

June 4, 1935.

H. A. FOOTHORAP

2,003,997

CROSSFOOTER REGISTER

Filed April 25, 1931

4 Sheets-Sheet 1

Fig. 1.

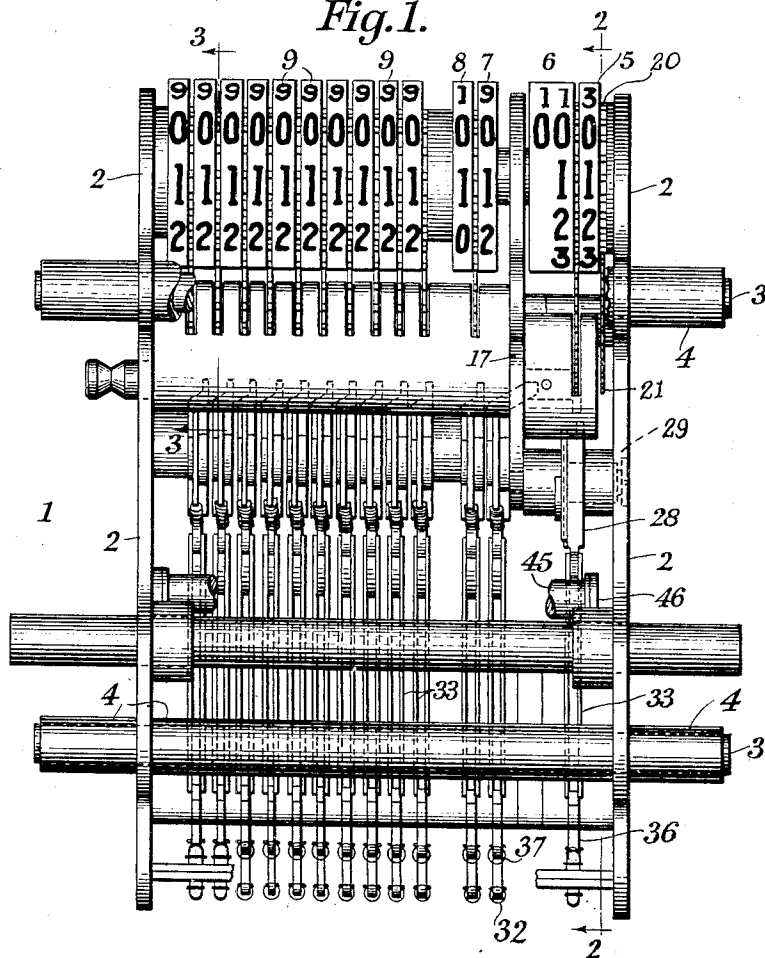
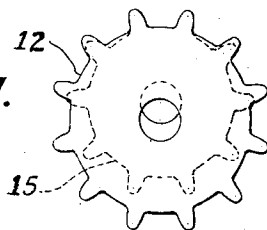


Fig. 7.



