

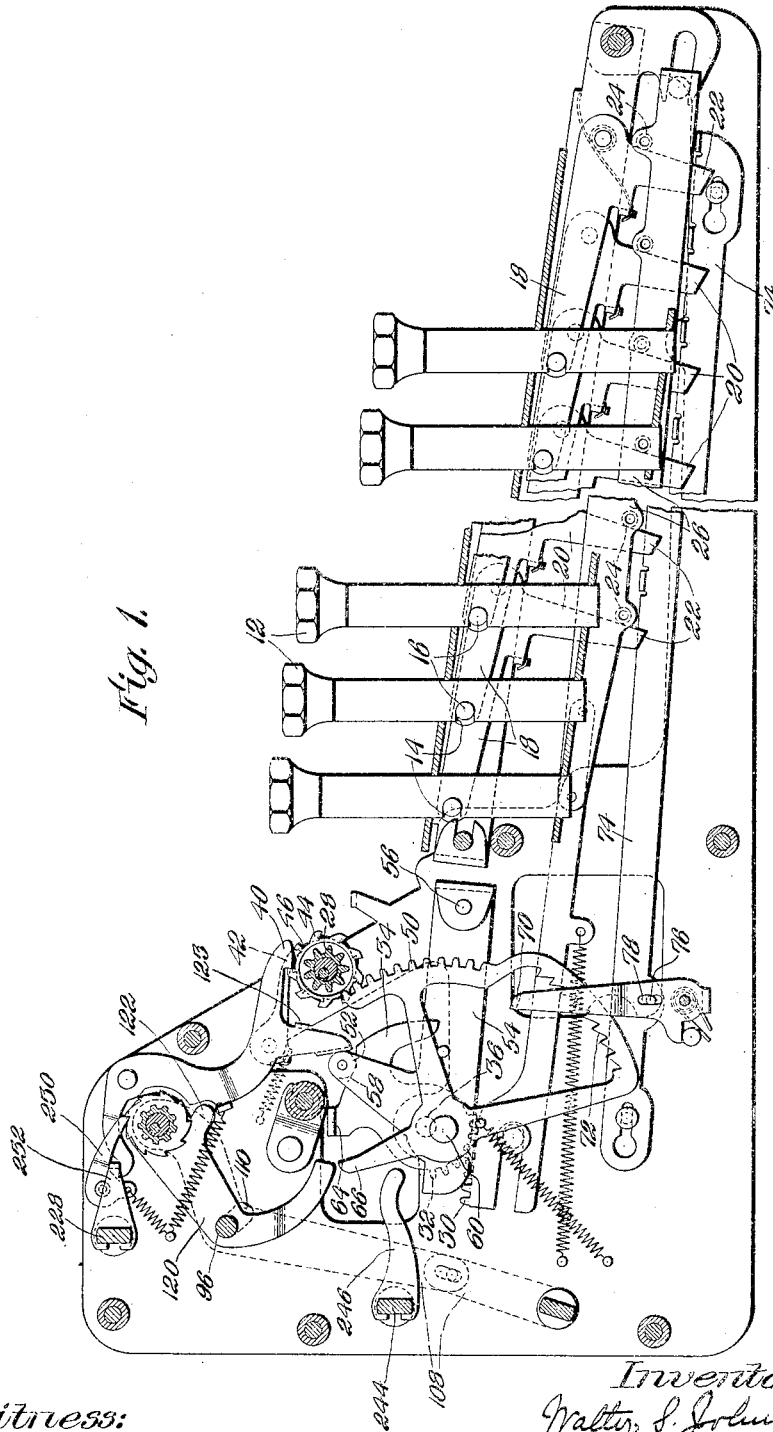
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1,886,883

