging lever 116, which is provided with a rearwardly extending arm 195. The arm 195 is connected to the type slide 196 by the link 197.

During the machine operation, the depressed key 31 (Fig. 2) controls the setting of the type slide 196 to position two type characters at the printing line (see Fig. 3). For example, if the "4" key is depressed and the machine operated, both the "4" and the "5" type characters are positioned at the printing line. Two separate printing hammers are provided, each operated independently of the other for printing from one or the other of the two type characters. When an even-number fraction key 31 alone is depressed, the printing hammer 198 (Fig. 2) is released to print from the type carrier containing the character representing the depressed key. However, if an odd-number numerator key 32 is depressed, as described above, which also depresses the adjoining even-number numerator key 31, the type carriers will be positioned just as before, under control of the even-number key 31. However, depression of a key 32 effects a control over the release of the printing hammers so that the hammer 198 will not be released to print, and a hammer 199 (Fig. 5) will be released to take an impression from the left-hand type carriers, as viewed in Fig. 3, which are set at the printing line.

The release of the hammer 198 will be described first. This hammer is released in the same manner as the hammer 168, described above. The type slide 196 is provided with a stud 215, normally maintaining a finger 201 in ineffective position. Adjustment of the type slide 196, under control of a key 31, withdraws the stud 215 from contact with the finger 201 and permits the spring 200 to rock the finger 201 counter-clockwise. Such movement positions the end of the finger 201 behind a shoulder 202 on a pawl 203, normally engaging a hook 204 on the hammer 198. After the finger 201 is positioned behind the shoulder 202, the shaft 177 is rocked around the shaft 179 as a pivot point, thus causing the finger 201 to rock the pawl 203 to release it from the hook 204 of the impression hammer 198, and causing the spring 205 to swing the hammer 198 clockwise to strike the type carrier carrying the even-number numerator character to take an impression on the record strip. The hammer 199 for taking impressions from the odd-number type characters is released as follows. As explained above, the index bar 120 is released under control of the keys 32 but moves only one step under control of the stud 121 thereon. The index bar 120 thereby moves the diverging lever 124 one step clockwise when a key 32 in the odd-number numerator bank is depressed, before the operation of the machine. The diverging lever 124 has an arm 206 connected to a bar 207 by a link 208.

The bar 207 does not have type carriers mounted at its top, like the similar bars 1611 and 196, described above. However, this bar 207 is provided with a stud 214 for controlling a finger 209 to move behind a shoulder 210 on a pawl 211 normally latching behind a hook 212 on the printing hammer 199. The hammer 199 is aligned with the odd-numbered type characters in the basket shown in Figs. 2 and 3.

From this it is apparent that, in any machine operation in which the diverging lever 124 is moved one step, the printing hammer 199 will be released for operation to cause the hammer 199 to be released to print, from the odd-number

type carrier set by the even-number keys 31, onto the record material.

In those operations of the machine in which the hammer 199 is released, it is necessary to prevent release of the hammer 198, so that printing of the even-number numerator is prevented when the odd-number numerator is printed. Such preventing means consists of a plate 218 secured to the side of the bar 207. The plate 218 is provided with a stud 219 (see also Fig. 2), which projects under the finger 201, and therefore, when the bar 207 is raised out of its normal position, the finger 201 is also raised from behind the shoulder 202 if said finger has been lowered into the path of said shoulder 202 by the raising of the stud 215.

From the above it becomes clear that only a single type basket is set, but the two banks of keys 31 and 32 control not only from which type the character is to be printed but also which type hammer is to be released to cause the proper printing. The control is such that the keys 31 set the type carriers and normally release the printing hammer for printing the even-number numerator characters. However, when an odd-number numerator key 32 is depressed, this control is modified by the stud 219 raising the trip finger 201 from behind the shoulder 202, so that the hammer 198 is not released for operation, and, at the same time, the stud 214 positions the finger 209 behind the shoulder 210, so that the hammer 199 is released for operation and the odd-number numerator character is printed.

