

No. 893,717.

PATENTED JULY 21, 1908.

J. C. WAHL.
CALCULATING MACHINE.
APPLICATION FILED OCT. 28, 1904.

6 SHEETS—SHEET 1.

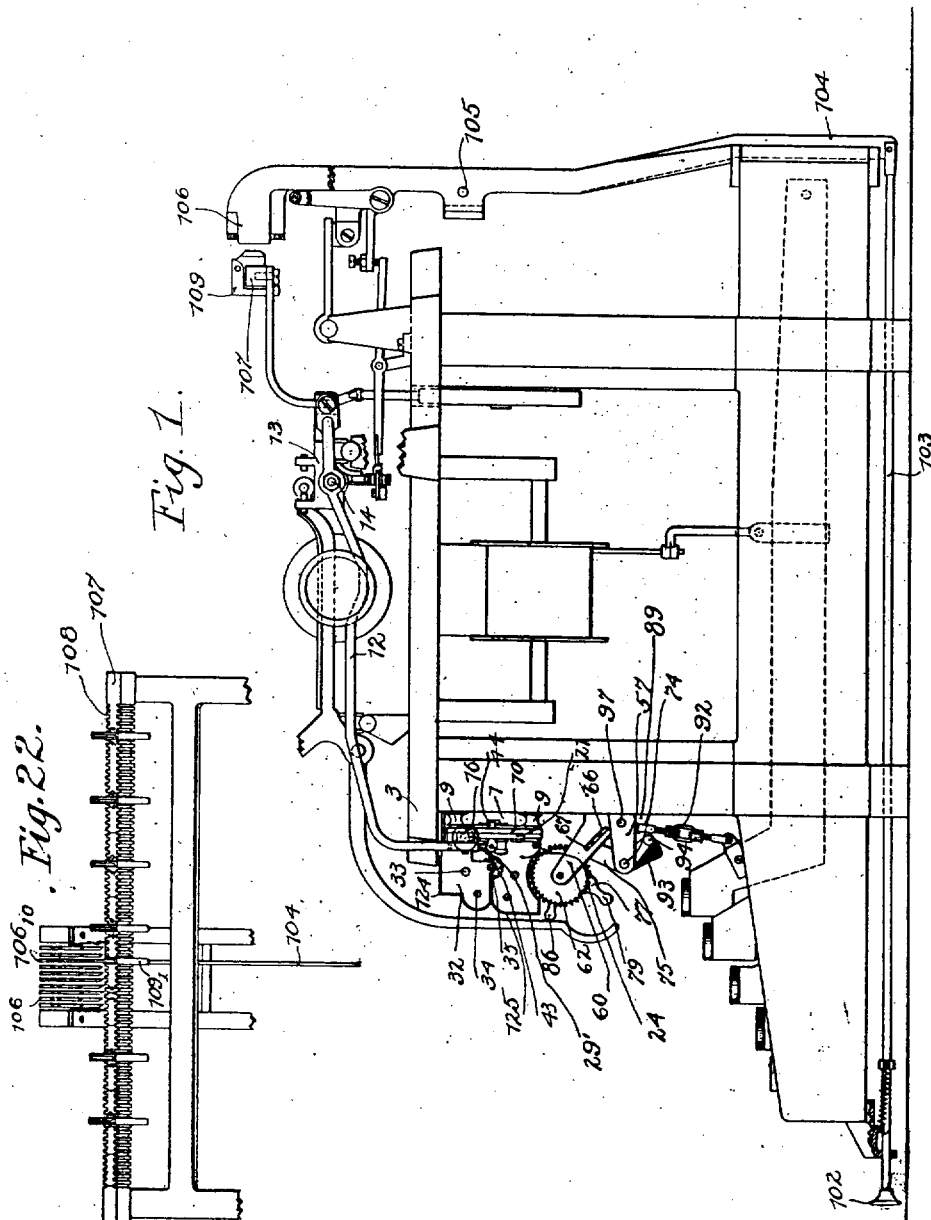


Fig. 1.

Fig. 22.

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Inventor:
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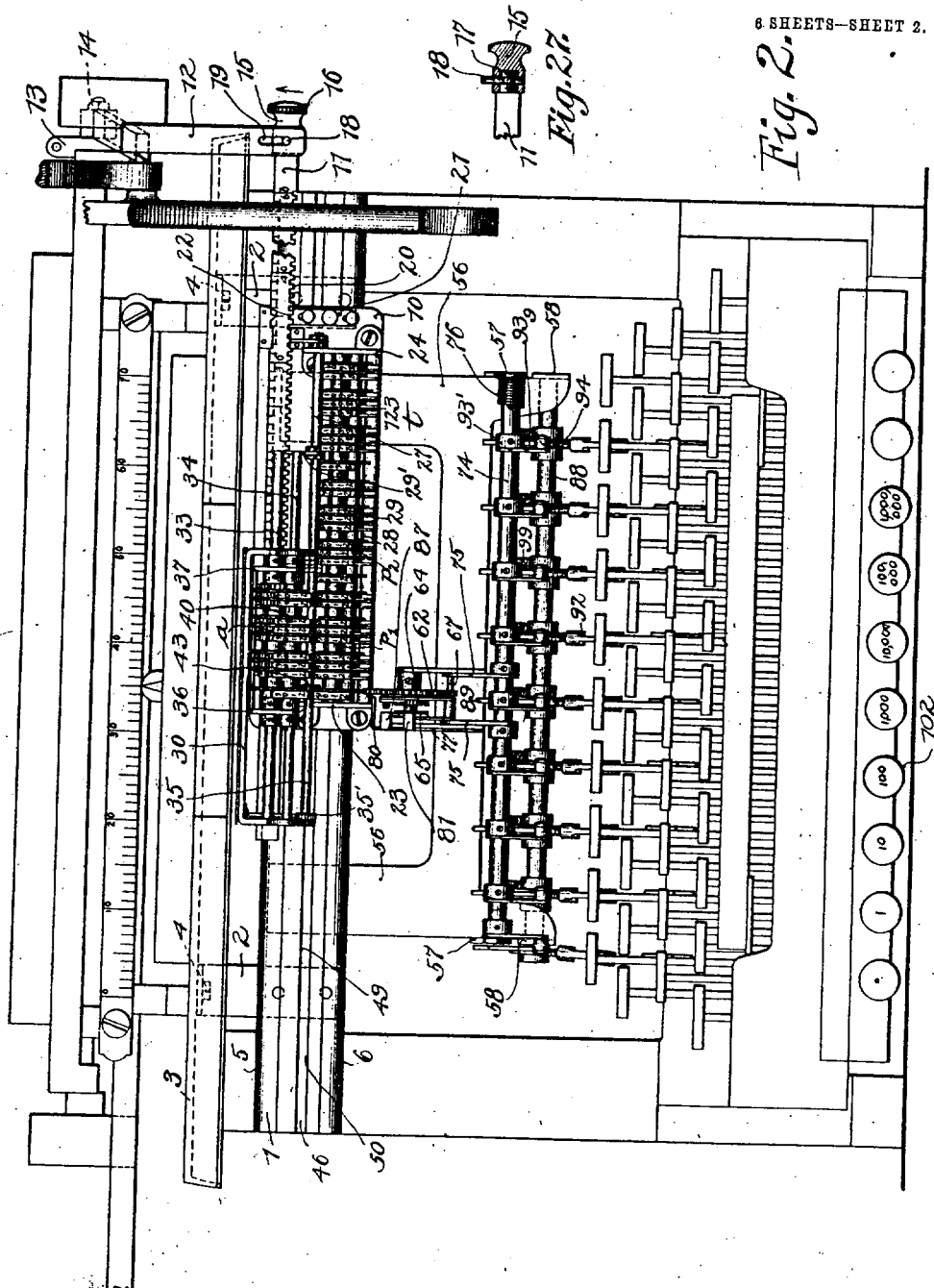
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6 SHEETS—SHEET 2.



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6 SHEETS—SHEET 3.

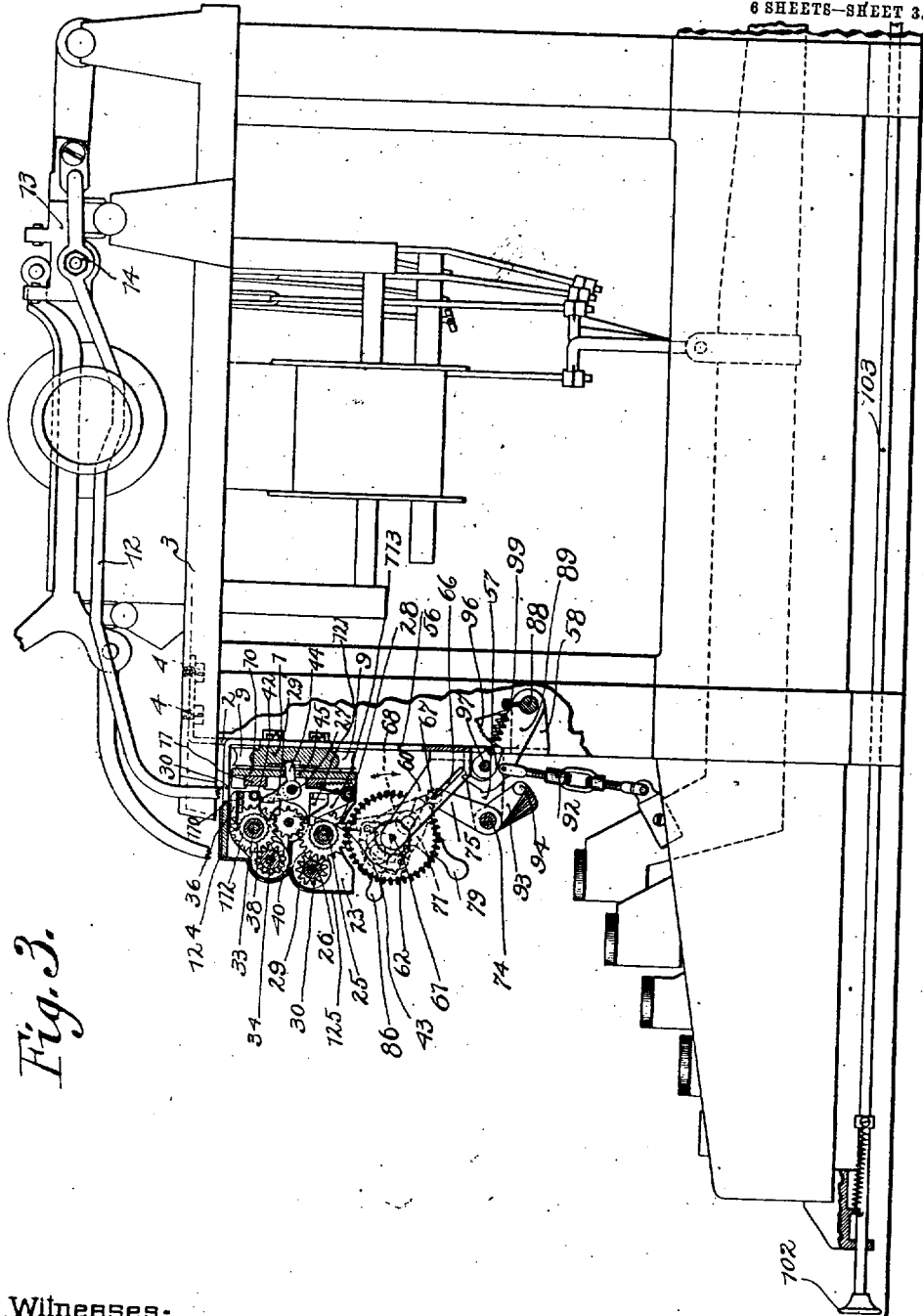


Fig. 3.