CALCULATING MACHINE

Original Filed April 23, 1921 3 Sheets-Sheet 1



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CALCULATING MACHINE

Original Filed April 23, 1921 3 Sheets-Sheet. 2

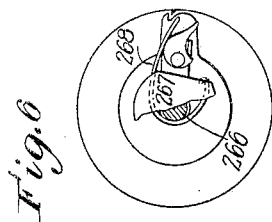
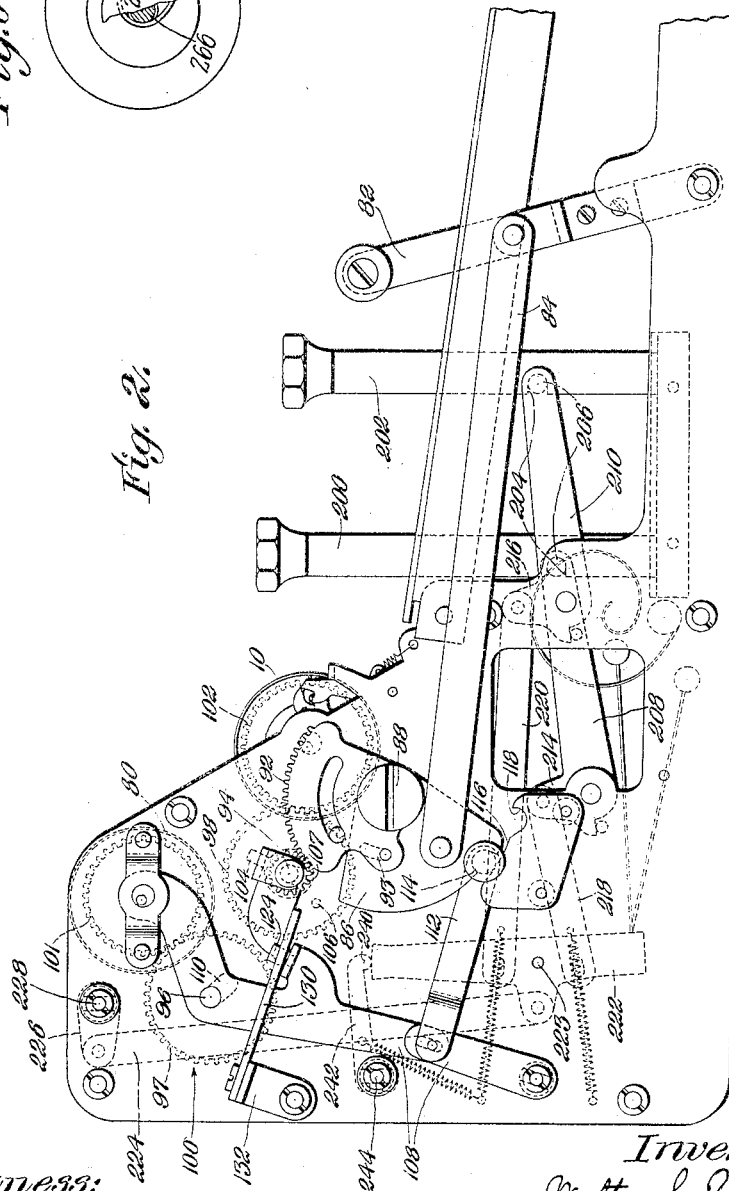


Fig. 2.



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CALCULATING MACHINE

Original Filed April 23, 1921 3 Sheets-Sheet 3

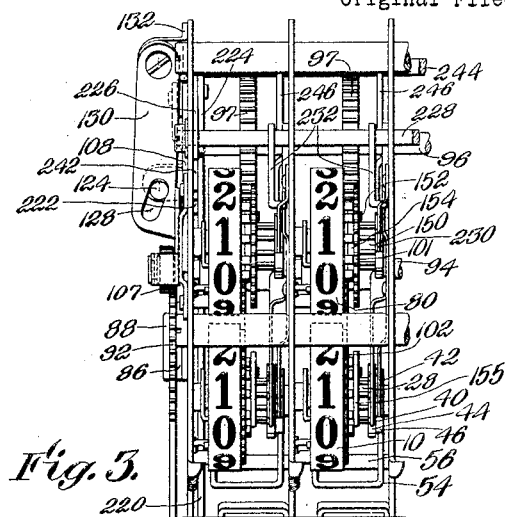


Fig. 3.

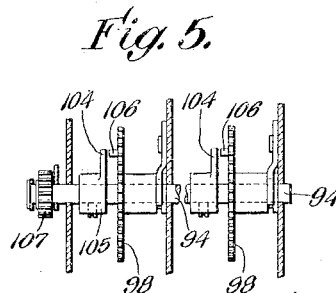


Fig. 5.

