

April 13, 1954

N. R. FRIEBERG

2,675,175

INDIAN CURRENCY ADDING MACHINE

Filed April 21, 1953

3 Sheets-Sheet 1

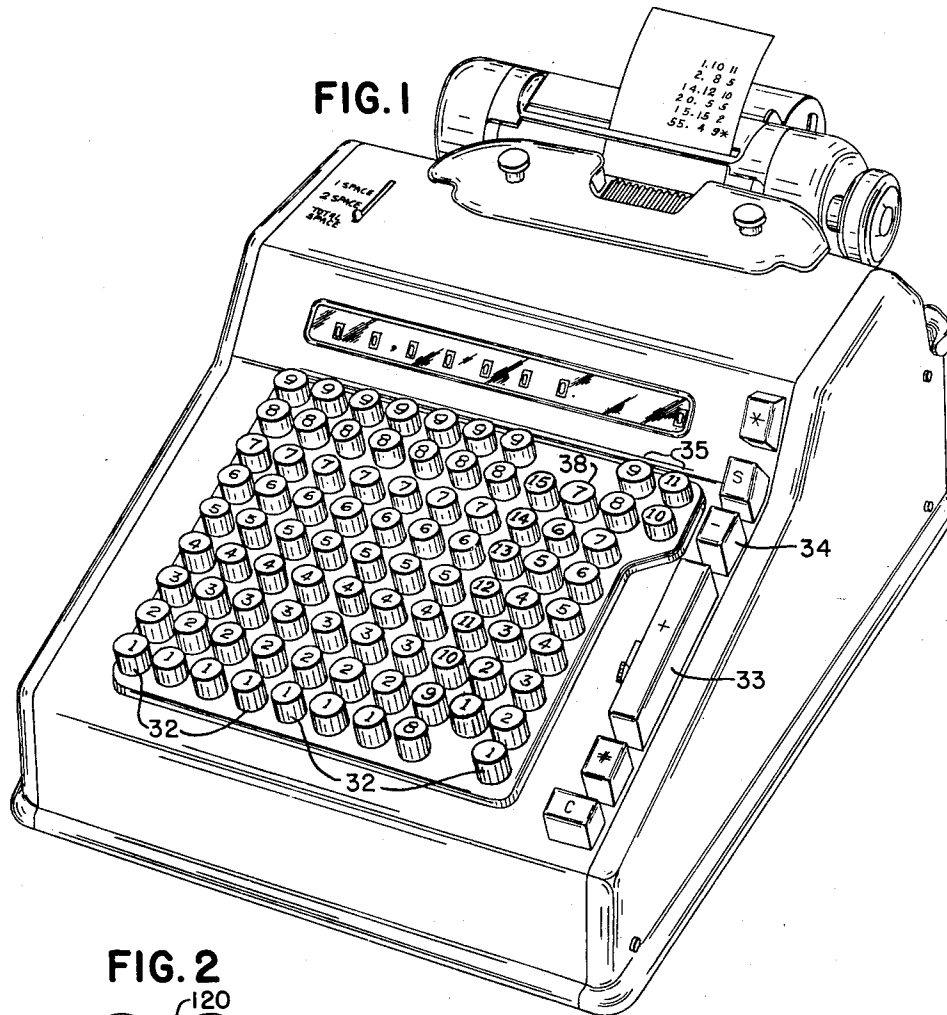


FIG. 2

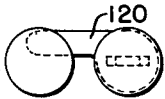


FIG. 3

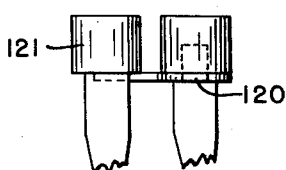
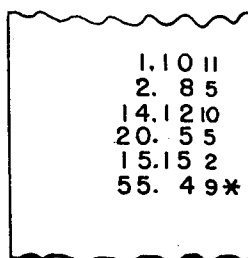