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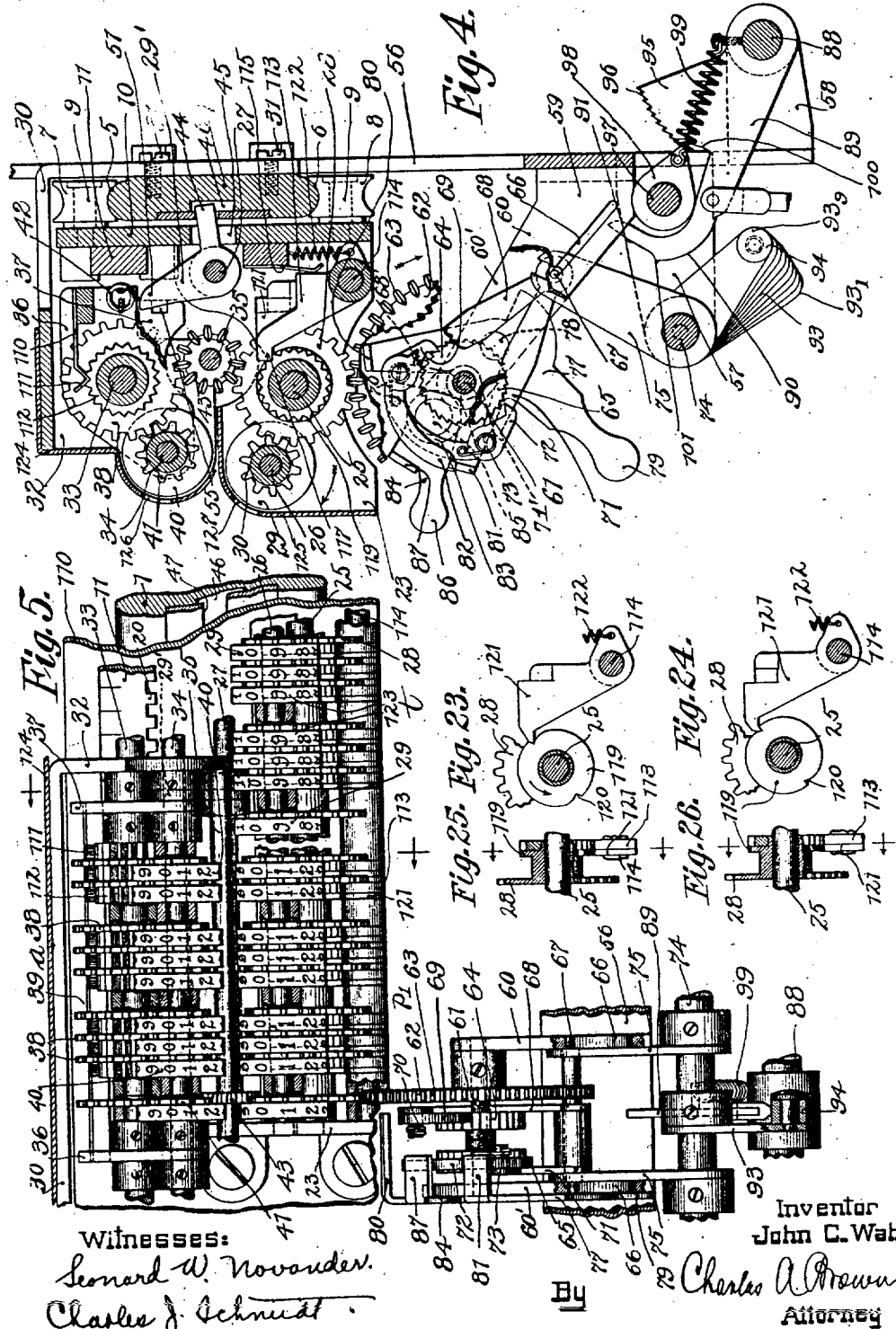
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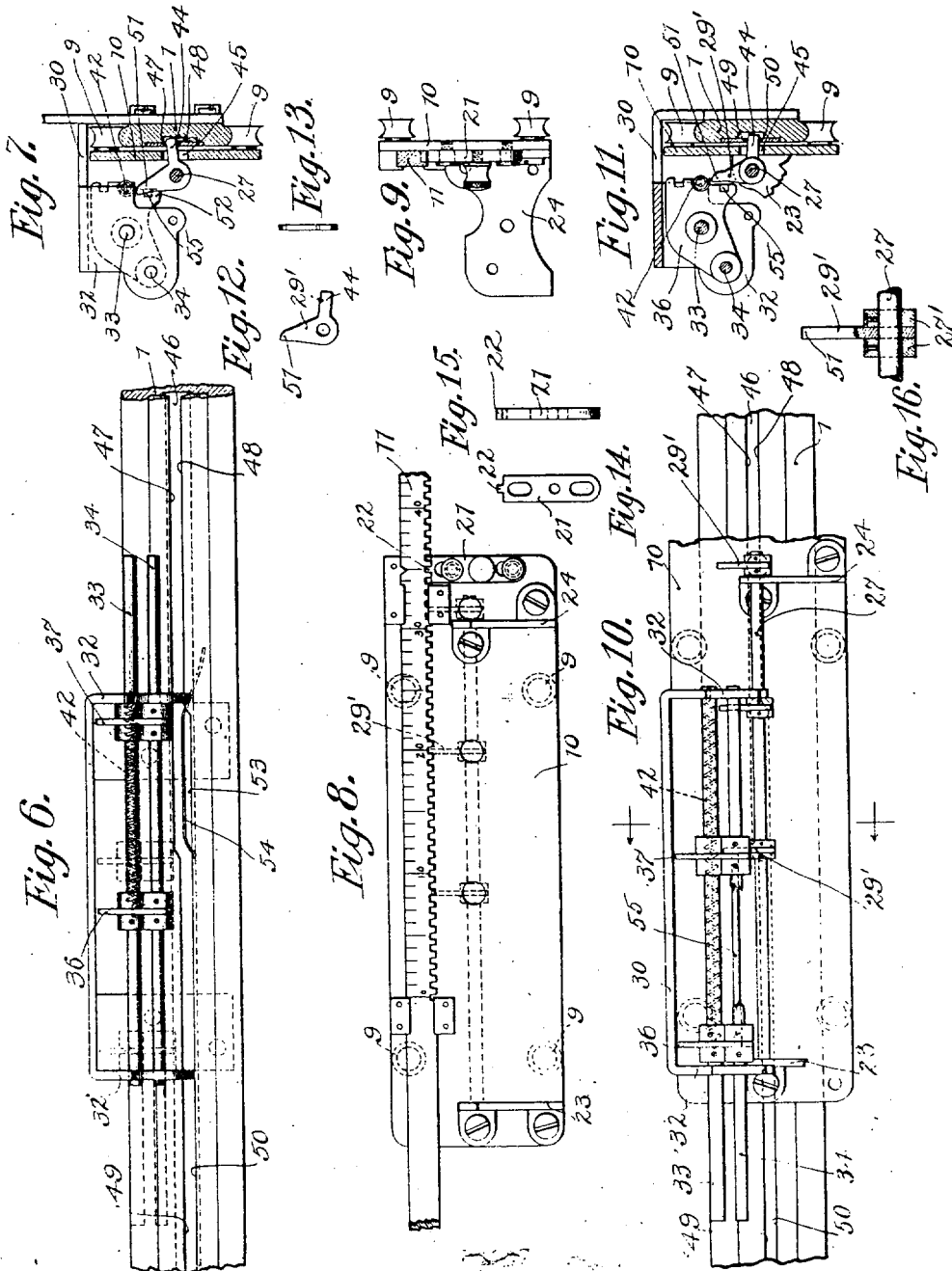
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6 SHEETS—SHEET 4.



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6 SHEETS—SHEET 5.



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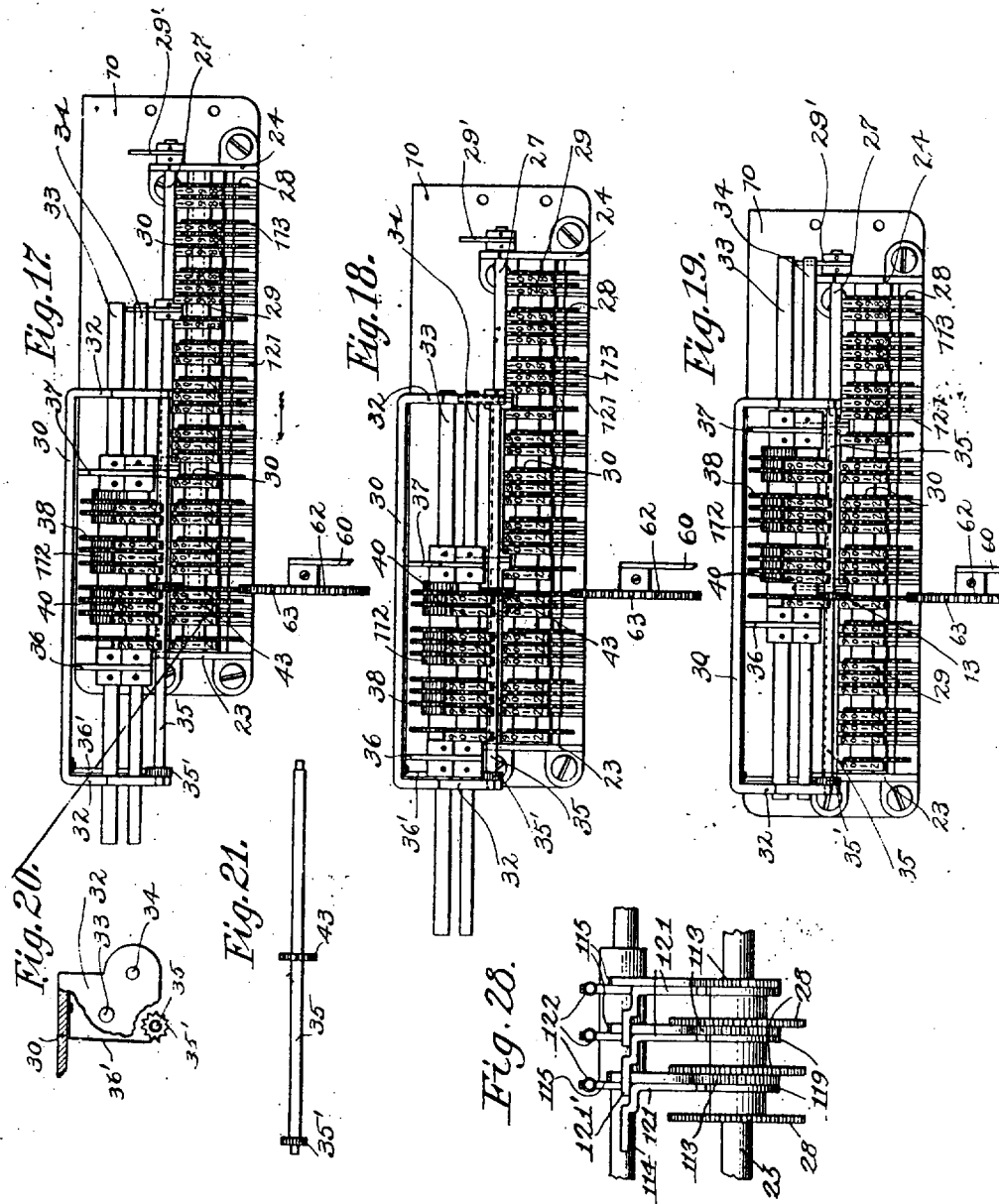
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6 SHEETS—SHEET 6.



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UNITED STATES PATENT OFFICE.

JOHN C. WAHL, OF CHICAGO, ILLINOIS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS,
TO WAHL ADDING MACHINE COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF
ILLINOIS;

CALCULATING-MACHINE.

No. 893,717.

Specification of Letters Patent.

Patented July 21, 1908.

Application filed October 28, 1904. Serial No. 230,296.

To all whom it may concern:

Be it known that I, JOHN C. WAHL, citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have
5 invented a certain new and useful Improvement in Calculating-Machines, (Case 1,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part
10 of this specification.

My invention relates to calculating devices and more particularly to calculating devices adapted for attachment to typewriting machines for automatically performing calculations.

My invention is most adaptable for calculations of addition or subtraction. It is a well-known operation in arithmetic to check the result of an additional calculation by
20 means of vertical and horizontal adding, the sums to be added being arranged in vertical and horizontal rows, the horizontal rows being cross-added and the vertical rows being added vertically, and if the calculation is
25 correct the total of the cross-footings should agree with the total of the vertical footings. In devices of the prior art of this kind either only vertical adding or subtracting could be accomplished or only horizontal adding or
30 subtracting could be done, but by means of my invention I am enabled to accomplish both simultaneously, and thus am enabled to automatically accomplish such calculations. It will readily be seen that my invention is of
35 great importance in accounting for calculating the balance in debit and credit accounts.