Total-taking operations

In the present machine, totals are taken in the same manner as in the previously mentioned patent to Peters; i. e., the totalizer wheels are moved into engagement with the actuator racks at the beginning of the machine operation and rotated in a reverse direction until the tens-transfer cams secured to the totalizer wheels strike against the tens-transfer pawls and stop the movement of the racks and type bars. The printing hammers are then fired to print the total on the record material, after which the actuator racks and type bars are returned to their home positions, with the totalizer wheels either engaged with or disengaged from the racks, depending on whether a total or a sub-total is desired. Thus, in the present machine, the tens-transfer cam 103, secured to the pinion 74 and dial 75 (Fig. 1) for the whole number of units order, is rotated in a reverse or clockwise direction until a shoulder on the cam comes into contact with a flange (similar to flange 152) on a ten-transfer pawl or arm 104. The wheel is now in its zero position, and the amount standing thereon prior to its return to this position will be set up on the type slide 1611.

The eight-tooth pinion 159 and the dial 110 for the even numerator order (Fig. 2) will be returned to zero in a similar manner, the pinion and the dial being arrested in their zero position when a tens-transfer cam 105, secured thereto, strikes against a flange (similar to flange 152) on a tens transfer arm 106. The type slide 196 will now be positioned with one of its eight sets of type situated at the printing line ready to be driven by either hammer 198 or 199 against the platen 164. Which of the two hammers will be released for operation will depend on the setting of the cam member 150 prior to total taking. If the cam member is in its zero or even position, as shown in Fig. 5, with the shoulder 149 of one

of the points 151 located behind the flange 152 on the arm 153, when the odd numerator pinion 123 will be held against movement during total taking, and the slide bar 207 will likewise be prevented from moving upward. The finger 239 will thus be held in the position shown in Fig. 5, and the hammer 199 will not be released. The even numerator hammer 198 (Fig. 2) will be released, however, since the finger 201 will be lowered into engagement with the shoulder 202 and the pawl 203 by reason of the upward movement of the slide 196. If the cam member 150 is in its odd position when a total is taken, the pinion 123 will move one step before the shoulder 149 of one of the points 151 strikes against the back face of the flange 152. This will allow the slide 207 to move up one step and cause the finger 209 to move behind the shoulder 210 on the pawl 211 so as to fire the hammer 199. At the same time, the hammer 198 is disabled by the stud 219, which holds the finger 201 out of engagement with the shoulder 202 on the pawl 203.

In this manner, the proper fractional amount will be printed on the record material, along with a whole number total, as shown by the facsimile of the record tape in Fig. 9.

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

What is claimed is:

1. In a machine of the class described, the combination of a differentially positionable type supporting means; two groups of type carriers mounted on the supporting means; two printing hammers, one hammer, being normally effective and located in relation to the groups of type carriers whereby the hammer strikes a type carrier of one group for making a record, the other hammer being normally ineffective and located in relation to the groups of type carriers whereby the hammer strikes a type carrier of the other group for making a record; a bank of keys for controlling the adjustment of the supporting means to position a type carrier of each group at the printing line; a second bank of keys; and means rendered effective when one of the keys of said second bank is depressed for causing said one hammer to be rendered ineffective and said other hammer to be rendered effective so as to cause a record to be made from said other group of type carriers rather than from said one group of type carriers.

2. In a machine of the class described, the combination of a differentially positionable type supporting means, a group of type carriers on the supporting means representing even-number numerators of fractions, a group of type carriers on the supporting means representing odd-number numerators of fractions, a bank of even-number numerator keys, a differential means controlled by the even-number numerator keys to adjust the supporting means to position an even-number numerator type carrier and an odd-number type carrier at a printing position, a normally cocked hammer, main operating means, means operated by the main operating means to trip the cocked hammer to print by the even-number numerator type carrier, a bank of odd-number numerator keys, a control bar, a differential means controlled by the odd-number

numerator keys to adjust the control bar from a normal position into a moved position, means on the control bar to render said tripping means ineffective, a second cocked hammer, a normally ineffective means to trip the second cocked hammer to print by the odd-number type carrier, means on the control bar to render the second-named tripping means effective when moved into moved position, and means operated by the main operating means to operate the second-named tripping means to release the second-named hammer to print from said odd-number numerator when the even-number numerator or hammer tripping means is ineffective.

3. In a machine of the class described capable of being given cycles of operation and having a platen and record material supported on the platen, the combination of a differentially positionable type carrier; a plurality of groups of type arranged on said carrier; a printing hammer associated with each group of type and adapted to cooperate therewith for making an impression on said record material; means for moving said carrier relative to the platen; means for controlling the movement of said carrier so as to cause a type of each group to be moved into printing position and also for determining which one of said hammers is to be rendered effective during a given cycle of operation of the machine to thereby enable a printing impression to be made from any one of the type contained in any of said groups.