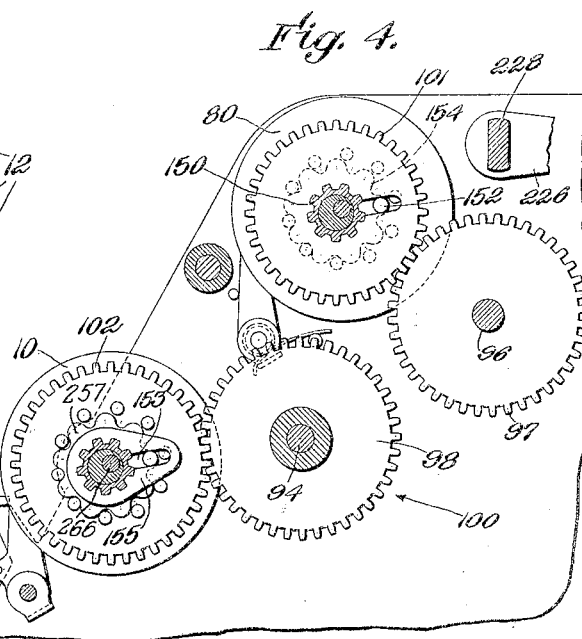


Fig. 4.

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CALCULATING MACHINE

Application filed April 23, 1921, Serial No. 463,870. Renewed March 30, 1932.

This invention relates to calculating machines.

One feature of the invention resides in the provision of mechanism for registering and totalizing the sub-totals arrived at through successive computations made upon the computing mechanism of the machine. This is preferably accomplished through the transfer of the sub-totals from the computing wheels of the computing mechanism to totalizing wheels. With the usual constructions of calculating machines, in adding a number of separate items, the operator makes one computation, as for example, the cost on a certain invoice, writes down the result in pencil, then clears the machine, that is, returns all of the computing wheels to zero, and then computes succeeding items, setting each sub-total down and thereafter clearing the machine. After all of the sub-totals have been computed, he uses the machine to add them up, reading the result from the computing wheels. The present invention enables the total as well as the sub-totals to be computed by the machine and eliminates the necessity of setting down the individual sub-totals as well as the operation of adding the sub-totals.

Another feature of the invention resides in the provision of mechanism for clearing the computing wheels when the transfer of a sub-total therefrom to the totalizing wheels is made. In this manner the computing mechanism is placed in condition for the next operation of computing the succeeding sub-total.

A further feature of the invention resides in the provision of mechanism by which the totalizing wheels and the computing wheels may be cleared independently of one another. This feature of the invention facilitates the elimination of errors in individual sub-totals.

Other features of the invention will be hereinafter pointed out and particularly defined in the claims.

In the drawings illustrating the preferred embodiment of the invention Fig. 1 is a vertical longitudinal section of the machine; Fig. 2 is an elevation of the left-hand side of

the machine; Fig. 3 is a plan of the left-hand portion of the machine; Fig. 4 is a sectional detail showing the driving mechanism for transferring the sub-totals from the computing wheels to the totalizing wheels; Fig. 5 is a detail to be referred to; and Fig. 6 is a detail view of the carrying and restoring mechanism.

The mechanism in the calculating machine illustrated in the drawings for computing the sub-totals is similar in construction and mode of operation to the computing mechanism of the calculating machine illustrated and described in the patent to George C. Chase, No. 1,329,262, of Jan. 27, 1920. In order to assist in understanding the present invention, the computing mechanism will be briefly described, but reference is made to the Chase patent for a detail description thereof.

Referring to the drawings, the present machine comprises a plurality of sections each provided with computing and totalizing mechanism. The computing mechanism of each section includes a number wheel 10 rotatably mounted in the machine frame arranged to be rotated by depression of any one of a series of nine keys 12 to perform the computing operation. For this purpose each key is connected through a slot 14 and pin 16 to one arm 18 of a bell crank lever 20 pivoted upon the machine frame. Depression of the key operates through engagement by the second arm 22 of the bell crank 20 with a roll 24 carried by a slide bar 26 to cause movement of the slide bar 26 to the right, viewing Fig. 1, or toward the front of the machine. Succeeding bell cranks are arranged with arms of different lengths so that the slide bar is moved a distance directly proportional to the number upon the particular key which is depressed.

Movement of the slide bar 26 toward the front of the machine upon depression of the key is transmitted to a driving pinion 28 arranged to rotate the number wheel 10, and for this purpose the rear end of the slide bar is provided with a rack 30 engaging a segmental gear 32 formed upon a cam member 34 pivoted to the machine frame at 36. As the slide bar 26 is moved toward the