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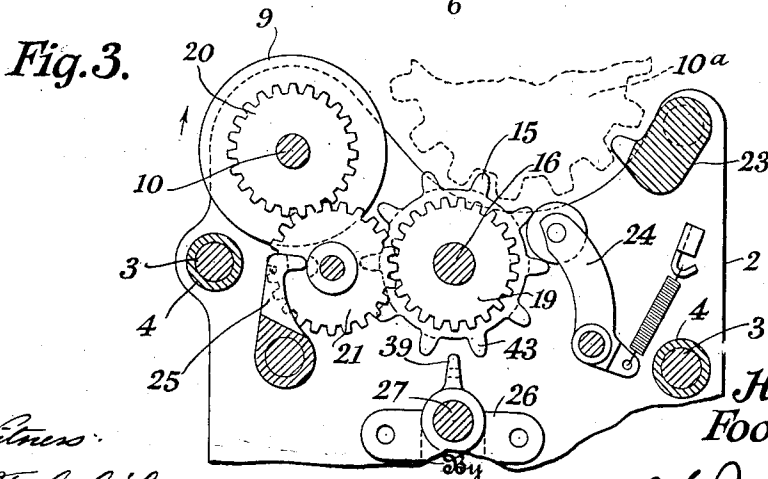
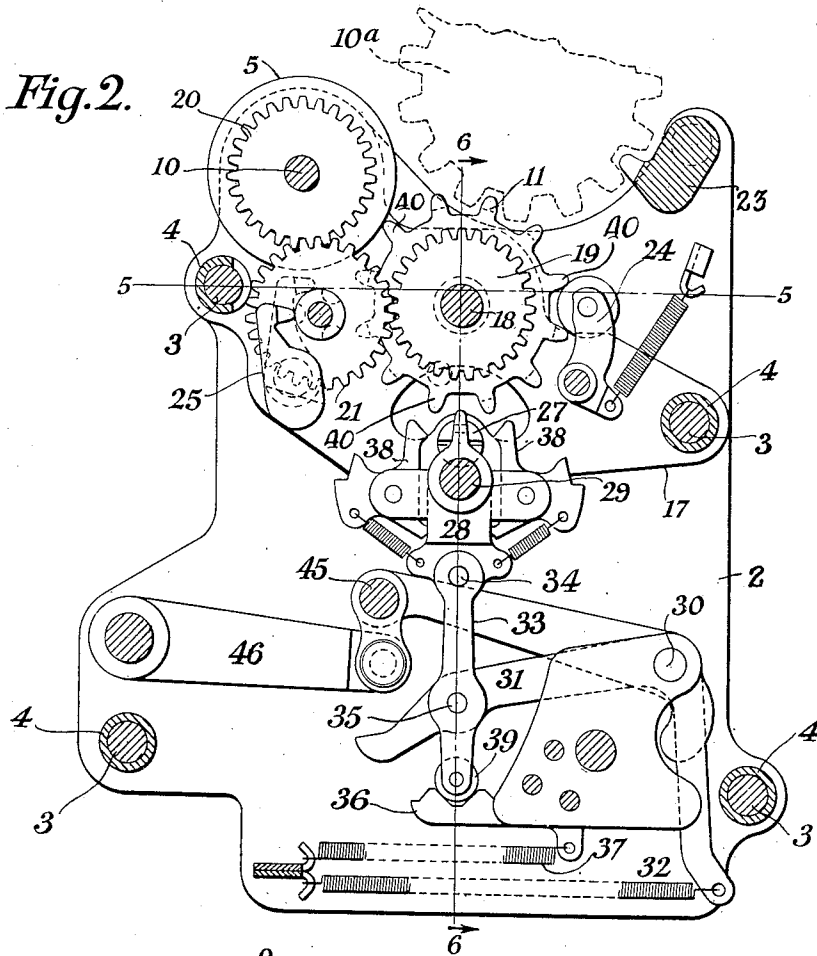
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4 Sheets-Sheet 2



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4 Sheets-Sheet 3

Fig. 4.