My device is directly associated with the number keys of the typewriting machine, upon actuation of which the numbers will be
40 printed upon the sheet and simultaneously recorded by indicators on the device and the device then automatically accomplishes the desired calculation, the result of which may be read from the indicators and printed on
45 the sheet, and I provide means for preventing occurrence of mistakes, the machine being thus entirely reliable.

The device consists primarily of a plurality of indicator mechanisms or totalizers so arranged and connected with the typewriter
50 attachments as to perform the desired calculations. A plurality of primary totalizers are arranged in a horizontal row or series and are mounted on a traveling frame connected
55 with the traveling carriage of the typewriter.

As the keys of the typewriter are struck, this row of totalizers is moved with the escapement of the carriage and the gear wheels of the totalizers have temporary engagement with a stationary driving wheel connected by
60 driving mechanism with the various number keys of the typewriting machine. Upon actuation of a number key, the driving wheel will be rotated a corresponding distance to move the engaged totalizer wheel to indicate
65 the number of the key actuated and this number is simultaneously printed on the sheet in the machine. The row or series may contain any number of totalizers and as they pass across the machine a corresponding
70 number of sums may be printed and will be registered. When the last totalizer of the series has been actuated, the carriage with the totalizer frame is moved to its initial position and the sheet advanced one or more
75 spaces and then another row or series of sums may be struck off on the typewriter, and so on.

It will be seen that each totalizer will accumulate the various sums placed thereon and thus at the end of the calculation, each
80 totalizer shows the vertical footing of the individual sums which have been received thereby and thus far we have vertical footings of several sets of sums. To derive the grand total of these sums, I employ what
85 call an accumulator, which is mounted in a frame rigidly secured to the typewriter frame. This accumulator initially registers with the first of the primary totalizers and is adapted to duplicate the sum, which will be
90 shown on the first primary totalizer. As the carriage with the primary totalizers is moved, the accumulator travels with each of the primary totalizers until the sum desired is placed on the primary totalizer,
95 when the accumulator is released and is moved back to engage the succeeding primary totalizer and to cumulatively receive the sum placed on the succeeding primary totalizer, whereupon it is again moved back
100 to register with the third primary totalizer, and so on. This accumulator, therefore, after the series has passed thereby will have cumulatively received all the sums impressed on the primary totalizers and, therefore,
105 will show the cross-footing of these sums. On the last totalizer of the series the number wheels are reversed; that is, they pass around the number wheels in opposite direction from that on the number wheels of the
110

other primary cyclometers. As this last, or totaling grand totalizer comes into register with the accumulator, the drive wheel is reversed in direction and the operator plays on the number keys the sum indicated on the accumulator. The effect of this will be to impress this number on the grand totalizer and to restore the accumulator to zero. At the end of one stroke of the typewriter carriage, therefore, each primary totalizer shows a sum and the grand totalizer shows the total sum of these individual sums, while the accumulator is at zero. The sheet in the typewriter may now be advanced one or more spaces and another horizontal row of sums is struck off on the number keys to be imprinted on the sheet in line with the previous sums thereon and each of the second sums will be added to the sum already shown on the corresponding primary totalizer. At the end of this stroke, the accumulated sum on the accumulator will again be transmitted to the grand totalizer, which will then show the grand total of all the sums thus far. In this manner any number of horizontal rows of sums may be printed and at the end of the calculation the primary totalizers will show the vertical footings of the registering sums and the grand totalizer will show the grand total of all the sums. The operator after properly spacing the sheet copies on the number keys the various sums shown on the primary totalizers, first, however, seeing that the direction of the driving wheel is reversed. The vertical footings then shown on the totalizers will be printed on the paper, while the number wheels of the totalizers will be returned to zero. The accumulator totalizer, however, will cumulatively receive the footings but in a reverse direction. As the grand totalizer now registers with the accumulator, the operator again causes forward rotation of the driving wheel and copies on the number keys the grand total displayed on the grand totalizer and the grand totalizer and the accumulator will both be returned to zero, and the device is then in readiness for another calculation.

In calculating devices in the prior art difficulty is experienced in performing the ordinary adjustments and movements of the typewriter without interfering with the calculating attachment, but my attachment is so connected with the typewriter as to be entirely independent of the adjusting parts thereon and consequently in no way interferes therewith. I also provide means which prevent the typewriter carriage from escaping without recording on the indicators the number struck on the keys. Other means prevent the indicator wheels from being returned beyond the zero mark, and this is of very great importance as it prevents mistakes being made, such as subtracting a larger number from a smaller. In

prior devices this has been possible, the result being utter confusion. In my device the indicators are so guarded and the attachments are so adjusted that upon an attempt to move them beyond the zero mark the typewriter keys are prevented from being actuated sufficiently to cause printing and the wheels will be locked upon reaching the zero mark. This immediately notifies the operator that some mistake has been made and it can be immediately corrected and prevented from extending through the calculation.

My device is adaptable for operation in connection with the tabulating attachment well known on typewriting machines and this makes it unnecessary to begin with the first division of the totalizers, but upon depression of a corresponding tabulating key, the desired initial position of the totalizer may at once be moved into engagement with the drive wheel. For instance, if it is desired to print 10 on the sheet, it is unnecessary to begin with the first, i. e., the million position of the typewriter, but upon depression of the corresponding tabulating key the tens division of the totalizer will immediately become disposed before the drive wheel and the number can then be struck on the keys. By means of this connection with the tabulating mechanism, the totalizers may be adjusted for any column on the sheet.

All these features require novel actuating mechanisms and arrangements thereof, the construction and application of which will be better understood from the accompanying drawings, in which

Figure 1 is a side elevation of a typewriting machine showing the calculator attachment associated therewith; Fig. 2 is a front elevation of the typewriting machine with the calculating mechanism attached thereto; Fig. 3 is a side elevation of a typewriting machine showing the calculating attachment partly in section; Fig. 4 is a detached view of the calculating mechanism and actuating mechanism therefor, parts being shown in section and parts being broken away, for clearness; Fig. 5 is a front view of the parts shown in Fig. 4; Fig. 6 is a detached view of the calculating device supporting bar showing the arrangement thereon of the accumulator frame; Fig. 7 is an end elevation of Fig. 6; Fig. 8 is a front elevation of the primary totalizer supporting frame; Fig. 9 is an end elevation of Fig. 8; Fig. 10 is a detached view of the device supporting bar and the totalizer frames mounted thereon; Fig. 11 is an end view of Fig. 10; Fig. 12 shows a pawl for engaging the accumulator; Fig. 13 is a side view of Fig. 12; Fig. 14 is a front view showing the latch bar for adjustably securing the primary totalizer frame to the rack bar connected with the typewriter

machine carriage, Fig. 15 is a side view of Fig. 14, Fig. 16 shows the manner of mounting the pawls shown in Fig. 12 on a pawl shaft, Figs. 17, 18 and 19 show various relative positions of the primary totalizers and the accumulator, Fig. 20 is a detached view showing the manner of braking the idler shaft, Fig. 21 is a view of the idler supporting shaft, Fig. 22 is a detached view of the adjusting rack for the tabulating mechanism and the tops of the tabulating levers, Figs. 23 and 24 are detached views showing totalizer ratchet wheels and pawls for preventing return thereof beyond the zero position, Figs. 25 and 26 are side views of Figs. 23 and 24, respectively, and Fig. 27 is a detached view showing a suitable attachment between two actuating members, Fig. 28 is a plan view of the parts shown in Fig. 23.

Like reference characters refer to like parts throughout the various figures.

I have shown my device attached to the well-known Remington typewriter machine. A horizontal supporting bar 1 is secured to hangers 2, 2, fastened to the frame 3 of the typewriter by means of screws 4, 4, as best shown in Fig. 2. This frame has an upper and a lower raceway or track 5 and 6, respectively, adapted to be engaged by rollers 7 and 8 pivoted from shafts 9 extending from the back of the primary totalizer supporting frame 10. The frame 10 is thus adapted for longitudinal travel along the track bar 1 and the bar 11 connects with this frame and with a bar 12 secured to the typewriter carriage which usually consists of a body part 13 and the relatively movable part 13' for supporting the type roller and sheet. This bar 12 extends upwardly and rearwardly along the sides of the typewriter, as shown, and at its rear end is secured to the body part 13 of the carriage by means of screws 14. As the typewriter carriage moves across the machine, the frame 10 is carried therewith and, owing to this manner of attaching the rod 12 to the body part of the carriage, the front part 13 of the carriage supporting the type roller may be swung without in any way interfering with the totalizers. The end of the bar 11 is adapted for separable engagement with the lower end of the bar 12 and thus the calculating attachment may be entirely separated from the typewriting machine, which may then be used in its ordinary capacity. For this purpose the end of the bar 11 is provided with a cap 15, as shown in Fig. 27, having a knurled thumb head 16. The end of the bar 11 has a groove 17, and a pin 18, extending outwardly from the sleeve of the head 15, also extends inwardly into engagement with this groove. The lower end of the bar 12 has an elongated slot 19 for receiving the pin 18 and in Fig. 2 the pin is shown within the slot to lock the bar 11 to the bar 12. To disengage the bar 11 the cap 15 is

turned to remove the pin 18 from the slot 19 and the carriage of the machine may move without actuating the totalizer frame. For adjusting purposes, which will be described hereafter, the frame 10 may be adjustably engaged with any part of the bar 11 and for this purpose the lower edge of the bar is provided with teeth 20, 20, whose spaces correspond with the escapement spaces of the typewriting machine. A spring actuated latch 21, shown in Figs. 14 and 15, is mounted on the frame 10 and has a tooth 22 for engaging between the teeth of the rack bar 11. End plates 23, 24 extend from the support 10, in which are disposed horizontal shafts 25, 26 and 27. The central shaft 25 carries the actuating gear wheels 28 for the primary totalizers, the upper shaft 26 carries the number wheels 29 secured to gear wheels 30 for meshing with the gears 28, while the shaft 27 carries dogs 29', the function of which will be more clearly explained later. These dogs may be pivoted to the shaft 27 between collars 27', as shown in Fig. 16.

A frame 30 is rigidly secured to the supporting track bar 11 by means of screws 31, 31, as best shown in Fig. 4. This frame has downwardly extending side walls 32, in which are journaled sliding shafts 33 and 34 and a relatively stationary idler shaft 35. End plates 36 and 37 are secured to the sliding shafts 33 and 34 and the gear wheels 38, 38 of an accumulator indicator 39 are mounted upon the shaft 33, while the number wheels 40 are mounted upon the shaft 34, these number wheels having gears 41 for meshing with the gear wheels 38. A helical spring 42 is secured to the side wall 32 and to the movable accumulator frame, preferably to the end plate 36 thereof.