front of the machine the cam member 34 is oscillated about its pivot to the left, viewing Fig. 1. The number wheel 10 is normally prevented from rotation in either direction
 5 by pawls 40, 42 which engage the teeth of opposed ratchets 44, 46. During the computing operation the pawl 40 is lifted to permit forward rotation of the number wheel, the pawl 42 acting merely as a check pawl.
 10 Movements of the cam member are utilized to lift the pawl 40 from its ratchet and also to move an actuating segment 50 into engagement with the driving pinion 28. For this purpose a cam roll 52 on one arm of a bell
 15 crank 54 pivoted to the machine frame at 56 is arranged to rest upon the cam surface 58 as shown in Fig. 1. As the cam member 34 rotates to the left the cam roll 52 is moved upwardly and to the right, causing oscillation of the pawl 40 and lifting the same from
 20 engagement with its ratchet. During this initial movement of the cam member 34 the actuating segment 50 is pivoted to the bell crank at 60 is moved upwardly through the action of the cam roll 52 as it rides upon the
 25 cam surface 58 until the pivot 60 coincides with the pivot 36 of the cam member. Thereafter the segment 50 is rotated about 36 as a pivot.
 30 This initial movement of the cam member 34 operates to move the actuating segment 50 into engagement with the driving pinion 28 and takes place while a lug 64 upon the cam member 34 is moved into contact with
 35 an arm 66 extended upwardly from the actuating segment 50. Thereafter as the cam member 34 is rotated to the left the actuating segment 50, driven through contact of the lug 64 with the arm 66, operates to cause rotation of the driving pinion 28 and number
 40 wheel 10 to perform the computing operation.
 Over depression of the operating keys 12 and over rotation or spinning of the number wheel 10 during the computing operation is
 45 prevented by a pawl 70 and ratchet 72 formed on the lower portion of the actuating segment 50. The pawl 70 is actuated by a second slide bar 74 arranged below the first slide bar and arranged to be moved by the ends
 50 of the arms of the several bell cranks as the operating keys are depressed. The rear end portion of the second slide bar 74 is provided with a pin 76 which extends into a slot 78 in the pawl 70. The relation of the arms of
 55 the several bell cranks to the second slide bar 74 is such as to delay movements thereof until after movement of the first slide bar, and also such that the pawl 70 is thrown into the tooth of the ratchet 72 corresponding with
 60 the number of the key which is depressed. In this manner overdepression of the keys and over-rotation of the number wheels are positively prevented.

The computing number wheels 10 are provided with carrying mechanism by which a

complete rotation of one number wheel is carried over to cause one-tenth of a rotation of the wheel of the next higher order. This is the same in construction and mode of operation as that disclosed in said Chase patent above mentioned. The carrying mechanism is not shown in detail in the present drawings, but comprises in general a series
 70 of carrying disks 267 mounted upon eccentrically mounted carrying shafts 266 arranged so that a rotation of the disk of one number wheel causes a rotation of the carrying shaft of the number wheel of the next higher order. A rotation of the latter carrying shaft
 75 operates through an eccentrically mounted nine tooth pinion 257 which engages a ten tooth gear on the succeeding number wheel to advance the latter a tenth of a rotation. The carrying disk is actuated by a coil spring
 80 268 previously wound up during the rotation of the preceding number wheel from zero to nine, and a cam actuated latch is arranged to release the disk as the preceding number wheel is passing from nine to zero thus operating to permit a complete rotation of the
 85 disk and carrying shaft to advance the succeeding number wheel one-tenth of a rotation.

The construction and mode of operation of the calculating machine thus far described is substantially that shown and described in
 90 said Chase patent.

From the description thus far it will be apparent that in operating the machine a sub-total may be recorded upon the number
 100 wheels 10 of the computing mechanism by manipulation of the keys 12. In order that the total of any number of computations may be computed and indicated totalizing wheels 80 are mounted in the frame above the computing
 105 wheels and provision is made for transferring the result of each computation from the computing to the totalizing wheels. Provision is also preferably made for clearing the computing wheels, that is for returning
 110 them to zero in readiness for the next computing operation in effecting the transfer.

To effect the transfer a transfer handle 82 (see Fig. 2) pivoted upon the machine frame
 115 is connected by a link 84 extended along the left-hand side of the machine to an oscillatory crank 86 pivoted at 88. The crank 86 is connected with a segmental actuating gear 92 by a pin and slot connection 93 through
 120 which a certain amount of lost motion is provided, so that during the first part of the throw of the transfer handle 82 the crank 86 is permitted to be turned without causing movement of the segmental actuating gear
 125 92. The movement of the crank 86 during the first part of the throw of the transfer handle 82 is utilized to perform three operations preparatory to the actual transferring of the reading upon the computing wheels
 130