FIG. 4



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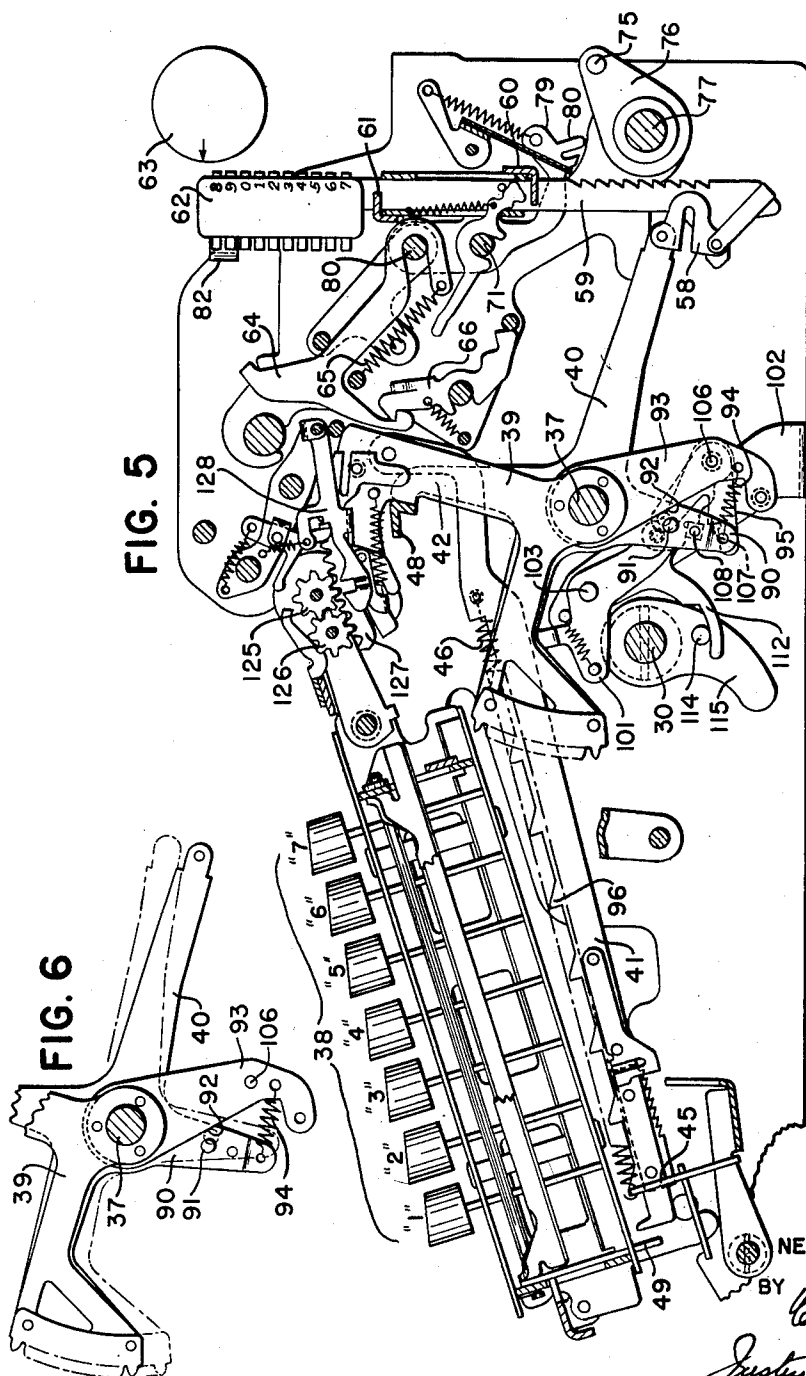
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3 Sheets-Sheet 2