One of the dogs 29', before mentioned, is mounted on the dog shaft 27 at the right end of each of the primary cyclometers in such position that as the primary totalizers are moved with the traveling carriage, the corresponding dog will engage the end plate 37 of the accumulator frame and will carry the accumulator with the corresponding primary totalizer until the accumulator reaches the other end of its supporting frame, the corresponding gear wheels of the indicators being in alinement. At the end of the accumulator stroke, the dog will be withdrawn and the accumulator will be quickly removed to its initial position by the helical spring into registration with a second primary totalizer, when another dog, corresponding to the second primary totalizer, will engage the accumulator frame and again carry it to the end of its stroke when it will again be withdrawn to allow return of the accumulator, and so on. The idler shaft 35 carries an idler gear 43 which normally is in mesh with the first gear wheel of the accumulator, when the accumulator is in its initial position at the right of its

supporting frame, and as the primary totalizers are moved with the carriage the gear wheels thereof are successively brought into mesh with the idler gear and thus connected with the corresponding gear wheels of the accumulator as the two devices are moved together. Each dog is provided with a tail 44 extending through a corresponding slot or opening 45 through the support 10 and extending a slight distance beyond the rear of this support. In the supporting track bar 1 I provide a longitudinal groove 46 having guiding edges 47, 48 and 49, 50, between which the tails of the dogs travel. The edges 49 and 50 are lower than the edges 47 and 48 and when the tails of the dogs are between the edges 47 and 48, as shown in Fig. 7, the noses 51 of the dogs 29 will engage the end 52 of the end plate 37 of the accumulator which will, therefore, be carried with the primary totalizer frame. When the accumulator reaches the end of its stroke, as shown in Fig. 18, the tail of the engaging dog will pass between the lower edges 49 and 50, as shown in Fig. 11, and the nose of the dog will be moved away from the end 52, allowing escape of the accumulator, the end plate 37 of which is then received by the dog corresponding to the second primary totalizer when it is again carried to the end of its stroke and again released to be engaged by the third dog, and so on. After all the primary totalizers have been moved with the accumulator, the typewriter carriage may be moved to its initial position and the primary totalizers are moved therewith past the accumulator. Unless some preventive means be provided, the dogs upon return of the primary totalizers would engage the inner side of the end 52, for the reason that the tail of the dog would enter between the higher edges 47, 48, which would cause the nose thereof to be moved to engage the inner side of the end 52 and thus further return motion of the primary totalizer frame would be prevented. I, therefore, extend the upper and lower edges 47 and 50 a distance beyond each other, as best shown in Fig. 6, to form a widened guideway 53 for the tails of the dogs, and I dispose a spring 54 in the slot 46, which spring substantially acts as a yielding extension of the guiding edge 48. I also connect the ends of the end plates 36 and 37 by a bar 55. As the primary totalizers are now returned, the tails of the dogs are engaged by the spring which tends to move the noses of the dogs forwardly, but the bar 55 prevents such forward motion of the noses, as best shown in Fig. 10, and guides them beyond the extension 52, when they are allowed to be moved forward, first by the action of the spring 54, and then by guiding edges 49 and 50. Upon a forward stroke of the primary totalizer frame the spring, as before stated,

acts as an extension to the guiding edge 48 and holds the noses of the dogs forwardly in engagement with the outside of the extension 52 until the accumulator reaches the end of its stroke and the tails of the dogs enter between the guiding edges 49 and 50. Any number of primary totalizers may be mounted in a row and a dog provided for each.

I shall now describe the driving mechanism associated with the keys of the type-writing machine for actuating the totalizers.

A supporting frame 56 is secured to the bar 1 and extends downwardly, at its lower end being provided with forward extensions 57, 57', and rearward extensions 58, 58'. A U-shaped frame 59 is secured to the frame 56 below the totalizers and extends upwardly and forwardly. At the ends of the limbs 60 and 60' of the U-shaped frame is journaled a shaft 61 to one side of which is secured a driving wheel 62. The periphery of this driving wheel is provided with gear teeth 63 for engagement with the gear wheels of the primary totalizers. As the teeth of the totalizer gear wheels must pass through the teeth of this driving wheel, the teeth 63 are extended a distance over the edge of the periphery in order that the totalizer gear teeth may be readily guided therein. Between the drive wheel 62 and the limb 60' ratchet wheels 64 and 65 are secured to the shaft, the teeth on the ratchet wheel 64 being opposite to the teeth on the ratchet wheel 65. At the base of the limbs 60 and 60' are provided elongated slots 66, in which rides a shaft 67. An arm 68 is pivoted at one end to the shaft 67 and at its other end is provided with a pawl 69 which normally is pressed into engagement with the teeth of the ratchet wheel 64 by means of a spring 70. A second arm 71 is also pivoted at its lower end to the shaft 67 and at its upper end terminates in a pawl 72, which is adapted to be held in engagement with the teeth of the ratchet wheel 65 by the spring 73. Arms 68 and 71 are pivotally supported from the shaft 61 by means of the links 68' and 71', respectively, shown in Fig. 4. A shaft 74 connects the ends of the forward extensions 57 and arms 75, 75' secured to the shaft at one end pivot at their other end on the shaft 67, a coiled spring 76 secured to the shaft and to one of said extensions serving to normally rotate said shaft with said arms to hold the shaft 67 and the pawl mechanism in an upper position. Upon rotation of the shaft 74, the arms 75 will be actuated to move the shaft 67 downwardly in the slots 66 and the direction of rotation of the drive wheel will be determined by the particular ratchet wheel engaged by the corresponding pawl. Thus, if the pawl 69 is in engagement with the ratchet wheel 64, the top of the drive wheel

will move forwardly and if the pawl 72 engages the ratchet wheel 65 the drive wheel will rotate in an opposite direction.

To control the engagement of the pawls with the ratchet wheels, I provide a lever frame 77, pivoted at 78 to the limb 60'. The lever frame has an actuating lever 79 and two inwardly extending actuating fingers 80 and 81. The pawl 69 is provided with a tail 82 and the pawl 72 is provided with a tail 83. These tails are disposed in the path of the fingers 80 and 81 and when engaged thereby the corresponding pawls are lifted from the corresponding ratchet wheel. Thus, in the position shown in Fig. 4, the actuating lever 79 is in its upper position and the finger 81 engages the tail 83 to lift the pawl 72 from the ratchet wheel. The tail 82, however, is free and the spring 70 will, therefore, move the pawl 69 into engagement with the ratchet wheel 64 and upon rotation of the shaft 74 this ratchet wheel will be rotated as shown by the arrow, and the drive wheel will be correspondingly rotated, this rotation being transmitted through the gear wheels 28 and to the number wheels 29. This rotation is also transmitted through the idler gear 43 and through the accumulator gear wheels to the number wheels 40. The gear is so arranged that the number wheels on the primary totalizers and on the accumulator travel equal distances at each impulse. When the actuating lever arm 79 is moved to its lower position, the finger 80 will engage the tail 82 and the finger 81 will be removed from the tail 83 and thus upon rotation of the shaft 74 only the ratchet wheel 65 will be actuated and a reverse rotation will result of the indicator number wheels. The fingers 80 and 81 are so adjusted that when the lever arm 79 is in an intermediary position, both pawls will be prevented from leaving the ratchet wheels and thus the shaft 74 will be prevented from being rotated. I also employ an additional lever frame 84 pivoted at 85 at the end of the limb 60'. This lever frame has an actuating lever 86 and an inwardly extending finger 87 which finger is normally out of engagement with the tails of the pawls. With the lever frame 77 in its lower position and the pawl 69 disengaged upon engagement of the finger 80 with the tail 82, the lever frame 84 may be rotated upwardly until the finger 87 thereof engages the tail 83 of the pawl 72 to disengage this pawl from its ratchet wheel. Upon actuation of the shaft 74, there will then be no rotation of the driving wheel as both the pawls are disengaged from the ratchet wheels. The shaft 67, however, with the pawl arms is free to move. Upon further upward motion of the frame 84 the pressure of finger 87 against the tail 83 will be transmitted to the pawl arm 71 and both pawl arms with their pawls will be moved downwardly until the shaft 67 to which they are

pivoted reaches the lower end of the slots 66; and the purpose of this will appear later.

The shaft 88 connects the ends of the rear extensions 58 and upon said shaft corresponding with the positions of the number bearing keys of the typewriting machine are secured actuating cam arms 89. Each actuating arm terminates at its end in a cam surface 90 and a circular surface 91 concentric with the axis of the shaft 88. Each actuating arm is adjustably connected with the corresponding number key as, for instance, by a turnbuckle 92, and upon actuation of any number key the corresponding actuating arm is rotated about the shaft 88. Secured to the shaft 74 are a plurality of levers 93 equal in number to the actuating arms 89 and to the number keys of the typewriter. These levers are disposed to be engaged by the corresponding actuating arms and at their ends are provided with cam rollers 94 for engaging the cam surface 90 and the circular surface 91 of the actuating arms. As best shown in Fig. 4, the actuating levers 93 are angularly displaced on the shaft 74 and this is for the purpose of allowing just sufficient engagement of the levers by the actuating arms to cause just enough rotation of the driving wheel to give the associated totalizer number wheel a number of impulses equal to the number on the typewriter key actuated. Thus the lowest lever arm 93, will be engaged by the corresponding actuating arm only sufficiently to cause the drive wheel to be rotated a distance to give the engaged number wheel one impulse as, for instance, from zero to 1; and the upper actuating lever 93 will be engaged by the corresponding actuating arm sufficiently to cause rotation of the drive wheel to give the engaged number wheel nine impulses, as, for instance, from the position zero to 9. All the intermediate actuating levers are correspondingly actuated to give the required number of impulses to a number wheel corresponding to the number key actuated.

It is very important, to avoid mistakes and confusion, that the typewriter number keys be depressed the full distance in order to give the required rotation to the lever arms and to the drive wheel. If this were not done, other numbers besides those desired would appear on the cyclometer and the numbers on the cyclometer and the sheet would not agree. I, therefore, provide a wing 95 for each actuating arm, the edge of which has teeth 96 disposed on a line concentric with the shaft 88. A shaft 97 extends between the forward extensions 57 at the base thereof and on said shaft are mounted detent wedges 98, one for each actuating arm. The end of each wedge detent is connected by a spring 99 with the hub of the corresponding actuating lever. The sum of the distance between the axis of the shaft 88 and the

teeth 96 and the distance between the axis of the shaft 97 and the point of the wedge 98 is greater than the distance between the axes of the shafts 88 and 97 and, consequently, when the detent engages the teeth 96 the actuating arm can be moved only in one direction. The actuating arms are cut away at 100 to receive the ends of the detent to allow the arms to be actuated in either direction. Upon downward motion of an actuating arm the corresponding detent wedge will be rotated downwardly and will then engage the teeth 96 and will act as a pawl for preventing the return of the arm until the wedge again leaves the teeth at the other end of the wing 95, and thus escapement of the typewriter carriage is impossible unless the actuated arm is moved to the end of its stroke and this insures proper actuation of the levers 93 to cause correct indication of the corresponding cyclometer wheel. Also to prevent mistakes arising from lost motion, I extend the end 101 of the cam surface 90 on each actuating arm a slight distance beyond the circular surface 91, this extension causing sufficient additional motion of the actuating lever to take up whatever lost motion there might be.

As before stated, when the actuating lever 79 is in its intermediary position, both pawls will be prevented from leaving their associated ratchet wheels and there can be no rotation of the shaft 74 to which shaft are secured the actuating levers 93. These levers when the shaft is thus locked are in their innermost position and thus prevent passage thereby of the actuating arms connected with the typewriter keys. In this manner, therefore, the keys may be locked against interference in the absence of the operator. Again, as above described, upon upward actuation of the lever 86 the pawl arms will be moved downwardly to rotate the shaft 74 and in this position the actuating levers 93 will be held in their uppermost position and clear of the actuating arms and the typewriter may be used without actuation of the totalizer mechanism and upon also disengaging the rack bar 11 from the arm 12 the typewriter may be used in its ordinary capacity entirely independent of the calculating apparatus.

By means of the rack bar 11 and the latch plate 21, I am enabled to set the calculating mechanism with respect to the starting point on the sheet. As shown in Fig. 2 the starting point of the carriage is 35 and in order that the drive wheel register with the first gear wheel of the first primary totalizer the tooth of the latch plate 21 should engage the graduated latch bar at the division 35, as shown, and thus whenever the carriage is brought back to the 35 point on the typewriter scale the first gear wheel of the first primary totalizer will be brought into engagement with the driving wheel. As the distances between the totalizer gears are equal

to the escapement distances of the carriage, the succeeding totalizer wheels after each escapement will be in mesh with the driving wheel.

To render it unnecessary for the operator to strike off the spacing on the spacing bar of the typewriter to bring the totalizer to the columns desired, I adapt the totalizer mechanism for actuation in conjunction with the tabulating mechanism which may be attached to the typewriter. Figs. 1 and 2 show a well-known form of tabulating mechanism employed in conjunction with the typewriter shown. The tabulating keys 102, 102 are disposed in a horizontal row at the front of the machine and connect by rods 103 with levers 104 pivoted at 105 and terminating in their upper end in escapement fingers 106. Mounted on the traveling carriage of the typewriter is a bar 107 provided with teeth 108 whose pitch is equal to the pitch of the escapement teeth of the typewriter. The escapement fingers 106 are grouped to the rear of this actuating bar and are spaced to correspond with the teeth 108. Abutments 109 are adapted for adjustable insertion in the teeth of the rack 107 and are spaced thereon to correspond with the spacing between the totalizer gears and the starting point of the typewriting machine. Thus the abutment 109, is secured in the position 35 on the rack bar 107 and normally is disposed one space to the left of the detent fingers. As shown in Fig. 22, the operator desired to print a sum beginning with the tens column and she, therefore, pressed the corresponding tabulating key 10 to bring forward the detent finger 106. At the same time, the carriage was released and moved to the right until the abutment 109, engaged the detent finger 106. She now depresses the number key bearing the number desired to be printed and this number will be printed on the sheet in the desired tens column, and she then strikes the keys to obtain the figures in the units and the decimal columns. Thus upon depression of the proper tabulating key the carriage frame will be released to assume the proper position so that the number actuated will appear in the proper column on the sheet.