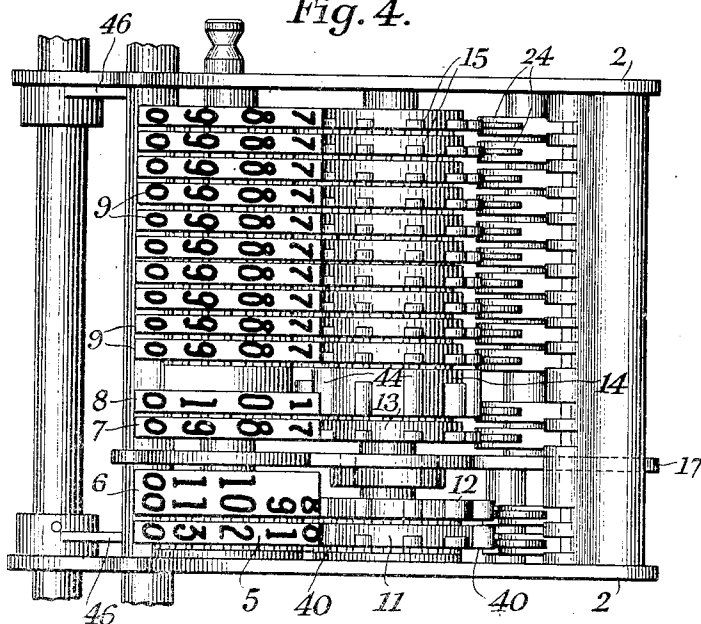
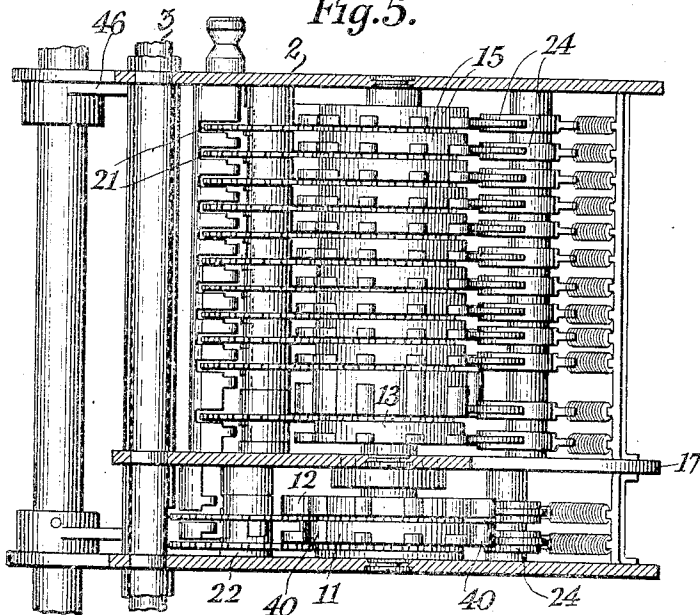


Fig. 5.



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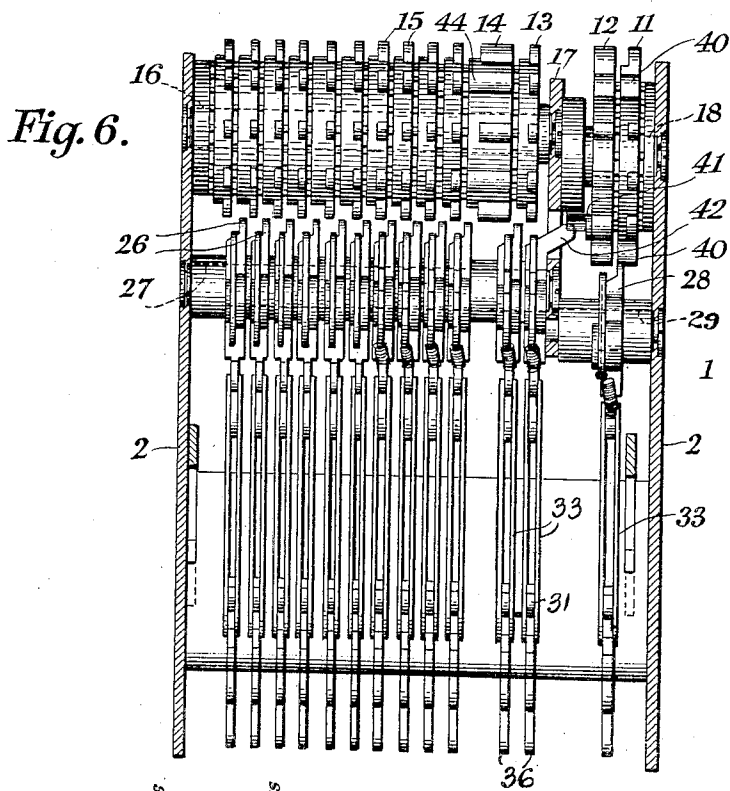
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CROSSFOOTER REGISTER

Filed April 25, 1931

4 Sheets-Sheet 4



Pounds	Shillings	Pence	Farthings
0	00	00	00
1	11	11	11
2	02	22	22
3	13	33	33
4	04	40	40
5	15	51	51
6	06	62	62
7	17	73	73
8	08	80	80
9	19	91	91
9	87	102	102
		113	113
		6	5

Fig. 8.