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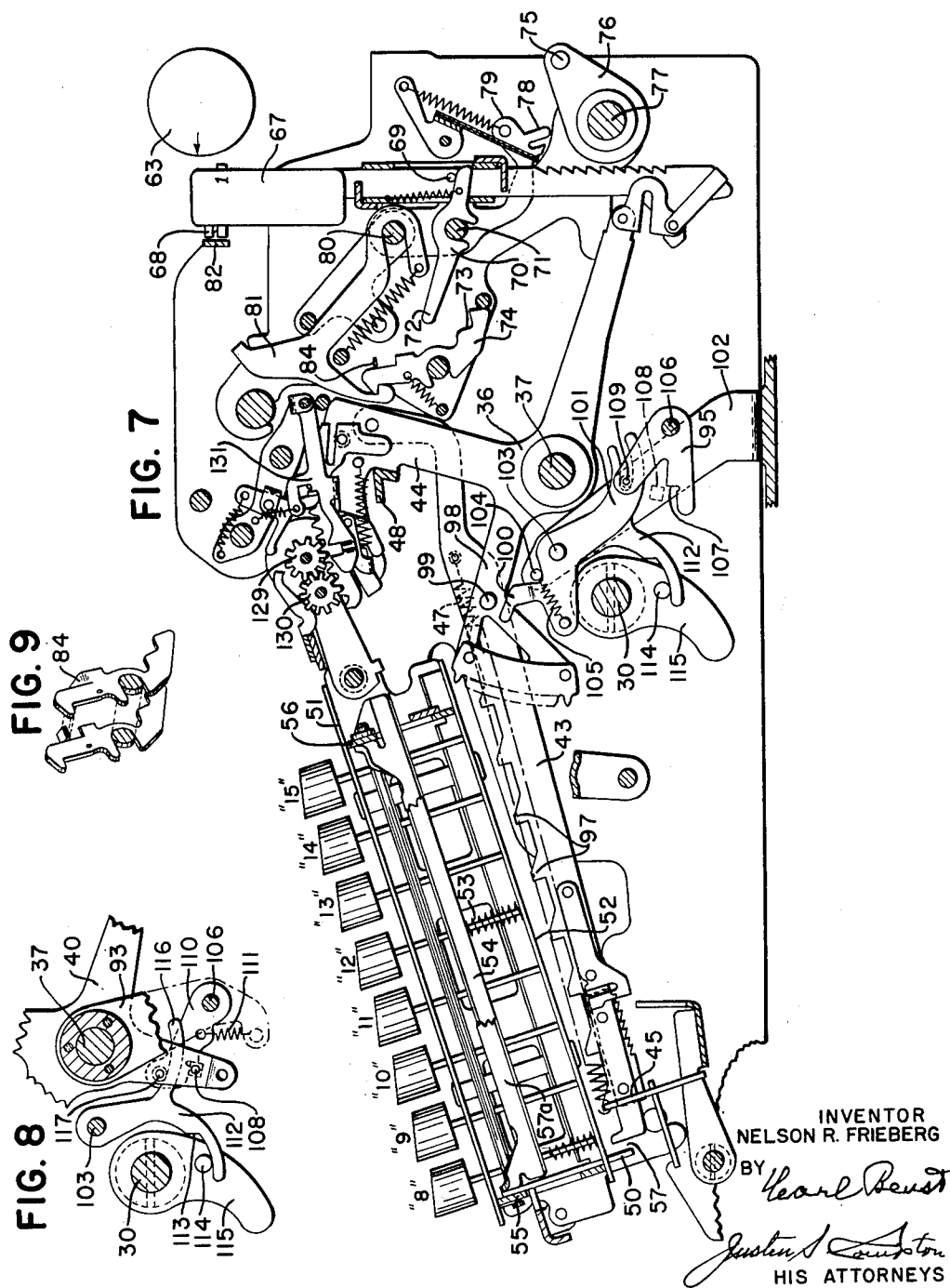
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INDIAN CURRENCY ADDING MACHINE

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UNITED STATES PATENT OFFICE

2,675,175

INDIAN CURRENCY ADDING MACHINE

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Application April 21, 1953, Serial No. 349,998

2 Claims. (Cl. 235—60.28)

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This invention relates to a calculating machine capable of receiving and printing entries of data based on the Indian currency system of pies, annas and rupees.

As is common knowledge, there are 12 pies in an anna, and 16 annas in a rupee. The rupees are received and accumulated decimally, and the printing all three currency units is done decimally. That is to say, there are no printed digits other than the decimal digits "1," "2," "3," "4," "5," "6," "7," "8," "9" and "0" to present a number of pies or annas in excess of nine.

In a machine which must deal with rupees in the decimal notation it is practical to accumulate twelve annas in a single totalizer wheel and print the characters "1" to "11" and "0," from a single printing member adjusted according to the amount entered or withdrawn from the wheel, and such is done in the sterling system where the lowest order is based on the pence notation of twelve pence in a shilling. This machine has such known construction for the lowest order totalizer wheel and printing bar as there are twelve pies in an anna.

However, in dealing with annas, it is impractical to have a single totalizer wheel having sixteen steps of movement and a corresponding printing member having the type representing the characters "1" to "15," and "0."