To prevent accidental rotation of the totalizer gears otherwise than upon actuation of the number keys, I provide brake mechanism for these gear wheels. To lock or brake the gears of the accumulator, I employ a spring comb 110 secured to the rear upper ends of the end plates 36 and 37, the spring teeth 111 extending upwardly and engaging toothed wheels 112. The friction of these springs on the toothed wheels prevents idle or accidental motion of the gear wheels and causes the gear wheels to rotate a certain fixed distance at each impulse. The locking of the gear wheels of the primary and grand

totalizers is accomplished by arms 113 pivoted to a shaft 114 extending between the end plates 23 and 24. Springs 115, 115 maintain the ends 117 of the levers in engagement with the toothed wheels secured to the gear wheels. The idler shaft 35 is provided with a toothed wheel 35' having the same number of teeth thereon as the idler gear wheel 43 on said shaft. A spring 36' secured to the frame 30 has frictional engagement at its end with the toothed wheel 35' and thus the teeth of the idler gear wheel 43 are at all times maintained in position to allow ready passage therethrough of the totalizer gear teeth.

To avoid confusion and mistakes, it is essential that the number wheels be not rotated in a reverse direction beyond the zero mark. This may readily happen in subtraction where an attempt might unknowingly be made to subtract a larger from a smaller number and I provide means for locking the typewriter against actuation upon such attempt. Sometimes in subtracting a smaller number from a larger it is necessary to subtract a larger digit from a smaller one; thus in subtracting 97 from 234 the "9" and "7" in the tens and units places respectively are larger than the "3" and "4" in the tens and units places respectively from which the said 97 is subtracted; but it can never occur that a larger digit is subtracted from a smaller one in the highest ordinal denominational place of said number for that would produce a negative result. In other words, it may sometimes be necessary to rotate a figure wheel reversely beyond zero but the figure wheel in the highest ordinal place must never be thus rotated. In order to accomplish the above result each of the primary totalizer gear wheels has connected thereto a ratchet wheel 119. As the ratio of gearing between the totalizer gear wheels and the number wheels is here shown as two to one, the ratchet wheels 119 are provided with two diametrically opposite pawl detents 120 adapted for engagement by pawls 121, also pivoted on the shaft 114 and held in engagement with the ratchet wheels by the spring 122. Each of said pawls has a shoulder 121' thereon which overlaps and rests upon the pawl next to the left, so that it is retracted from its wheel whenever said pawl next to the left is retracted. Thus whenever it is attempted to subtract one number from another, for instance 97, from 234, the pawl cooperating with the hundreds wheel will be retracted and therefore so will the pawls of the tens and units wheels; and these pawls will therefore not prevent the subtractive rotation of said tens and units wheels beyond zero—which rotation is necessary to subtract 97 from 234. But should it be attempted to subtract 297 from 234, then the "2" in the hundreds column could be subtracted, where-

upon the pawl in the hundreds column locks its cooperating wheel, and the pawl in the tens column engages the tens wheel to prevent the subtraction of the 97 from the 34.

Figs. 23 and 25 show the locking pawl and the ratchet wheel provided for the primary totalizer gears which it will be seen may be actuated forwardly in the direction of the arrow, but whose rearward rotation is gaged by the detents 120. Thus if one of said gears has been rotated forwardly to bring the engaged number wheel to, say number 6, if the operator should attempt when the driving wheel engages this gear wheel to depress the key 7 when the driving wheel is reversed, she can depress the lever 7 only until the pawl 121 engages the detent 120. This depression, however, is insufficient to allow escapement of the carriage and she immediately knows that some mistake has been made. The number wheel, however, will return to zero but will be prevented from passing beyond zero by virtue of this ratchet mechanism.

The last totalizer 123 of the primary series has number wheels about which the numbers are disposed oppositely to the numbers on the other primary totalizer wheels and the purpose of this will appear in the description of the operation of the machine which will appear herein later.

Figs. 24 and 26 show the arrangement of the ratchet and pawl mechanism for preventing the number wheels of the grand totalizer from being reversed beyond the zero mark, this being accomplished in the same manner as in the other primary totalizer wheels, the detents 120, however, being reversed as shown in Fig. 24.

The operation of my improved calculating device is now apparent. After setting the totalizer frame to agree with the starting division of the carriage, as shown in Fig. 2, the operator may proceed to strike the number keys to print the desired sums on the paper and the totalizers will automatically perform the calculations desired, depending upon the adjustments of the driving wheel. If a plurality of sums is desired to be added, the driving wheel will be adjusted to rotate in a forward direction or in the direction as shown by the arrow in Fig. 4. Suppose the operator desires to add the following numbers,—235, 650, 25, 32, 80 and 1250. She first presses the tabulating key 100 to bring the 100 column of the first primary totalizer before the driving wheel and then successively depresses number keys 2, 3 and 5. During this operation the carriage moves to the left and with it the primary totalizer p_1 . Through the medium of the dogs described above, the accumulator a travels with the primary totalizer p_1 until the end of its stroke when it will be released and will register with the second primary totalizer p_2 .

which will have moved into the position vacated by the totalizer p_1 . In order that the accumulator may be released, it is necessary for the operator to account for the decimal point space and the decimal figures. For instance, after striking the number 235 she must cause three more escapements of the carriage before the accumulator is released, one escapement corresponding to the decimal point and the other two to the decimal figures, if there are any. The operator now in the same manner actuates successively the numbers, 6, 5, 0 and accounts for the decimal point and decimal numbers, whereupon the accumulator will be again released to register with the last or grand totalizer t . It will be seen that the accumulator has cumulatively received the numbers 235 and 650 and the sum indicated on the accumulator should now, therefore, be 885, or, in other words, should be the sum of the numbers 235 and 650, which appear respectively on the totalizers p_1 and p_2 . The number wheels, as before stated, on the grand totalizer are in reverse direction to the number wheels on the primary totalizers, and when the grand totalizer comes in register with the accumulator, the operator reverses the rotation of the driving wheel 63, by moving the actuating lever 79 downwardly, as before described. She then successively depresses the actuating number keys 8, 8 and 5. This operation causes the number 885 to appear on the grand totalizer but owing to the reversal of rotation, the accumulator cyclometer will be reversed and will consequently indicate 0. The sheet in the typewriter now shows a horizontal series of sums, the first two sums being the sums appearing respectively on the primary totalizers p_1 and p_2 and the last sum being the cross-footing, or the sum appearing on the grand totalizer. The operator now moves the sheet forwardly one or more spaces and returns the carriage to its initial position at 35, also returning the actuating lever 79 to its upper position to cause forward rotation of the driving wheel. She then actuates the tabulating key 10 and successively actuates keys 2 and 5, and allows three further escapements to account for the decimal point and the decimal positions. This sum 25 will be added to the sum 235 already indicated on the primary totalizer p_1 and this totalizer will now indicate 260. The accumulator, however, which was at zero will receive and will indicate the number 25 and will escape as before described. In the same manner the sum 32 will be registered on the second primary totalizer p_2 and the sum 32 will be added to the number 650 already appearing on the totalizer p_2 , which will then show 682; the sum 32 will also be added to the sum 25 received on the accumulator from the totalizer p_1 and the accumulator will then show 57. When the grand

totalizer is again in register with the accumulator, the driving wheel is again reversed and the keys 5 and 7 actuated. This will restore the accumulator to zero but the number 57 will be added to the cross-footing sum 885 already thereon and the grand totalizer will show 942. After this operation we have a second horizontal series of numbers appearing on the sheet, namely, 25, 32 and the cross-footing sum 57. The driving wheel is again caused to rotate forwardly and in the same manner as above the sum 80 is added to the number 260 appearing on the totalizer p_1 , which will then show 340 and will be indicated on the accumulator.

The sum 1250 will be added to the sum 682 already on the totalizer p_2 , which will show 1932 and the sum 1250 will be added to the sum 80 on the accumulator and the accumulator will show 1330. As the grand totalizer now comes in register with the accumulator, the driving wheel is again reversed and the number 1330 struck on the keys and this number will be added to the sum 942 already on the grand totalizer, which will then show the grand total sum, namely, 2272, while the accumulator will be restored to zero. On the sheet will appear a third horizontal series of sums aligned below the two previous series and will contain the sums 80, 1250 and the cross-footing sum 1330. The operator may now print on the sheet the vertical footings of the aligned numbers and the vertical footings of the cross-footings, which will be the sum total. Leaving the driving wheel at the reverse, she moves the carriage to its initial starting position and presses the tabulating key 100 to correspond to the vertical footing number 340 appearing on the totalizer p_1 . Upon striking these numbers on the keys, the totalizer p_1 is restored to zero but the accumulator will receive the sum 340 in negative direction and will show 660. When the totalizer p_1 registers with the accumulator the operator strikes the number 1932 which appears on this totalizer and the totalizer will also be restored to zero but the number thereon will be added negatively to the number 89 660 the number of "9s" in front depending upon the capacity of the totalizer appearing on the accumulator, which will then show 97728. As the grand totalizer now comes into register with the accumulator, the operator adjusts the driving wheel to rotate forwardly and then actuates the keys to print the number 2272 appearing on the grand totalizer. This operation will restore both the grand totalizer and accumulator to zero and all the totalizers are then in their normal position and ready for another calculation. These above calculations will appear on the sheet, as shown in the following table, the various sums to be added appearing in the two left columns,

while the cross-footings appear in the right columns. The vertical footings appear under the respective vertical columns, while the sum of the cross-footings, or the grand total, appears under the right column and this grand total sum is equal to the sum of the two vertical footings, and the calculation thus checks.

	235	650	885
10	25	32	57
	80	1250	1330
	340	1932	2272

15 By proper adjustment of the rotation of the driving wheel, other calculations, such as subtraction, may be carried out with equal facility. For instance, in balance accounts, the debit and credit columns can be placed on the totalizers, which will then automatically indicate the various balances.

Each of the totalizer mechanisms is surrounded by shields 124 and 125, respectively. The shield 124 is provided with a slot 126 through which the indications on the number wheels of the accumulator may be read. A shield 125 is provided with a slot 127 for reading the indications on the number wheels of the primary and grand totalizers.

30 I thus provide a device which is adapted for ready and suitable attachment to any typewriting machine, being very simple and compact and occupying very little space, and not interfering in any way with the normal operations of the machine. Owing to the small number of parts to be actuated, the additional pressure required on the number keys is barely noticeable. I think it is broadly new with me to embody in a machine means for simultaneously performing vertical and horizontal calculations. It is easily seen that a device of this kind must be very useful as, besides performing the calculations described, the device automatically checks itself and by means of the various safety devices described, the machine automatically prevents occurrence of mistakes. The operator at all times knows what is printed on the sheet by reading the indications on the various totalizers and the operator need only dispose the given sums on the totalizers when the result will be automatically worked out thereby and indicated thereon.

55 As many modifications in the arrangement and construction of the various parts employed may readily be made without departing from the spirit of the invention, I do not wish to limit myself to such construction and arrangement as herein shown and described.

60 What I claim as new and desire to secure by Letters Patent is:—

1. In a calculating machine, the combination with indicating mechanism, of a drive wheel for actuating said mechanism, actuat-

ing means associated with said driving wheel, adjusting means for said actuating mechanism for allowing said drive wheel to be actuated in a forward or a reverse direction, means for locking said actuating mechanism to prevent rotation of said driving wheel, and means for releasing said actuating mechanism from said drive wheel, whereby said wheel is inactive upon actuation of said mechanism.

2. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism; pawl and ratchet mechanism associated with said driving wheel, actuating means for said pawl and ratchet mechanism, means for adjusting said pawl and ratchet mechanism to cause either forward or reverse rotation of said driving wheel, means for locking said pawl and ratchet mechanism to prevent actuation thereof and of said driving wheel, and means for allowing actuation of said pawl and ratchet mechanism without causing rotation of said driving wheel.

3. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said indicating mechanism, ratchet wheel mechanism connected with said driving wheel; pawl mechanism engaging said ratchet wheel mechanism, actuating means for said pawl mechanism, means for adjusting said pawl mechanism to allow either forward or reverse rotation of said driving wheel, means for locking said pawl mechanism to said ratchet wheel mechanism to prevent rotation of said driving wheel, and means for releasing said pawl mechanism from said ratchet wheel mechanism whereby said driving wheel is inactive upon actuation of said pawl mechanism.

4. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said indicating mechanism, ratchet wheels associated with said driving wheel, a pawl for engaging each ratchet wheel, arms for said pawls, actuating means connected with said arms, engagement of one of said pawls with the associated ratchet wheel causing forward rotation of said driving wheel, engagement of the other pawl with its associated ratchet wheel causing reverse rotation of the driving wheel, adjusting means for connecting either one of said pawls with the associated ratchet wheel, adjusting means for connecting both of said pawls with the ratchet wheels whereby rotation of said driving wheel is prevented upon actuation of said pawl arm actuating means, and adjusting means for disengaging both pawls from said ratchet wheels whereby said driving wheel is inactive upon actuation of said actuating mechanism.

5. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism; a for-

ward and reverse ratchet wheel connected with said driving wheel, a pawl for each of said ratchet wheels, pawl arms extending from said pawls, actuating mechanism connected with said arms, means tending normally to engage said pawls with the associated ratchet wheels, an adjusting lever adapted in one position to remove one of said pawls from the associated ratchet wheel, whereby upon actuation of said actuating means said driving wheel is rotated in one direction, and means at another position of said lever for releasing said first pawl from said lever and disconnecting the other pawl from said ratchet mechanism, whereby said driving wheel is rotated in an opposite direction upon actuation of the pawl arm mechanism, a third position of said lever causing engagement of both pawls with the ratchet wheels whereby rotation of said driving wheel is prevented.

6. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, a forward and reverse ratchet wheel connected with said driving wheel, a pawl for each of said ratchet wheels, pawl arms extending from said pawls, actuating mechanism connected with said arms, means tending normally to engage said pawls with the associated ratchet wheels, an adjusting lever adapted in one position to remove one of said pawls from the associated ratchet wheel whereby upon actuation of said actuating means said driving wheel is rotated in one direction, means at another position of said lever for releasing said first pawl from said lever and disconnecting the other pawl from said ratchet mechanism whereby said driving wheel is rotated in an opposite direction upon actuation of the pawl arm mechanism, a third position of said lever causing engagement of both pawls with the ratchet wheels whereby rotation of said driving wheel is prevented, and additional means for removing both pawls from said ratchet wheels whereby said driving wheel is inactive upon actuation of said actuating means.

7. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, a forward and reverse ratchet wheel connected with said driving wheel, a pawl for each of said ratchet wheels, pawl arms extending from said pawls, actuating mechanism connected with said arms, means tending normally to engage said pawls with the associated ratchet wheels, an adjusting lever adapted in one position to remove one of said pawls from the associated ratchet wheel whereby upon actuation of said actuating means said driving wheel is rotated in one direction, means at another position of said lever for releasing said first pawl from said

lever and disconnecting the other pawl from said ratchet mechanism whereby said driving wheel is rotated in an opposite direction upon actuation of the pawl arm mechanism, a third position of said lever causing engagement of both pawls with the ratchet wheels whereby rotation of said driving wheel is prevented, and an additional lever associated with said first lever for causing disengagement of both pawls from said ratchet wheels.

8. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, a forward and reverse ratchet wheel connected with said driving wheel, a pawl for each of said ratchet wheels, pawl arms extending from said pawls, actuating mechanism connected with said arms, means tending normally to engage said pawls with the associated ratchet wheels, an adjusting lever adapted in one position to remove one of said pawls from the associated ratchet wheel whereby upon actuation of said actuating means said driving wheel is rotated in one direction, means at another position of said lever for releasing said first pawl from said lever and disconnecting the other pawl from said ratchet mechanism whereby said driving wheel is rotated in an opposite direction upon actuation of the pawl arm mechanism, a third position of said lever causing engagement of both pawls with the ratchet wheels whereby rotation of said driving wheel is prevented, and an additional lever for disengaging one pawl from its ratchet wheel upon disengagement of the other pawl from its ratchet wheel by the first lever whereby said driving wheel is inactive upon actuation of said actuating means.

9. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, actuating keys, mechanism intervening between said keys and said driving wheel, means upon actuation of said keys for causing said actuating mechanism to rotate said driving wheel in a forward direction, means upon actuation of said keys for causing said actuating mechanism to rotate said wheel in a reverse direction, and means for causing said actuating mechanism to prevent actuation of said keys.

10. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, actuating keys, mechanism intervening between said keys and said driving wheel, means upon actuation of said keys for causing said actuating mechanism to rotate said driving wheel in a forward direction, means upon actuation of said keys for causing said actuating mechanism to rotate said wheel in a reverse direction, means for causing said actuating mechanism to prevent actuation of said keys, and means upon actuation of said

keys for releasing said intervening mechanism from said driving wheel whereby said wheel remains inactive.

11. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, actuating keys, mechanism intervening between said keys and said driving wheel, means upon actuation of said keys for causing said actuating mechanism to rotate said driving wheel in a forward direction, means upon actuation of said keys for causing said actuating mechanism to rotate said wheel in a reverse direction, means for causing said actuating mechanism to prevent actuation of said keys, and means for disconnecting said intervening mechanism from said keys.

12. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, actuating keys, mechanism intervening between said keys and said driving wheel, means upon actuation of said keys for causing said actuating mechanism to rotate said driving wheel in a forward direction, means upon actuation of said keys for causing said actuating mechanism to rotate said wheel in a reverse direction, means for causing said actuating mechanism to prevent actuation of said keys, means for releasing said intervening mechanism from said driving wheel whereby said wheel remains inactive upon actuation of said keys, and means for disconnecting said intervening mechanism from said keys.

13. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, an actuating lever, clutch mechanism connecting said lever with said driving wheel, means for adjusting said clutch mechanism to cause forward rotation of said driving wheel, means for adjusting said clutch mechanism to cause reverse rotation of said driving wheel, means for locking said clutch mechanism to prevent actuation of said lever and said driving wheel, and means for releasing said clutch mechanism whereby said driving wheel is inactive upon actuation of said lever.

14. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, an actuating lever, pawl and ratchet clutch mechanism connecting with said driving wheel and said lever, means for adjusting said clutch mechanism to cause forward rotation of said driving wheel, means for adjusting said clutch mechanism to cause reverse rotation of said driving wheel, means for locking said clutch mechanism to prevent actuation of said lever and said driving wheel, and means for releasing said clutch mechanism whereby said driving wheel is inactive upon actuation of said lever.

15. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, ratchet wheel mechanism connected with said driving wheel, pawls for said ratchet wheel mechanism, an actuating lever connected with said pawls, means for connecting one pawl with said ratchet mechanism to cause forward rotation thereof upon actuation of said lever, means for connecting said other pawl to the ratchet wheel mechanism to cause reverse direction of said driving wheel, means for connecting both pawls with said ratchet wheel mechanism to lock said driving wheel and said actuating lever, and means for disengaging both pawls of said ratchet wheel mechanism whereby said driving wheel is inactive upon actuation of said lever.

16. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, ratchet wheels connected with said driving wheel, pawls for said ratchet wheels, arms extending from said pawls, an actuating lever, arms extending from said actuating lever and connected with said pawl arms, actuation of said lever causing said pawl arms and pawls to be moved about said ratchet wheels, means for adjusting said pawls to cause either forward or reverse rotation of said driving wheel upon actuation of said lever, means for adjusting said pawls to lock said driving wheel and lever against rotation, and means for adjusting said pawls to allow actuation of said lever without causing rotation of said driving wheel.

17. In a calculating machine, the combination with indicating means, of a driving wheel for actuating said indicating means, a forward and reverse ratchet wheel connected with said driving wheel, a pawl for each ratchet wheel, pawl arms extending from said pawls, an actuating lever, arms extending from said actuating lever and pivoted to said pawl arms, means upon actuation of said lever for causing one pawl to engage the forward ratchet wheel to cause forward rotation of the driving wheel, means for causing the other pawl to engage the reverse ratchet wheel to cause reverse rotation of said driving wheel, and means for locking said driving wheel and actuating lever against rotation.

18. In a calculating machine, the combination with indicating means, of a driving wheel for actuating said indicating means, a forward and reverse ratchet wheel connected with said driving wheel, a pawl for each ratchet wheel, pawl arms extending from said pawls, an actuating lever, arms extending from said actuating lever and pivoted to said pawl arms, means upon actuation of said lever for causing one pawl to engage the forward ratchet wheel to cause forward rotation of the driving wheel, means for causing the other pawl to engage the reverse ratchet wheel to cause reverse rotation of said driving wheel, and means for locking said driving wheel and actuating lever against rotation.

wheel to cause reverse rotation of said driving wheel, means for locking said driving wheel and actuating lever against rotation, and means for allowing actuation of said lever without causing rotation of said driving wheel.

19. In a calculating machine, the combination with indicating means, of a driving wheel for actuating said indicating means, a forward and reverse ratchet wheel connected with said driving wheel, a pawl for each ratchet wheel, pawl arms extending from said pawls, an actuating lever, arms extending from said actuating lever and pivoted to said pawl arms, means upon actuation of said lever for causing one pawl to engage the forward ratchet wheel to cause forward rotation of the driving wheel, means for causing the other pawl to engage the reverse ratchet wheel to cause reverse rotation of said driving wheel, means for locking said driving wheel and actuating lever against rotation and means for causing both pawls to engage the ratchet wheels whereby said lever and driving wheel are locked against motion.

20. In a calculating machine, the combination with indicating means, of a driving wheel for actuating said indicating means, a forward and reverse ratchet wheel connected with said driving wheel, a pawl for each ratchet wheel, pawl arms extending from said pawls, an actuating lever, arms extending from said actuating lever and pivoted to said pawl arms, means upon actuation of said lever for causing one pawl to engage the forward ratchet wheel to cause forward rotation of the driving wheel, means for causing the other pawl to engage the reverse ratchet wheel to cause reverse rotation of said driving wheel, means for locking said driving wheel and actuating lever against rotation, and means for disengaging both pawls from said ratchet wheels whereby said lever may be actuated without causing rotation of said driving wheel.

21. In a calculating machine, the combination with indicating means, of a driving wheel for actuating said indicating means, a forward and reverse ratchet wheel connected with said driving wheel, a pawl for each ratchet wheel, pawl arms extending from said pawls, an actuating lever, arms extending from said actuating lever and pivoted to said pawl arms, means upon actuation of said lever for causing one pawl to engage the forward ratchet wheel to cause forward rotation of the driving wheel, means for causing the other pawl to engage the reverse ratchet wheel to cause reverse rotation of said driving wheel, means for locking said driving wheel and actuating lever against rotation, means for causing both pawls to engage the ratchet wheels whereby said lever and driving wheel are locked against motion, and means for disengaging both pawls from said

ratchet wheels whereby said lever may be actuated without causing rotation of said driving wheel.

22. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, a forward and reverse ratchet wheel for said driving wheel, a pawl for each ratchet wheel, pawl arms extending from said pawls, means tending to normally engage said pawls with said ratchet wheels, an actuating lever, arms extending from said actuating lever and pivoted at their ends to the ends of said pawl levers, and an adjusting lever frame adapted in one position to disengage one of said pawls from the associated ratchet wheel whereby said driving wheel is rotated in a forward direction upon actuation of said lever, another position of said adjusting frame causing release of said first pawl and engagement of the second pawl with its associated ratchet wheel whereby said driving wheel is rotated in a reverse direction upon actuation of said lever.

23. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, a forward and reverse ratchet wheel for said driving wheel, a pawl for each ratchet wheel, pawl arms extending from said pawls, means tending to normally engage said pawls with said ratchet wheels, an actuating lever, arms extending from said actuating lever and pivoted at their ends to the ends of said pawl levers, an adjusting lever frame adapted in one position to disengage one of said pawls from the associated ratchet wheel whereby said driving wheel is rotated in a forward direction upon actuation of said lever, another position of said adjusting frame causing release of said first pawl and engagement of the second pawl with its associated ratchet wheel whereby said driving wheel is rotated in a reverse direction upon actuation of said lever, and means at a third position of said adjusting frame for causing both pawls to be engaged with the ratchet wheels whereby said wheel and lever are locked against actuation.

24. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, a forward and reverse ratchet wheel for said driving wheel, a pawl for each ratchet wheel, pawl arms extending from said pawls, means tending to normally engage said pawls with said ratchet wheels, an actuating lever, arms extending from said actuating lever and pivoted at their ends to the ends of said pawl levers, an adjusting lever frame adapted in one position to disengage one of said pawls from the associated ratchet wheel whereby said driving wheel is rotated in a forward direction upon actuation of said lever, another position of said adjusting frame causing

release of said first pawl and engagement of the second pawl with its associated ratchet wheel whereby said driving wheel is rotated in a reverse direction upon actuation of said lever; and an additional adjusting frame for disengaging one of said pawls from its ratchet wheel upon disengagement of the other pawl by said first lever whereby said lever may be actuated without causing rotation of said driving wheel.

25. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, a forward and reverse ratchet wheel for said driving wheel, a pawl for each ratchet wheel, pawl arms extending from said pawls, means tending to normally engage said pawls with said ratchet wheels, an actuating lever, arms extending from said actuating lever and pivoted at their ends to the ends of said pawl levers, an adjusting frame adapted in one position to disengage one of said pawls from the associated ratchet wheel whereby said driving wheel is rotated in a forward direction upon actuation of said lever, another position of said adjusting frame causing release of said first pawl and engagement of the second pawl with its associated ratchet wheel whereby said driving wheel is rotated in a reverse direction upon actuation of said lever, means at a third position of said adjusting frame for causing both pawls to be engaged with the ratchet wheels whereby said wheel and lever are locked against actuation, and an additional adjusting frame for disengaging one of said pawls from its ratchet wheel upon disengagement of the other pawl by said first lever whereby said lever may be actuated without causing rotation of said driving wheel.

26. In a calculating machine, the combination with an indicating mechanism, of a driving wheel for actuating said indicating mechanism, clutch mechanism for said driving wheel, an actuating shaft, lever mechanism connecting said shaft with said clutch mechanism, an actuating arm extending from said actuating shaft, a cam arm for engaging said actuating arm, and a key connected with said cam arm, actuation of said key causing said cam arm to engage the lever arm whereby said actuating shaft is rotated and said clutching mechanism actuated to cause rotation of said driving wheel.

27. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said indicating mechanism, clutch mechanism for said driving wheel, an actuating shaft, lever mechanism connecting said shaft with said clutch mechanism, an actuating arm extending from said actuating shaft, a cam arm for engaging said actuating arm, a key connected with said cam arm, actuation of said key causing said cam arm to engage the lever arm whereby said

actuating shaft is rotated and said clutching mechanism actuated to cause rotation of said driving wheel, and means associated with said clutch mechanism for reversing the rotation of said driving wheel.

28. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said indicating mechanism, clutch mechanism for said driving wheel, an actuating shaft, lever mechanism connecting said shaft with said clutch mechanism, an actuating arm extending from said actuating shaft, a cam arm for engaging said actuating arm, a key connected with said cam arm, actuation of said key causing said cam arm to engage the lever arm whereby said actuating shaft is rotated and said clutching mechanism actuated to cause rotation of said driving wheel, means associated with said clutch mechanism for reversing the rotation of said driving wheel, and means for locking said clutch mechanism to prevent actuation of said driving wheel and said actuating mechanism.

29. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said indicating mechanism, clutch mechanism for said driving wheel, an actuating shaft, lever mechanism connecting said shaft with said clutch mechanism, an actuating arm extending from said actuating shaft, a cam arm for engaging said actuating arm, a key connected with said cam arm, actuation of said key causing said cam arm to engage the lever arm whereby said actuating shaft is rotated and said clutch mechanism actuated to cause rotation of said driving wheel, means for locking said clutch mechanism to prevent actuation of said driving wheel and said actuation mechanism, and means for releasing said clutch mechanism from said driving wheel whereby said actuating shaft may be rotated by said cam arm without causing rotation of said driving wheel.

30. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said indicating mechanism, clutch mechanism for said driving wheel, an actuating shaft, lever mechanism connecting said shaft with said clutch mechanism, an actuating arm extending from said actuating shaft, a cam arm for engaging said actuating arm, a key connected with said cam arm to engage the lever arm whereby said actuating shaft is rotated and said clutching mechanism actuated to cause rotation of said driving wheel, means associated with said clutch mechanism for reversing the rotation of said driving wheel, and means for locking said clutch mechanism to prevent actuation of said driving wheel and said actuating mechanism, means for releasing said clutch mechanism from said driving wheel whereby said actuating shaft may be rotated

by said cam arm without causing rotation of said driving wheel.

31. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said indicating mechanism, clutch mechanism for said driving wheel, an actuating shaft, lever mechanism connecting said shaft with said clutch mechanism, cam arms secured to said actuating shaft, and actuating levers having cam surfaces for engaging said cam arms to cause rotation of said actuating shaft, said cam arms being angularly displaced on said actuating shaft whereby equal actuations of said actuating arms will cause the rotation of said actuating shaft to correspond to the angular displacement of the actuated cam arm, said driving wheel being rotated a distance corresponding to the angle of rotation of said actuating shaft.

32. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, clutch mechanism associated with said driving wheel, an actuating shaft, lever mechanism connecting said shaft with said clutch mechanism, cam arms secured to said shaft and extending therefrom, and an actuating lever for each cam arm having a cam surface for engaging the end of the cam arm, the adjustment of said cam arms and actuating levers being such that equal actuations of said actuating arms will cause different angular rotations of the cam arms whereby said driving wheel is given a different angular displacement upon actuation of each of the different cam arms.

33. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said indicating mechanism, clutch mechanism for said driving wheel, an actuating shaft, lever mechanism connecting said shaft with said clutch mechanism, rotation of said shaft causing actuation of said clutch mechanism to rotate said driving wheel, angularly displaced cam arms secured to and extending from said actuating shaft, and similar actuating arms pivoted to a shaft and having cam surfaces for engaging said cam arms, rotation of an actuating arm causing rotation of the engaged cam arm corresponding to the angular displacement of said cam arm, the corresponding rotation of the driving shaft causing said clutching mechanism to move said driving wheel a corresponding angular distance.

34. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said indicating mechanism, clutch mechanism for said driving wheel, an actuating shaft, lever mechanism connecting said shaft with said clutch mechanism, rotation of said shaft causing actuation of said clutch mechanism to rotate said driving wheel, a cam arm secured to and ex-

tending from said actuating shaft, an actuating arm having a cam surface for engaging said cam arm to cause rotation of said actuating shaft and a corresponding rotation of said driving wheel, means tending to return said actuating arm to its normal position upon actuation thereof, and detent means for preventing return of said actuating arm until said arm has been rotated a fixed distance.

35. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said indicating mechanism, clutch mechanism for said driving wheel, an actuating shaft, lever mechanism connecting said shaft with said mechanism, rotation of said shaft causing actuation of said clutch mechanism to rotate said driving wheel, a cam arm secured to and extending from said actuating shaft, an actuating arm having a cam surface for engaging said cam arm to cause rotation of said actuating shaft and a corresponding rotation of said driving wheel, means tending to return said actuating arm to its normal position upon actuation thereof, and pawl and ratchet mechanism for preventing the return of said arm until said arm has been rotated a fixed distance.

36. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said indicating mechanism, clutch mechanism for said driving wheel, an actuating shaft, lever mechanism connecting said shaft with said clutch mechanism, rotation of said shaft causing actuation of said clutch mechanism to rotate said driving wheel, a cam arm secured to and extending from said actuating shaft, an actuating arm having a cam surface for engaging said cam arm to cause rotation of said actuating shaft and corresponding rotation of said driving wheel, means tending to return said actuating arm to its normal position upon actuation thereof, teeth on said actuating arm, and a detent for engaging said teeth upon forward rotation of said actuating arm and for preventing return of said arm until said arm has been moved forwardly sufficiently to allow escape of said detent from said teeth.

37. In a calculating machine, the combination with indicating means, of a driving wheel for actuating said indicating means, clutch mechanism associated with said wheel, an actuating shaft, lever mechanism connecting said shaft with said clutch mechanism, rotation of said shaft causing rotation of said driving wheel, angularly displaced cam arms secured to and extending from said shaft, an actuating lever for each cam arm having a cam surface for engaging said cam arm, said levers being similar and pivoted in a straight line to a shaft, means upon rotation of said actuating arms in a forward direction tending to return said arms, and de-

tent mechanism for preventing return of said arms until said arms are rotated a fixed distance, said distance being equal for all said arms, actuation of said cam arms by said actuating arms causing a rotation of said driving wheel corresponding to the angular displacement of the actuated cam arm.

38. In a calculating machine, the combination with indicating means, of a driving wheel for actuating said indicating means, clutch mechanism associated with said driving wheel, an actuating shaft, lever mechanism connecting said shaft with said clutch mechanism, rotation of said shaft causing rotation of said driving wheel, angularly displaced cam arms secured to and extending from said shaft, an actuating lever for each cam arm having a cam surface for engaging said cam arm, said levers being similar and pivoted in a straight line to a shaft, teeth on said actuating arm, and detents for said teeth adapted to allow forward rotation of said actuating arms but to prevent return of said arms until said arms have been rotated forwardly a fixed distance.

39. In a calculating machine, the combination with longitudinally traveling calculating mechanism, of a stationary driving wheel for actuating said mechanism, clutch mechanism for said driving wheel, lever mechanism connected with said clutch mechanism, means for adjusting said clutch mechanism to cause either forward or reverse rotation of said driving wheel upon actuation of said lever mechanism, means for locking said clutch mechanism to prevent actuation of said driving wheel and said lever mechanism, and means for releasing said clutch mechanism to allow actuation of said lever mechanism without causing rotation of said driving wheel.

40. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, clutch mechanism for said driving wheel, an actuating shaft, lever mechanism connecting said shaft with said clutch mechanism, cam arms extending from said actuating shaft, actuating arms having cam surfaces for engaging said cam arms to cause rotation of said actuating shaft, spring means for normally maintaining said cam arms in position to be actuated by said actuating arms, and means for locking said actuating shaft in a position to cause the cam arms thereon to prevent actuation of the actuating levers.

41. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, clutch mechanism for said driving wheel, an actuating shaft, lever mechanism connecting said shaft with said clutch mechanism, cam arms extending from said actuating shaft, actuating arms having cam surfaces for engaging said cam arms to cause rotation of

said actuating shaft, spring means for normally maintaining said cam arms in position to be actuated by said actuating arms, means for locking said actuating shaft in a position to cause the cam arms thereon to prevent actuation of the actuating levers, and means for releasing the clutch mechanism whereby said actuating arms may engage the cam arms to cause actuation of said shaft independently of the driving wheel.

42. In a calculating attachment for typewriting machines or the like, the combination with a frame adapted to travel with the carriage of the machine, totalizers mounted on said frame, gears for said totalizers, a stationary driving gear wheel for actuating said gear wheels as they pass thereby, actuating means for said driving wheel, means for causing either forward or reverse rotation of said driving wheel upon actuation of said actuating mechanism, means for locking said actuating mechanism to prevent rotation of said driving wheel, and means for allowing actuation of said actuating mechanism independently of said driving wheel.

43. In a calculating device for attachment to typewriting machines or the like, the combination with a frame adapted to travel with the escapement carriage of the machine, a totalizer mounted on said frame, a driving wheel having gear teeth for engaging the teeth of the totalizer gears upon travel of the carriage, actuating mechanism connected with said driving wheel and with the number keys of the machine, means upon actuation of the number keys for causing the rotation of the driving wheel to produce a rotation of the totalizer corresponding to the number of the key actuated, means for locking said actuating mechanism to prevent rotation of said driving wheel, and means for releasing said actuating mechanism whereby said keys and actuating mechanism may be actuated independently of said driving wheel.