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UNITED STATES PATENT OFFICE

2,003,997

CROSSFOOTER REGISTER

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mesne assignments, to Underwood Elliott
Fisher Company, New York, N. Y., a corpora-
tion of Delaware

Application April 25, 1931, Serial No. 532,813

3 Claims. (Cl. 235—59)

My invention relates to calculating mechanism and more particularly to improvements in totalizer, or crossfooter registers, so called, of the type adapted for operation by a toothed actuator or master wheel having uniform increments or steps of rotary movement and laterally movable for denominational selection of number wheels, as exemplified in my patent, Number 1,576,961, dated March 16, 1926.

The principal object of my invention is to provide a register of the above designated type operative for either addition or direct subtraction, in accordance with the English currency system, and equipped with aligned value indicating wheels of like diameter, and with number wheels arranged for successive operation by the toothed actuator or master wheel.

To the accomplishment of the above, and also subordinate objects as will presently appear, a preferred embodiment of my invention has been illustrated in the accompanying drawings which will be set forth in detail in the following description and defined in the claims appended thereto.

In the drawings:

Figure 1 is a view in front elevation of a portion of the register constructed in accordance with my invention;

Fig. 2 is a view in vertical section taken on the line 2—2 of Fig. 1;

Fig. 3 is a similar, fragmentary view, taken on the line 3—3 of Fig. 1;

Fig. 4 is a view in top plan.

Fig. 5 is a horizontal section taken on the line 5—5 of Fig. 2;

Fig. 6 is a fragmentary view in vertical transverse section taken on the line 6—6 of Fig. 2;

Figure 7 is a detail side elevation illustrating in full and dotted lines, the relative positions of number wheels of lower and higher orders, respectively, of the register, and

Fig. 8 is a diagrammatic view illustrating the arrangement of value indicating digits on the value indicating wheels of the register.

Referring to the drawings, 1 designates a portion of the crossfooter register, including side frame plates 2 held in spaced relation on the rods 3 by spacing sleeves 4. Mounted, preferably, between the upper front corners of the frame plates 2 is a series of aligned denominational value indicating wheels 5, 6, 7, 8 and 9 freely rotatable upon a horizontal shaft 10 suitably secured at its ends in the frame plates 2.

As previously stated, in substance, the value indicating wheels are designed to register amounts expressed in the terms of the English currency

system, hence, they may be termed farthings, pence, shillings and pounds wheels, respectively. The extreme right hand wheel 5, that of lowest denominational order is the farthings wheel, that of next higher denomination, 6, the pence wheel, the next two wheels 7 and 8 are the units and tens of shillings wheels, respectively, and the succeeding wheels 9 are the pounds wheels of successively higher denominational order.

The value indicating wheels 5, 6, 7, 8 and 9 are of like diameter and provided on their peripheries with equi-distantly spaced digits, as follows: The farthings wheel is provided with three series of digits, each series including "1", "2", and "3" followed by "0". The pence wheel, which is of double width, is provided with the digits "1" to "11" followed by "00". The units of shillings wheel 7 bears the digits "1" to "9" followed by "0", and the tens of shillings wheel, 8, bears five series of digits each comprising "1" and "0". The pounds wheels 9 are each provided with the digits, "1" to "9" followed by "0". A comparatively wide space is left between the pence wheel and the units of shillings wheel and also between the tens of shillings wheel and the pounds wheels to facilitate reading the register.