to the totalizing wheels. The first operation comprises a movement of the idler gears 97 loosely mounted on a countershaft 96 into mesh with driving gears 98 loosely mounted on a countershaft 94 to complete the gear train 100. The gear train 100 comprises upper and lower gears 101 and 102 secured to the totalizing wheels and computing wheels respectively, together with the driving gears 98 and idler gears 97 as shown in Figs. 2 and 4. Upon subsequent and further operation of the transfer handle the gear train 100 is driven to transfer the reading from the computing wheels to the totalizing wheels. The second operation comprises the lifting of both pawls 40, 42 from engagement with their ratchets; and the third operation comprises the lateral movement of the counter-shaft 94 upon which the driving gears 98 are loosely mounted so as to bring the arms 104 secured upon the shaft into engagement with pins 106 upon the driving gears 98.

The first operation is accomplished by the breaking of toggles 108, one upon each side face of the machine in which the ends of the counter shaft 96 are journaled. Slots 110 in the opposite side faces of the machine frame permit movement of the counter shaft 96 during the movement of the toggles. One toggle is connected by a link 112 to a cam roll 114 embraced by a notch in the lower portion of the oscillatory crank 86. The cam roll 114 is supported upon a cam surface 116 and its extreme movement to the right is limited by a notch 118 therein. The second operation, to wit the lifting of the computing wheel locking pawls, is accomplished from movement of the toggle during the breaking thereof through a pivoted cam arm 120, a portion 122 of which is arranged to engage the pawl arms to cause the pawls 40 to be lifted sufficiently to lift the pawls 42 through engagement of lugs 123 with the pawls 42 in order to permit clearing of the computing wheels. The first two operations, to wit the throwing in of the driving gears and the lifting of the pawls, preferably take place nearly simultaneously, but care is taken that the gears are thrown into mesh before the pawls are released. The third operation, to wit the lateral movement of the counter shaft 94, is accomplished by the engagement of a cam pin 124 carried by one of the toggle arms (see Figs. 2 and 3) with a cam slot 128 in an arm 130 pivoted to a bracket 132 bolted to the machine frame. The end of the pivoted arm 130 is secured to the end of the counter shaft 94, so that movements of the arm during the breaking of the toggle operate to cause lateral movement of the counter shaft 94 toward the right of the machine. In this manner the arms 104 carried by collars 105 secured to the counter shaft 94 are brought into the path of pins 106 secured to the loosely mounted driving gears 98 (see Fig. 5), so that upon rota-

tion of the counter shaft 94 the arms 104 will engage the pins 106 and cause rotation of the driving gears.

After the foregoing preparatory operations have been completed during movement of the crank 86 independently of the segmental actuating gear 92, and as the throw of the transfer handle is continued, the segmental actuating gear 92 operates through engagement with a pinion 107 on the counter shaft 94 to cause the arms 104 to revolve until they strike the pins 106 on the driving gears and thereafter each gear train 100 is driven directly from the transfer handle. The relative position of the pins 106 at any time corresponds to the reading upon the particular computing wheel 10, so that the actual extent of drive of the gear train operates to transfer the reading from the computing wheel to the transfer wheel and at the same time to return the computing wheels to zero.

The totalizing wheels are provided with carrying mechanism of the same construction and mode of operation as that disclosed in said Chase patent and as embodied in the computing mechanism above described, with the exception that, as shown in Fig. 4, the movements of the driving pinion 150 of the carrying mechanism are transmitted through a slot in the gear 101 of the gear train 100 to a pin 152 upon the nine tooth pinion 154, instead of through a slot 153 in a plate 155 secured to the driving pinion as employed in the carrying mechanism of the computing mechanism and as in the Chase patent above mentioned. By means of the carrying mechanism a complete rotation of each number wheel of the totalizing mechanism is carried over to cause a tenth of a rotation of the number wheel of the next higher order, exactly as in the case of the computing mechanism.

As above described the transferring operation automatically clears the computing wheels or returns them to zero after each subtotal has been computed. Sometimes it is desirable to clear the totalizing wheels and computing wheels independently of each other, as for example when it is desired to correct errors in the reading upon the computing wheels. For this purpose, provision is made for selectively lifting the pawls by which both the totalizing wheels and computing wheels are held thus releasing the tension which has been set up in the coil springs 268 of the carrying mechanism to permit the same to operate to return the wheels to zero. Accordingly, two keys 200, 202 are provided, one corresponding with the totalizing wheels and designated "Top" in Fig. 3, and the other corresponding to the computing wheels and designated "Bottom" in Fig. 3. The keys 200, 202 are provided with notches 204 arranged to engage pins 206 in the ends of bell cranks 208, 210 respectively, pivoted to the machine frame. The second arms 214, 216