44. In a calculating device for attachment to typewriting machines or the like, the combination with a frame adapted to travel with the escapement carriage of the machine, a totalizer on said frame, a driving wheel having teeth for engaging the teeth of the totalizer gears as the frame is moved with the carriage, actuating mechanism connected with the driving wheel and the number keys of the machine, means for locking said actuating mechanism to prevent actuation of said keys and of said driving wheel, and means for releasing said actuating mechanism from said keys whereby said keys may be actuated independently of said driving wheel.

45. In a calculating device for attachment to typewriting machines or the like, the combination with a traveling frame having separable engagement with the escapement carriage of the machine, totalizers mounted on

said frame having gear wheels, a stationary driving gear wheel having teeth for engaging said totalizer gears upon passage thereby, clutch mechanism for said driving wheel, mechanism connecting said clutch mechanism with the number keys of the machine, means upon actuation of any number key for causing rotation of the corresponding totalizer gear to indicate the number of the actuated key, means for causing forward or reverse rotation of said driving wheel, means for locking said keys against actuation, and means for releasing said keys from said driving mechanism.

46. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said indicating mechanism, an actuating shaft, actuating arms extending from said actuating shaft, mechanism intervening between said driving wheel and said actuating shaft, and adapted upon rotation of said shaft to cause rotation of said driving wheel and said indicating mechanism, keys, levers connected with said keys adapted upon actuation of said keys to engage the actuating arms to cause rotation of said actuating shaft, and means associated with said mechanism for locking said actuating arms out of range of said levers whereby said keys may be actuated independently of said shaft and said driving wheel mechanism.

47. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said indicating mechanism, an actuating shaft, actuating arms extending from said actuating shaft, mechanism intervening between said driving wheel and said actuating shaft, and adapted upon rotation of said shaft to cause rotation of said driving wheel and said indicating mechanism, keys, levers connected with said keys adapted upon actuation of said keys to engage the actuating arms to cause rotation of said actuating shaft, and means for locking said actuating arms in the path of said levers whereby actuation of said keys is prevented.

48. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said indicating mechanism, an actuating shaft, actuating arms extending from said actuating shaft, mechanism intervening between said driving wheel and said actuating shaft, and adapted upon rotation of said shaft to cause rotation of said driving wheel and said indicating mechanism, keys, levers connected with said keys adapted upon actuation of said keys to engage the actuating arms to cause rotation of said actuating shaft, means associated with said mechanism for locking said actuating arms out of range of said levers whereby said keys may be actuated independently of said shaft and said driving wheel mechanism,

and means for locking said actuating arms in the path of said levers whereby actuation of said keys is prevented.

49. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said indicating mechanism, clutch mechanism for said driving wheel, an actuating shaft, lever mechanism connecting said shaft with said clutch mechanism, cam arms secured to said actuating shaft, keys for said machine, actuating levers connected with said keys and adapted upon actuation to engage said cam arms to cause rotation of said actuating shaft, means for adjusting said clutch mechanism to cause either forward or reverse rotation of said driving wheel upon actuation of said keys, and means for actuating said clutch mechanism to allow actuation of said keys independently of said cam arms, said clutch mechanism and said driving wheel.

50. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said indicating mechanism, clutch mechanism for said driving wheel, an actuating shaft, lever mechanism connecting said shaft with said clutch mechanism, cam arms secured to said actuating shaft, keys for said machine, actuating levers connected with said keys and adapted upon actuation to engage said cam arms to cause rotation of said actuating shaft, means for adjusting said clutch mechanism to cause either forward or reverse rotation of said driving wheel upon actuation of said keys, and means for causing actuation of said clutch mechanism whereby said keys are prevented from being actuated.

51. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, ratchet wheels for said driving wheel, pawls for said ratchet wheels, pawl arms extending from said pawls, means tending normally to engage said pawls with the ratchet wheels, an actuating shaft, arms extending from said actuating shaft and pivoted at their ends to the ends of said pawl levers, cam arms extending from said shaft, keys for said machine, actuating levers connected with said keys and adapted upon actuation of said keys to engage said cam arms to cause rotation of said shaft whereby said ratchet mechanism is actuated to cause rotation of said driving wheel, and an adjusting frame for engaging said ratchet mechanism, actuation of said adjusting frame causing said shaft to be rotated and locked in position so that the cam arms thereon are removed from the path of the actuating levers whereby said keys may be actuated independently of said cam arms and the mechanism connected therewith.

52. In a calculating machine, the combination with indicating mechanism, of a driv-

ing wheel for actuating said indicating mechanism, keys for said machine, clutch mechanism for said driving wheel, bell crank lever mechanism intervening between said clutch mechanism and said keys, actuation of said keys causing actuation of said bell crank lever mechanism and said clutch mechanism to cause rotation of said driving wheel, means for adjusting said clutch mechanism to cause either forward or reverse rotation of the driving wheel upon actuation of said keys, and means for removing said bell crank lever mechanism from connection with said keys whereby said keys may be independently actuated.

53. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said indicating mechanism, keys for said machine, clutch mechanism for said driving wheel, bell crank lever mechanism intervening between said clutch mechanism and said keys, actuation of said keys causing actuation of said bell crank lever mechanism and said clutch mechanism to cause rotation of said driving wheel, means for adjusting said clutch mechanism to cause either forward or reverse rotation of the driving wheel upon actuation of said keys, and means for locking said bell crank lever mechanism in position to prevent actuation of said keys.

54. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said indicating mechanism, keys for said machine, clutch mechanism for said driving wheel, bell crank lever mechanism intervening between said clutch mechanism and said keys, actuation of said keys causing actuation of said bell crank lever mechanism and said clutch mechanism to cause rotation of said driving wheel, means for adjusting said clutch mechanism to cause either forward or reverse rotation of the driving wheel upon actuation of said keys, means for removing said bell crank lever mechanism from connection with said keys whereby said keys may be independently actuated, and means for locking said bell crank lever mechanism in position to prevent actuation of said keys.

55. The combination with indicating mechanism, of a driving wheel connected therewith, actuating mechanism adapted for association with said driving wheel to cause either forward or reverse rotation thereof, and means for rigidly locking said actuating mechanism to said driving wheel to prevent actuation of said actuating mechanism to rotate said driving wheel.

56. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, keys for said machine, adjusting means for causing either forward or reverse rotation of

said driving wheel upon actuation of said keys, and means for locking said driving wheel to prevent actuation of said keys.

57. In a calculating machine, the combination with indicating mechanism, of a driving wheel for actuating said mechanism, keys for said machine, adjusting means for said driving wheel for causing either forward or reverse rotation thereof upon actuation of said keys, means for locking said driving wheel to prevent actuation of said keys, and means for allowing actuation of said keys independently of the driving wheel mechanism.

58. The combination with a typewriting machine having an escapement carriage consisting of a body part and a relatively movable part, of calculating mechanism, and a bar connecting with said calculating mechanism and with said body part of the carriage whereby upon travel of said carriage said calculating mechanism will be carried therewith.

59. The combination with a typewriting machine having an escapement carriage consisting of a body part and a relatively movable part, of calculating mechanism carried by the machine, an arm secured to the calculating mechanism and to the body part of the escapement carriage in such a manner that the movable part of the carriage may be actuated without causing disconnection of the calculating mechanism.

60. The combination with a typewriting machine having an escapement carriage consisting of a body part and a relatively movable part, of calculating mechanism supported from the machine, an arm secured at its rear end to the body part of the carriage and having suitable engagement at its front end with the calculating mechanism.

61. The combination with a typewriting machine having an escapement carriage consisting of a rear body part and a front part adapted to be swung with relation to the body part, of calculating mechanism supported from the machine, a connecting arm secured at its rear end to the body part of the carriage and at its front end having connection with the calculating mechanism, said movable part of the carriage being adapted for actuation without causing disconnection of the calculating mechanism.

62. In a calculating machine, a totalizer capable of addition and subtraction, a set of numeral keys, each of which is adapted to operate the same both additively and subtractively said totalizer having means for preventing the subtraction of a larger number from a smaller one.

63. In a calculating machine, a totalizer having figure wheels for representing the various decimal denominations, a set of numeral keys, each of which is adapted to operate the

same both additively and subtractively and means for preventing the rotation of the highest figure wheel subtractively beyond zero.

5 64. In a calculating machine, a totalizer capable of addition and subtraction, said totalizer having a series of figure wheels arranged to represent the various decimal denominations, means in connection with each figure wheel for preventing subtractive rotation of said figure wheel beyond zero, said preventing means being put in operation whenever all the higher figure wheels are at zero.

15 65. In a calculating machine, a reversible totalizer having a series of figure wheels therein to represent the various decimal denominations, said figure wheels being rotated forwards for addition and backwards for subtraction, a set of numeral keys, each of which is adapted to operate the same both additively and subtractively, a locking member for the highest figure wheel, said locking member tending to prevent the negative rotation of said figure wheel beyond the zero point, whereby no figure wheel may be rotated negatively beyond zero when all the figure wheels to the left are at zero, the mechanism thus preventing subtraction of a larger number from a smaller one.

30 66. In a calculating machine, a totalizer having a series of figure wheels therein to represent the various denominations, said figure wheels being capable of rotating forwards for addition and backwards for subtraction, locking members one for each of said figure wheels normally tending to arrest said figure wheels at the zero point when rotating negatively, each of said locking members being held retracted by the next locking member to the left when the latter is in retracted position, whereby no figure wheel may be rotated negatively beyond zero when all the figure wheels to the left are at zero but any figure wheel may be rotated negatively beyond zero whenever any of the figure wheels to the left exhibits a valuable figure, the mechanism thus preventing subtraction of a larger number from a smaller one.

50 67. In a calculating machine, a totalizer having a series of figure wheels therein to represent the various decimal denominations, said figure wheels being capable of rotating forwards for addition and backwards for subtraction, locking means adapted for engagement with each of said figure wheels, said locking means when in engagement with any of said figure wheels preventing the backward or subtractive rotation of said figure wheel beyond zero, and said locking means being automatic to come into engagement with said figure wheel whenever all the higher figure wheels are at zero.

68. In a calculating machine, a totalizer

having a series of figure wheels therein to 65 represent the various decimal denominations, said figure wheels being capable of rotating forwards for addition and backwards for subtraction, locking means adapted for engagement with each of said figure wheels, said locking means when in engagement with any of said wheels preventing the backward or subtractive rotation of said figure wheel beyond zero, and mechanism for keeping said locking means out of engagement with said figure wheels whenever the highest figure wheel is not exactly at zero.

69. In a calculating machine, a totalizer having a series of figure wheels therein to represent the various decimal denominations, said figure wheels being capable of rotating forwards for addition and backwards for subtraction, locking means adapted for engagement with each of said figure wheels, a cam on each of said figure wheels, said locking means tending normally to engage said figure wheels and said cam normally keeping said locking means out of engagement with said figure wheels, except when said figure wheels are at zero.

70. In a calculating machine, a totalizer having a series of figure wheels therein to represent the various decimal denominations, said figure wheels being capable of rotating forwards for addition and backwards for subtraction, independent locking means for each of said figure wheels normally tending to engage said figure wheels and adapted for engagement therewith, said locking means when in engagement with a figure wheel preventing the backward or subtractive rotation thereof beyond zero, means for removing said locking means from engagement with said figure wheel, said moving means being operated by the next higher figure wheel.

71. In a calculating machine, a totalizer having a series of figure wheels therein to represent the various decimal denominations, said figure wheels being capable of rotating forwards for addition and backwards for subtraction, a cam fastened to each of said figure wheels, a pawl for each of said cams, each pawl tending normally to engage its cam to prevent the backwards or subtractive rotation of said figure wheel beyond zero, and means operated by the next higher figure wheel for removing said pawl from said cam to permit the subtractive rotation of said figure wheel beyond zero.

72. In a calculating machine, a totalizer having a series of figure wheels therein to represent the various decimal denominations, said figure wheels being capable of rotating forwards for addition and backwards for subtraction, a cam connected to each of said figure wheels, a pawl for each of said cams, each pawl tending normally to engage its

cam to prevent the backwards or subtractive rotation of said figure wheel beyond zero, an extension on each of said pawls, said extension abutting against the next higher pawl whereby the lower pawl is retracted from its figure wheel whenever the next higher pawl is in retracted position.

In witness whereof, I hereunto subscribe my name this 22nd day of October A. D., 1904.

JOHN C. WAHL.

Witnesses:

CHARLES J. SCHMIDT,
JOHN STAHR.