This invention includes a construction wherein two totalizer wheels are provided for the annas, the lowest order of the two anna wheels transferring to the higher order on every eighth unit, and the higher order anna wheel transferring to the lowest order of rupee wheels on every second unit. The lowest order anna denominational bank is controlled by seven digit keys "1," "2," "3," "4," "5," "6," and "7" but the associated printer member has type arranged thereon to represent the digits "1" to "9," and "0," but arranged in the following order: "8," "9," "0," "1," "2," "3," "4," "5," "6," and "7." The differential for the lowest anna denominational order is split, one element being connected to the printer and the other element being connected to the rack which moves the associated totalizer wheel. When no key in the higher anna's bank of keys is depressed, and the machine is operated, the printer element of the lower order is given two free steps of movement before being under control of the rack-connected differential element for whatever additional movement may be given it under control of the keys of the lower anna's bank. However, if a key is depressed in the higher anna's keybank the two differential ele-

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ments of the lower anna's bank are locked together. As will be explained, there are bridge connections between the following pairs of anna keys:

- 15—7
- 14—6
- 13—5
- 12—4
- 11—3
- 10—2
- 9—1

so that if the higher value key of a pair is operated, the connecting bridge will operate the other of a pair. It is also arranged that while the keys of the lower anna's bank control the associated differential to move a number of steps equal to the value of the operated key, any keys of the higher anna's bank, when operated, permits only one step of movement of the higher anna's totalizer wheel and printer member. The printer member associated with the higher anna's bank has only one type character "1." As no printing member type is in position at printing station while the machine is at rest, an initial "zero" step of movement is permitted the two differentials to bring the first type in each bank to printing position, as is usual in calculating machines of the type which will be described.

There is also provided means by which the lower order anna's printing hammer is rendered ineffective ordinarily until at least the "0" type is opposite the printing station eliminating the possibility of printing "8" or "9," but such condition is overcome by operating a key in the higher anna's order. Moreover, construction is provided for preventing effective operation of the higher anna's order printing hammer when an "8" or "9" is printed by the lower anna bank hammer.

The keyboard arrangement up to the tens-of-rupees keybank is as follows:

Tens of Rupees	Eights of Annas	Units of Annas	Pies
9			9 11
8	15	7	8 10
7	14	6	7
6	13	5	6
5	12	4	5
4	11	3	4
3	10	2	3
2	9	1	2
1	8		1

It will become apparent from the description

to follow that it is an object of the invention to provide novel means to accumulate and print items and totals in currency systems in which heterogeneous denominational order notations are converted and printed by use of decimal digits. With this and other objects in view which will become apparent, the mechanism will be described with reference to the drawings.

Of the drawings:

Fig. 1 is a perspective view of the machine.

Fig. 2 is a top plan view of the bridging between pairs of keys in the two rows of anna keys.

Fig. 3 is an elevation of the bridging construction between pairs of keys in the two rows of anna keys.

Fig. 4 is a piece of record tape showing a typical listing of items and their total as produced by the machine.

Fig. 5 is a vertical section through the machine, from front to rear, to the right of the lowest anna's bank.

Fig. 6 is a detail showing of the two steps of free movement given the printer half of the split differential of lowest anna's bank, when no key is depressed in the highest anna's bank.

Fig. 7 is a vertical section, from front to rear, to the right of the highest anna's bank, showing the locking mechanism for preventing the extra steps of movement of the printer half of the split differential of the lowest anna's bank.

Fig. 8 shows the means to prevent premature movement of the printer half of the split differential of lowest anna's bank.

Fig. 9 is a detail showing how the unlatching movement of the printing hammer latch of the highest anna's bank is transmitted to the latch of the lowest anna's bank.

General description

The invention is embodied in a machine having a main drive means, a keyboard mechanism, differential mechanism, a totalizer, and a printer of the general construction shown in the application for United States Letters Patent, Serial No. 171,118, of Carl H. Carlson et al., filed June 29, 1950. As the invention is not concerned especially with the machine main driving means, the motions, only, of the involved parts will be given.

In an item entering operation the main drive shaft 30 (Figs. 5 and 7) is rocked counter-clockwise about 90° and then returned to complete a machine cycle.

The amount to be registered is set up on the keyboard 32 (Fig. 1) and the machine set in operation by depressing the "Add" motor bar 33 if the item is to be added, or by depressing the "Subtract" motor bar 34 if the amount is to be subtracted.

For each of the rows of keys 32, except the lowest order of anna's keys, bracketed by bracket 38, there is a diverging lever like that shown at 36 (Fig. 7) mounted on a cross shaft 37 at intervals corresponding to the spacing of the key rows. The lowest order row 38 (Fig. 5) of anna's keys has a split, or double, diverging lever consisting of the stop bar and totalizer portion 39 (Fig. 5) and the printer portion 40, independently rotatable on shaft 37, except as will be described. The "pies" rows of keys 35 have a single diverging lever associated therewith, controlled by the keys "1" to "11" inclusive, in the manner shown and described in United States Letters Patent 2,476,853 which issued on the application of Roland G. Fowler which relates to a duo-decimal

keybank and associated differential mechanism. As the only relation of the pie's section of the machine to the novel mechanism is the transfer of a unit of data to the lowest anna totalizer wheel on the pies' totalizer wheel passing through zero no discussion of that order's mechanism need be made.