of the bell cranks are connected by links 218, 220 to an arm 222 above and below the pivot 223 therefor. Pin and slot connections are provided in order that the arm 222 may be oscillated under the influence of either key. The arm 222 is connected by a link 224 to a crank 226 mounted upon and secured to the pawl actuating shaft 228. From the description thus far it will be apparent that when the key 202, corresponding to the computing wheels, is depressed the arm 222 is oscillated to the right, thus operating to raise the crank 226 and oscillate the pawl actuating shaft 228 to the right viewing Fig. 1. When the key 200, corresponding with the totalizing wheels, is depressed, the arm 222 is oscillated to the left operating through the link 224 to cause rotation of the pawl actuating shaft 228 to the left viewing Fig. 1. From consideration of Fig. 1 it will be apparent that when the pawl actuating shaft 228 is oscillated to the right the pawls 40 are lifted from their ratchets upon the computing wheel, and on the other hand when the pawl actuating shaft is oscillated to the left the check pawls 230 for the totalizing wheels are lifted by arms 232 secured upon the shaft 228. As the arm is oscillated under the influence of either key the head 240 of an arm 242 pivoted upon the shaft 244 drops down over first one side or the other of the upper end of the arm 222, and operates to lock the parts in position so that the pawls remain lifted. This arm is reset upon the next operation of a key 12 in a subsequent computing operation by the engagement of the end of the bell crank 54 with a rocker arm 246 mounted upon the second end of the shaft (see Fig. 1). In this manner the totalizing wheels may be cleared by operation of the key 200, and the computing wheels may be cleared by operation of the key 202. However, both the computing wheels and totalizing wheels cannot be cleared at the same time through the operation of the keys 200, 202, as it is necessary that the locking arm 242 be reset by an intermediate computing operation, or actuation of the computing keys 12.

I claim:

1. A calculating machine having, in combination, computing mechanism including number wheels, totalizing mechanism including number wheels, a normally inoperative gear train including a driving gear adapted to connect the computing mechanism with the totalizing mechanism to transfer a sub-total, driving means normally disconnected from the driving gear and a manually operated transfer member having provision for first operating the gear train to connect the computing mechanism and the totalizing mechanism and to place the driving means and the driving gear into operative relationship and thereafter to actuate the driving means, the driving means and the driving

gear being associated in a manner to clear the computing wheels and to rotate the totalizing mechanism to an extent determined by the reading of the computing mechanism.

2. A calculating machine having, in combination, computing mechanism including number wheels, totalizing mechanism including number wheels, and means for transferring a sub-total from the computing mechanism to the totalizing mechanism including gears fixed to the number wheels of each mechanism, an idler gear constantly in mesh with one of said gears, a driving gear constantly in mesh with the second of said gears, and means for moving the idler gear into and out of mesh with the driving gear, an operating member, a rotatable shaft upon which the driving gear is loosely mounted, an arm fixed to the shaft, a pin fixed to the gear, and means actuated by the operating member for moving the shaft to position the arm in the path of the pin and to thereafter rotate the shaft to perform the transferring operation.

3. A calculating machine having, in combination, computing mechanism, means for actuating the computing mechanism to secure a sub-total, totalizing mechanism, and means for transferring a sub-total from the computing mechanism to the totalizing mechanism including an operating member, driving means actuated by the operating member and adapted to clear the computing mechanism when brought into cooperation therewith, means for bringing the driving means and the computing mechanism into cooperation upon initial actuation of the operating member, and connections between the driving means and the totalizing mechanism for actuating the latter upon continued movement of the operating member.

4. A calculating machine having, in combination, computing mechanism including number wheels, totalizing mechanism including number wheels, means for transferring a sub-total from the computing mechanism to the totalizing mechanism including a normally incomplete gear train between said mechanisms, an operating handle, said gear train comprising a driving gear constantly in operative connection with the computing mechanism, a counter shaft on which the driving gear is loosely mounted, a pin on the driving gear, an arm on the counter shaft normally out of the path of the pin, means connected with the operating member for completing the gear train on the initial movement thereof, means for placing the arm on the counter shaft in the path of the driving gear pin, and means acting upon continued movement of the operating member to rotate the counter shaft.

5. A calculating machine having, in combination, computing mechanism and totalizing mechanism each including number wheels, gears fixed to the number wheels of each