4. In a machine of the class described capable of being given cycles of operation and having a platen and record material supported on the platen, the combination of a differentially positionable type carrier; two groups of type arranged on said carrier; a normally effective printing hammer associated with the types of one group and a normally ineffective printing hammer associated with the types of the other group, said hammers being adapted to cooperate with the types of their respective groups for making an impression on said record material; means for moving said carrier relative to the platen; means, including a bank of depressible keys, for controlling the movement of said carrier so as to cause a type of each group to be moved into printing position; a second bank of depressible keys; and means controlled by said second bank of keys for rendering said normally effective hammer ineffective and said normally ineffective hammer effective during a given cycle of operation of the machine to thereby enable a printing impression to be made from the type associated with the latter hammer.

5. In a machine of the class described capable of being given cycles of operation and having a platen and record material supported thereon, the combination of a differentially positionable type carrier; two groups of type mounted on said carrier; a releasable printing hammer associated with each group of type and adapted to cooperate therewith for making an impression on the record material; means for moving said carrier relative to said platen; manipulative means for controlling said moving means to cause a type of each group to be moved into printing position; separate means for releasing each of said hammers during a machine cycle, one of said means being normally effective to release one of said hammers and the other of said means being normally ineffective to release the other of said hammers; and additional manipulative means for controlling said separate releasing means to cause

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said one releasing means to be rendered ineffective and said other releasing means to be rendered effective.

6. In a machine of the class described capable of being given cycles of operation and having a platen and record material supported thereon, the combination of a movable type carrier having a normal position; a group of even-numbered type on said carrier; a group of odd-numbered type on said carrier; a normally cocked printing hammer associated with each group of type and adapted to cooperate therewith for making an impression on the record material; means for moving said type carrier relative to said platen; a bank of even-numbered keys for controlling said moving means to cause a type of each group to be moved into printing position; a normally ineffective tripping member associated with each of said hammers for tripping the hammers at a predetermined time during the machine cycle; means for rendering the tripping member associated with the hammer for the even-numbered type effective whenever said type carrier is moved out of its normal position; a control bar movable from a normal position to a shifted position; a bank of odd-numbered keys; means controlled by said odd-numbered keys for moving said bar from its normal position to its shifted position; and means on said control bar for rendering the tripping member associated with the hammer for the odd-numbered type effective and the tripping member associated with the hammer for the even-numbered type ineffective to release their associated hammers whenever said control bar is moved from its normal position to its shifted position.

7. In a machine of the class described capable of being given cycles of operation and having a platen and record material supported thereon, the combination of a movable type carrier having a normal position; a plurality of pairs of type on said carrier each consisting of an even-numbered type and an odd-numbered type; a pair of normally cocked hammers, one of said hammers being adapted to cooperate with the even-numbered

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type and the other of said hammers being adapted to cooperate with the odd-numbered type; a plurality of pairs of depressible keys each consisting of an even-numbered key and an odd-numbered key; means controlled by the even-numbered keys for causing a selected pair of type to be moved into printing position; separate, normally ineffective means for releasing each of said hammers during a machine cycle; means on said type carrier for rendering the releasing means for the hammer cooperating with the even-numbered type effective when said carrier is moved out of its normal position; a control bar movable from a normal position to a shifted position; means controlled by the odd-numbered keys for moving said bar from its normal position to its shifted position; means on said bar for rendering the releasing means for the hammer cooperating with the odd-numbered type effective and the releasing means for the hammer cooperating with the even-numbered type ineffective when said bar is moved to its shifted position; and connections between the even-numbered key and the odd-numbered key of each pair for causing the even-numbered key to be depressed whenever the odd-numbered key is depressed to thereby cause the proper pair of type to be moved into printing position and the hammer cooperating with the odd-numbered type to be released.

HARRY L. LAMBERT.

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Certificate of Correction

Patent No. 2,457,050.

HARRY L. LAMBERT

December 21, 1948.

It is hereby certified that errors appear in the printed specification of the above numbered patent requiring correction as follows:

Column 13, line 40, claim 1, after the word "hammer" strike out the comma; column 14, line 13, strike out "or";

and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 12th day of April, A. D. 1949.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.