As disclosed in said Carlson et al. application, the diverging levers each have an associated stop bar pivoted thereto, the stop bar 41 for the lowest anna's bank being pivoted to the upper extending arm 42 of portion 39 of its split diverging lever, and the stop bar 43 for the highest anna's bank being pivoted to upper arm 44 of its diverging lever, as are all the other stop bars. All of the stop bars are supported at the front end by a guide comb 45, for sliding movement, and each stop bar is urged forwardly by a spring, like springs 46 and 47 (Figs. 5 and 7), extending between it and the guide comb 45. The tension of the mentioned springs tends to turn the diverging lever counter-clockwise (in the case of the lowest order anna's bank the element 39) but they are held, when the machine is at rest, in a home position by a bail 48 mounted by arms, not shown, on shaft 37, the bail 48 being held in place by the main operating mechanism until the commencement of a machine cycle, whereupon it rocks forwardly and downwardly, permitting the stop bars to move forwardly until stopped by the associated zero stop elements, which are numbered 49 and 50 in the denominational banks shown in Figs. 5 and 7, or by a depressed key.

The keys are slidably mounted in aligned slots in an upper plate 51 and in a lower plate 52 of the keybank unit, and each is resiliently held in an "up" or "restored" condition by its individual spring, such as spring 53 (Fig. 7). There is a latching shutter extending along the left side of each row of key stems and a zero-stop shutter extending along the right side of each row of key stems. The zero-stop shutter 54 (Fig. 7), which is typical, is pivoted in the end plates 55 and 56 of the keybank unit and is held against the key stems, with which it is associated, by a spring, not shown. As a key is depressed, a formation on the side of the key rocks the shutter and moves the zero-stop element 50, secured thereto, out of the path of movement of stop bar 43 which otherwise would be stopped after moving the distance 57 which permits the first type element to come to the printing station, as will be explained. The latching shutter for the keys shown in Fig. 7 is behind shutter 54 and cannot be seen, but it is mounted like shutter 54 and is urged against the left sides of the key stems against latching formations to hold a depressed key down during a machine operation. These elements are restored at the conclusion of a machine cycle as disclosed in the mentioned Carlson et al. application. A portion 57a of the latching shutter of the next lowest order of keys is shown, and from such showing the construction of the latching shutter may be deduced.

The printing mechanism

On a rearwardly extending arm of printing portion 40 (Fig. 5) of the split diverging lever assembly associated with the lowest anna's bank, is pivoted, by means of adjusting link 58 a printer bar 59 mounted, in guide combs 60 and 61, for vertical sliding movement. In a case 62 attached to the top of the printer bar are individual type resiliently retracted, as shown, but adapted to be driven toward a printing platen 63,

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shown diagrammatically, if opposite the printing station, indicated by the arrow, by printing hammer 64, urged in that direction by spring 65 but held latched while the machine is at rest by a latch 66. The elements 58, 59, 62, 64, 65 and 66 are typical of those common to all of the denominational banks. The particular printer bar shown is unique in having the type thereon in the order "8," "9," "0," "1," "2," "3," "4," "5," "6," and "7." At mid-cycle, after the diverging levers have been set according to the amount set-up on the keyboard, and the printing bars are adjusted accordingly, the printing latches of those banks in which an amount is to be printed are released.