It will be seen that the farthings and pence wheels 5 and 6 are designed to have twelve uniform increments or steps of rotary movement during a single rotation thereof, and the shillings and pounds wheels ten such increments or steps. In other words, the instant register is provided with aligned value indicating wheels of like diameter, some of which are designed to be rotated through ten and others through twelve step cycles of movement.

As before intimated, said wheels are designed for operation by an actuator shiftable laterally thereof and rotatable in uniform step by step degree. It has not been considered necessary in the present instance to illustrate and describe the mechanism for rotating the actuator or moving the same laterally. Suffice it to say that in the particular type of register with which my invention is concerned, the actuator shown at 10^a is moved with a typewriter carriage and rotated by the number keys thereof in either direction a number of increments, or steps, corresponding to the value of the key depressed, as disclosed for instance in my patent aforesaid.

In order that the proper degrees of rotary movement may be imparted to said indicating wheels under operation of the actuator 10^a, a series of toothed denominational number wheels 11, 12, 13, 14 and 15, (Fig. 3-6) individual to the

value indicating wheels 5, 6, 7, 8 and 9, and hence, corresponding in denominational order thereto, are mounted, preferably, in the rear of said value wheels 5, in peripherally spaced relation with respect to the latter. The tens of shillings number wheel (Fig. 4) 14 is wider than the others because of the wide spacing between the tens of shillings wheel 8 and the adjacent pounds wheel 9. As clearly indicated in Figs. 2 and 3, the actuator 10^a is located above said number wheels for movement thereover.

The farthings and pence number wheels 11 and 12 are each provided with twelve peripheral teeth equi-distantly spaced in correspondence with the increments or steps of movement of said farthings and pence wheels. The shillings and pounds number wheels 13, 14 and 15 have ten teeth, respectively, and hence, are smaller in diameter than the farthings and pence wheels 11 and 12.

In order that the actuator 10^a may move laterally across the relatively large and small number wheels, the smaller of said wheels, 13, 14 and 15 are mounted upon a common horizontal shaft 16 (Figs. 2, 4 and 6) having its opposite ends secured in one side plate 2 and in a bracket 17 located between and parallel with the side frames 2, and supported on the tie rods 3. The large number wheels 11 and 12 are likewise mounted upon a common horizontal shaft 18 suitably secured at its opposite ends in the other side frame plate 2 and said bracket 17, but the shafts 16 and 18 are relatively staggered or offset axially to locate the latter below the former, or in other words the large and small number wheels are eccentrically mounted with respect to each other sufficiently to present their teeth in horizontal alignment at the point where they mesh with the teeth of the actuator 10^a.

The indicating wheels 5 and number wheels 11, 12, 13, 14 and 15, respectively, of corresponding denominational orders are geared together by gear trains, each including a driving gear 19 suitably secured concentrically to one side of the number wheel, a driven gear 20 suitably secured concentrically to one side of the indicating wheel, and an intermediate idler gear 21. The gears 19, 20 and 21 in each gear train are designed to effect a one to one ratio of drive between the number wheel and the value indicating wheel. Preferably in each train they are of the same relative diameter. In the case of the farthings and pence wheels 5 and 6 and associated number wheels 11 and 12, the gears in each train are of the same relative diameter, but of larger diameter than the gears in the other trains, and the idlers 21 are eccentrically mounted relatively to the idlers in said other trains, as shown at 22 in Figure 5. This as will be understood, is because of the larger diameter of the number wheels 11 and 12.

At 23 (Fig. 3) is shown a comb plate for locking the actuator 10^a in location, and 24 indicates the number wheel locating devices, while 25 indicates a part of a clear signal mechanism, all forming part of the equipment of this type of register, as shown in my Patents Nos. 1,576,961 and 1,505,384, and which need merely be identified in passing.