The unlatching of the hammers will be described first with reference to the highest bank of annas, as it is standard for all the banks except that shown in Fig. 5. First of all, the type case 67 of the highest anna's bank has a blank type 68 which does not print, and a "1" which does print. In home position both the blank type and the "1" are below the printing station indicated by the arrow on the platen. In this position a stud 69 on the printer bar has rocked a latch release pawl 70, rockably mounted on a bail 71, so its nose 72 is not in line with surface 73 on hammer latch 74. The unlatching movement is originated by a stud 75 on a lever 76 secured to a drive shaft 77, coupled to shaft 30 by means shown in the Carlson et al. application, said shaft duplicating in movement the rocking of shaft 30. At mid-cycle stud 75 strikes surface 78 on an arm 79 pivoted on a shaft 80. Arm 79 and another like it, also pivoted on shaft 80, support the bail 71 which is rocked clockwise around shaft 80 as stud 75 rocks arm 79. In the position of the parts as shown, nose 72 misses surface 73 and hammer 81 will not be released. However, if the stop bar 43 is given one or more steps of movement by reason of having had a key depressed, that is to say, a movement in addition to that caused by the gap distance 57 between the front end of the stop bar and the zero-stop element, the stud 69 will have risen sufficiently to bring nose 72 into line with surface 73 and latch 74 will be rocked to ineffective position and the hammer 81 fires, printing the "1" unless prevented by hammer block shield 82 to be described. In all of the banks except the two anna banks, the movement caused by gap distance 57 will bring a zero type to printing position. In the bank of Fig. 7 that same movement caused by gap 57 brings the blank type to printing position as no printed zero is ever wanted in that bank. In the bank of Fig. 5 the "8" type is brought to printing position by the movement in closing gap 57. In none of the banks will the printing hammer unlatching pawl be moved to effective position by movement of the stop bar against the zero stop. However, provision is made for the automatic printing of zeros to the right of significant digits that are printed by having a finger 84 (Fig. 9) of the printing hammer latch of a lower bank pass in back of the latch of the next higher bank, so that when a latch of a higher bank is released it carries with it the latches of all the lower banks. The printing hammer latch for the highest anna bank has no such finger, and zeros or the equivalent will not be printed in orders lower than the units of rupees merely because a rupee key has been operated.

On the left side of the type case 62 (Fig. 5) of printer bar 59 of the lowest anna order is fastened hammer block shield 82 that extends into the

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path of movement of the printing hammer 81 (Fig. 7) of the highest anna bank, and is high enough so that type bar 59 (Fig. 5) must rise until at least the "0" type in case 62 is opposite the printing station before printing hammer 81 (Fig. 7) can but either the blank type or the "1" type. The blank type has no function except to act as a stop for the hammer.

The split diverging lever construction

On a downwardly extending arm 90 (Figs. 5 and 6) of printer portion 40 of the split diverging lever for the lowest anna bank is a stud 91 which is spaced away from surface 92 on the forward edge of the downwardly extending arm 93 of stop bar portion 39, by reason of the fact that bail 48 is holding the two parts in home position. A spring 94 tends to bring the arms 90 and 93 together until stud 91 strikes surface 92. This will happen when bail 48 is given its forward and downward movement in the first half of a machine cycle unless prevented by a latch 95 operated to effective position when the highest anna order diverging lever is given a step of movement in addition to the movement caused by gap 57, as will be explained. This always gives the printer bar 59 two steps of movement in addition to that caused by the movement of stop bar portion 39 as the stop bar moves to the zero stop element, providing the latch 95 has not been moved to effective position. This three steps of movement serves to bring the "0" type to the printing station during a machine operation if no key has been depressed. If a key has been depressed printer bar 59 moves further, according to the value of the depressed key. The stop bar 41 is positionable to one of seven places other than zero through the placement of the stop lugs 96.

The highest anna bank

The highest anna bank shown in Fig. 7 has lugs such as lugs 97, on its stop bar that permits it to have but one step of movement beyond the movement against the zero stop element to close gap 57, no matter which key is operated.

The forwardly extending arm 93 of diverging lever 36 has a stud 93 which on the movement of stop bar 43 against zero stop element 50 merely touches an arm 100 on a lever 101 pivoted at 103 to a frame-supported bracket 102, but which rocks lever 101 counter-clockwise slightly if the stop bar moves the extra unit under the control of a depressed key. Lever 101 is kept in home position against stud 104 by a spring 105.

On the movement of stop bar 43 against the zero stop element the blank type 68 is moved to printing position, and on the next unit of movement, under key control, the "1" type is moved to printing position.

The control of the higher anna diverging lever over printing in the lower anna bank

Pivoted at 106 (Fig. 5) to arm 93 is the latch 95 which when moved from its ineffective position shown, in a clockwise direction, presents a blocking surface 107 to a square stud 108 on arm 90, preventing the two-step relative movement between elements 39 and 40. Referring to Fig. 7, a stud 109 on latch 95 rides in the forked end of lever 101 and latch 95 thereby is rocked to effective position as lever 101 is rocked by stud 99.

As latch 95 cannot become effective until stop bar 43 has moved a step beyond the zero stop element, means is provided to preliminarily block relative movement of elements 39 and 40 (see Fig.

5) until latch 95 has had a chance to get behind stud 108. Another latch 110 (Fig. 8) is pivoted on stud 106 on arm 93 and when the parts are in home position is held rocked counter-clockwise against stud 108 by a spring 111, blocking movement between elements 39 and 40 until bail 48 has made sufficient movement to allow lever 101 to be rocked. A pawl 112 pivoted at 103 to bracket 102 has a forwardly-extending arm with a cam surface 113 and an end that makes contact with the under surface of a stud 114 on arm 115 secured to shaft 30. As shaft 30 rocks counter-clockwise enough movement is allowed the diverging lever 36 to rock lever 101 before stud 114 strikes surface 113 and rocks pawl 112 counter-clockwise. When pawl 112 rocks counter-clockwise a rearwardly extending arm 116 thereon engages a stud 117 on latch 110, lifting it to free element 40. Such freeing of element 40 occurs every machine operation but is ineffectual to release element 40 when latch 95 has moved to effective position.

The key bridges

As previously stated there is a bridge coupling between the "1" and "9" anna keys whereby depression of the "9" key carries down the "1" key but not the reverse.

Referring to Figs. 2 and 3, the right hand one of two bridged keys has secured to its stem a finger 120 which extends under the key cap 121 of its left-hand key. This allows the right hand key to be depressed without effect on the left-hand key, but when the left-hand key is depressed it carries the right hand key with it. The same bridging construction couples the "10" and "2" keys, the "11" and "3" keys, the "12" and "4" keys, the "13" and "5" keys, the "14" and "6" keys, and the "15" and "7" keys.

The totalizer

Only the totalizer pinions of the lowest order of annas and the highest order of annas are shown in the drawings. The lowest order of annas' pinions are shown in Fig. 5, the add pinion 125 having eight teeth being meshed with a similar subtract pinion 126, one or the other of these pinion being meshed with a rack 127 on arm 42 of diverging lever 39 when the machine is at rest. At the commencement of a machine operation the pinions are disengaged and the totalizer adjusted so either pinion 125 or 126 is in line with rack 127. Then element 39 has its excursion of movement counter-clockwise under control of the keys, and near mid-cycle the pinions are reengaged with the rack which then moves with the element 39 to home position entering the set-up value into said pinion. The pinion 125 is provided with transfer pawls which transfer, through transfer lever 128, a unit of data into the highest order anna totalizer pinions whenever pinion 125 passes through its zero position. The highest order annas' bank has an add pinion 129 (Fig. 7) having ten teeth, and a similar subtract pinion 130 is meshed therewith. Pinion 129 has a number of transfer pawls so that a transfer is made as every other tooth passes over transfer lever 131. The pies' totalizer wheels, not shown, have twelve teeth and transfer on every twelfth count and the totalizer wheels for the rupee banks have ten teeth and transfer on every tenth count. All of the totalizer wheels are mounted on a common frame and are engaged and disengaged with their respective racks together. As this invention, in its novel aspect, pertains principally to printing, the details of the

totalizer engaging, transfer, and add-subtract controls have not been given, but reference again is made to the Carlson et al. applications for details.

Operation

The operation of the novel mechanism will be explained with reference to a series of entries shown on the printer tape of Fig. 4.

The operator sets up the first amount of 1 rupee, 10 annas, and 11 pies on the keyboard, and thereafter sets the machine in operation. The one rupee is printed directly from the setting given the associated printer bar by the differential of the lowest order of rupees, in the usual manner. Having pressed the "10" key in the highest anna's bank, the "2" key in the lowest anna's bank is carried down by means of the bridge connection, the latch 95 (Fig. 5) is moved to effective position, the highest anna's bank differential moves one step in addition to the "Zero" movement and then the lowest anna's order bank differential moves two steps in addition to the "Zero" movement. The lowest order anna totalizer wheel moves two units and the highest order anna totalizer wheel moves one unit which is the equivalent of an eight count. Inasmuch as the totalizer wheels representing the annas cannot be read decimally, the cabinet has no openings opposite them, but the "decimal" translation appears as the first item on the printed tape. The next transaction is set up on the keys by depressing the "2" rupee key, the "8" anna key, and the "5" pie key. The lowest rupee differential moves two steps, the highest anna bank differential moves only to position the "1" type at the printing position and in doing so moves the highest order anna totalizer wheel one step for a count of eight, and the lowest anna bank differential moves to the zero stop to position the "8" type at the printing station. As the printing hammers are fired that for the highest anna's bank hits the hammer block 82 but in doing so carries the lowest anna order hammer with it and the lowest anna's bank prints an eight. Thus, it is seen the data is entered in the highest anna's order totalizer wheel and printed by the lowest anna's order printing mechanism.