Co-operating with the number wheels 11 to 15 is a two way transfer or carrying mechanism similar to that of my Patent No. 1,576,961 but modified, as follows, to adapt it to the different operating requirements in the present instance. Mounted below the shillings and pounds number

wheels 13, 14 and 15 is a series of transfer heads 26 (Fig. 3), individual to said wheels, and adapted to rock from a central normal position in opposite directions, respectively, about a common axis on a fixed horizontal shaft 27, the latter suitably mounted at its ends in one side frame plate 2 and the beforementioned bracket 17. Below the farthings wheel 11 (Fig. 2) is a similar transfer head 28 mounted on a horizontal shaft 29, the ends of which are secured in the other side plate 2 and the intermediate bracket 17, the shaft 29 being staggered (as shown in Fig. 2) to locate it below the shaft 27 in correspondence with the staggered relation of the shafts 16 and 18. Pivoted below the transfer heads 26 and 28, as at 30 (Fig. 2) are individual head operating levers 31 urged in the direction of the axis of the heads by motor springs 32. Associated operating levers and transfer heads are connected by a link 33 pivoted to its head below the axis thereof, as at 34, and to its operating lever, as at 35, so that in the central normal position of the transfer head, said link and head assume a toggle-locked relation resisting the urge of the motor spring. These parts are yieldingly held in their normal position by a detent member 36 tensioned by a spring 37 and engaging a roller 39 on the link 33.

In a carrying operation, a number wheel trips a transfer head in one direction or the other, as the case may be, and thus breaks the toggle-locked relation of the parts, whereupon movement of the tripped head is continued by the motor spring 32 as will be clear, and one or the other of a pair of combined carrying dogs and stops 38 are thereby engaged with the number wheel of next higher denominational order to move it one increment or step.

The farthings, pence and pounds number wheels 11, 13, 14 and 15, respectively, are provided with widened teeth (Figs. 4, 5 and 6) which, when said wheels have been rotated a number of increments, or steps, corresponding to the limits of their denominational values, engage trip members 39 on the transfer heads 26 and 28 to effect the tripping operation. In the case of the farthings wheel 11, three such teeth 40 are provided for tripping the transfer head 26 at every fourth step of movement of said farthings wheel, it being understood, of course, that the limit of denominational value in this instance is four. The pence wheel "12", in which denomination the limit of value is "12", is provided with a single laterally extending lug 41 (Fig. 6) for tripping a transfer head 26 associated with the units of shillings number wheel 13 and which, because of the relatively wide spacing of the number wheels in these two orders, is equipped with a trip member 42 projecting laterally into the path of said lug 41. The units of shillings wheel 13 and the pounds wheels 15 are each provided with a single widened tooth 43 (Fig. 3), the limit of denominational value being "10" in each of these denominations. In the case of the tens of shillings wheel 14, every other tooth is widened, as at 44 (Figs. 4 and 6) so that the associated transfer head 26 is tripped at every other step or degree of movement of said wheel for a reason which will be understood.

At 45 is shown a transfer restoring bail, and at 46, a part of bail operating mechanism which form a part of the transfer restoring mechanism disclosed in detail in my co-pending application Serial No. 505,906 filed December 31, 1930 and which have merely been included in the present showing in order to provide a complete dis-

closure of a register of the type with which my invention is concerned.

One of the aims of this invention is the provision of a set of visible indicating wheels, all of like diameter and journaled on a rectilinear axis for registering non-decimal as well as decimal amounts, an advantage being that no one of the wheels is more prominently displayer than another.

Also it is necessary in accumulating non-decimal amounts on a machine, the master actuator and the totalizer of which are relatively shiftable laterally, that the differential actuator be able to engage with any of the receiving wheels, during such relative movement.

Due to the character of the computation, however, that is, the different notational systems which must be taken into consideration in building a totalizer capable of decimal and non-decimal accumulation, and bearing in mind the differences in the pitch diameters of the totalizer wheels to obtain the necessary variations in the numbers of teeth on the respective decimal and non-decimal totalizer wheels, the present invention is thought to afford a solution both simple to manufacture, and operate.

The foregoing constitutes a detailed disclosure of a preferred embodiment of my invention, but it is to be understood that right is herein reserved to such modifications thereof as fall fairly within the scope of the protection prayed.