The foregoing adequately explains the operation of the novel mechanism, the tape of Fig. 4 showing a summation of several items to illustrate the mode of "decimally" printing the Indian monetary notation.

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

What is claimed is:

1. In a calculating machine for registering the Indian currency denominations of pies, annas, and rupees, and having a totalizer with a twelve-toothed pies' pinion, an eight-toothed annas' pinion of lower order, a ten-toothed annas' pinion of higher order, and a plurality of ten-toothed rupee pinions, all arranged in a denominational series including transfer devices operative so the pies' pinion transfers to the eight-toothed annas' pinion a unit equal to one anna for every twelve pies accumulated, the eight-toothed anna pinion transfers to the ten-toothed annas' pinion a unit equal to eight annas

for every eight annas accumulated, the ten-toothed annas' pinion transfers to the lowest rupee pinion a unit equal to one rupee for every sixteen annas accumulated, and each rupee pinion transfers a unit to the next higher pinion decimally, the combination of a keyboard having a higher anna order group of keys associated with the ten-toothed anna wheel representing the numbers "8" to "15" inclusive, and having a lower anna order group of keys associated with the eight-toothed annas' wheel representing the numbers "1" to "7" inclusive, there being couplings whereby operating the "9" key operates the "1" key, operating the "10" key operates the "2" key, operating the "11" key operates the "3" key, operating the "12" key operates the "4" key, operating the "13" key operates the "5" key, operating the "14" key operates the "6" key, and operating the "15" key operates the "7" key; a printer bar associated with higher annas order, said printer bar having thereon only the type character "1"; a printer bar associated with the lower annas order, said printing bar having the type characters "8," "9," "0," "1," "2," "3," "4," and "5," "6," and "7," in that order; a zero stop element for each of the key groups, normally in effective position, but each being moved to ineffective position when a key of the associated group is operated; a stop bar for each group of keys, moving, during a machine operation a "zero" distance against the associated zero stop element if it is in effective position or a further distance under control of the associated keys if one has been operated, the stop bar associated with the keys "8" to "15" never moving past the "zero" stop more than a distance of one unit equal to eight annas, and the stop bar for the key group having the keys "1" to "7" moving a number of units equal to the value of the operated key, each unit being equal to one anna; a differential diverging lever coupled to the stop bar associated with the higher anna order and to the associated printer bar, so that during a machine operation if there is a key of the "8" to "15" group operated the "1" type character will be moved to printing position; a stop bar differential diverging lever element coupled to the stop bar associated with the group of keys "1" to "7" and moved with it during a machine operation to represent "zero" or the values from "1" to "7," according to the value of the depressed key; a printer bar differential diverging lever element coupled to the printer bar asso-

ciated with the lower order annas keys which is allowed to move during a machine cycle until stopped by the stop bar differential diverging lever element, said movement of the printer bar differential diverging lever element normally being unimpeded by the stop bar diverging lever element for two free units of movement so that if no one of the anna keys "1" to "7" is operated the anna "0" type character will be positioned at the printing station; a blocking member on the stop bar diverging lever element that is moved to effective position by the diverging lever associated with stop bar of the higher anna order, when said latter stop bar moves a unit distance under control of a depressed key, blocking the free two unit movement of the printer bar diverging lever element; a printing hammer blocking shield extending from the anna printer bar having the type characters "8," "9," "0," "1," "2," "3," "4," "5," "6" and "7" in front of the anna printer bar having the type character "1"; a printing hammer for each printer bar held cocked by an associated latch in potentially operative condition at the commencement of a machine operation, each latch except that for the anna order that transfers to the lowest rupee order having a finger that extends in front of the latch of next higher order in the path of unlatching movement so that in the event the higher anna order printing hammer is fired so will the lower anna order printing hammer; a printing hammer unlatching pawl for each printing hammer, each being held in an ineffective position by its associated printer bar but which is allowed to move to effective position as its associated stop bar moves past the zero stop position, moving the associated printer bar accordingly, the movement of the stop bar of the lower anna order past the zero stop position causing such movement of the associated printer bar so as to move the printing hammer shield to ineffective position; and means to move the printing hammer latch pawls in an unlatching direction after the printer bars have been positioned, whereby the accumulated amount of annas is printed.

2. The machine of claim 1 in which means is provided to prevent the printer bar differential diverging lever element of the lower anna order from having its two units of free movement until the higher anna order diverging lever has had a chance to make its single step of movement.

No references cited.