What I claim is:

1. In a calculating machine, the combination with a master actuator; of a totalizer for accumulating decimal and non-decimal items, the denominational wheels of which are arranged in sets, the wheels of one set being of different diameter from the wheels of another set, the master actuator and the totalizer being relatively shiftable laterally to effect the engagement of the master actuator and successive wheels of the totalizer; axial supports for the respective sets of totalizer wheels in end to end eccentric relation, and so arranged that the peripheries of the totalizer wheels of less diameter lie flush with the peripheries of the totalizer wheels of larger diameter along a horizontal line defined by the points of engagement of the master actuator and all the totalizer wheels; a set of visible, denominational indicating wheels all of like diameter; a rectilinear axis on which all the indicating wheels are journaled; pinions fast with the respective indicating wheels the pinions on the indicating wheels corresponding with the actuator-driven wheels of one set varying in diameter from the pinions on the indicating wheels associated with the actuator-driven wheels of another set; and similarly variant sets of transmission wheels intermediate and connecting the denominational pinions and their corresponding denominational totalizer wheels; and one of the sets of intermediate transmission wheels being eccentrically mounted relatively to another, corresponding with the eccentric mounting of the sets of totalizer wheels with which they respectively engage, the denominational indicating wheel pinions and their transmission gears being of diameters corresponding with the diameters of the denominational totalizer wheels with which they are respectively in train.

2. In a calculating machine, the combination with a master actuator; of a totalizer for accumulating decimal and non-decimal items, the denominational wheels of which are arranged in sets, the wheels of one set being of different diameter from the wheels of another set, the master actuator and the totalizer being relatively shiftable laterally to effect the engagement of the master actuator and successive wheels of the totalizer; axial supports for the respective sets of totalizer wheels in end to end eccentric relation, and so arranged that the peripheries of the totalizer wheels of less diameter lie flush with the peripheries of the totalizer wheels of larger diameter along a horizontal line defined by the points of engagement of the master actuator and all the totalizer wheels; carrying mechanisms for the respective totalizer wheels except that of lowest denominations, the carrying mechanisms being arranged in sets corresponding with the sets of denominational totalizer wheels; and separate axes for the respective sets of carrying mechanisms the axes being arranged eccentrically relatively to each other.

3. In a calculating machine, the combination with a master actuator; of a totalizer for accumulating decimal and non-decimal items, the denominational wheels of which are arranged in sets, the wheels of one set being of different diameter from the wheels of another set, the master actuator and the totalizer being relatively shiftable laterally to effect the engagement of the master actuator and successive wheels of the totalizer; axial supports for the respective sets of totalizer wheels in end to end eccentric relation, and so arranged that the peripheries of the totalizer wheels of less diameter lie flush with the peripheries of the totalizer wheels of larger diameter along a horizontal line defined by the points of engagement of the master actuator and all the totalizer wheels; a set of visible, denominational indicating wheels all of like diameter; a rectilinear axis on which all the indicating wheels are journaled; pinions fast with the respective indicating wheels, the pinions on the indicating wheels corresponding with the actuator-driven wheels of one set, varying in diameter from the pinions on the indicating wheels associated with the actuator-driven wheels of another set; similarly variant sets of transmission wheels intermediate and connecting the denominational pinions and their corresponding denominational totalizer wheels; and one of the sets of intermediate transmission wheels being eccentrically mounted relatively to another, corresponding with the eccentric mounting of the sets of totalizer wheels with which they respectively engage, the denominational indicating wheel pinions and their transmission gears being of diameters corresponding with the diameters of the denominational totalizer wheels with which they are respectively in train; carrying mechanisms for the respective totalizer wheels except that of lowest denominations, the carrying mechanisms being arranged in sets corresponding with the sets of denominational totalizer wheels; and separate axes for the respective sets of carrying mechanisms, the axes being arranged eccentrically relatively to each other.

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