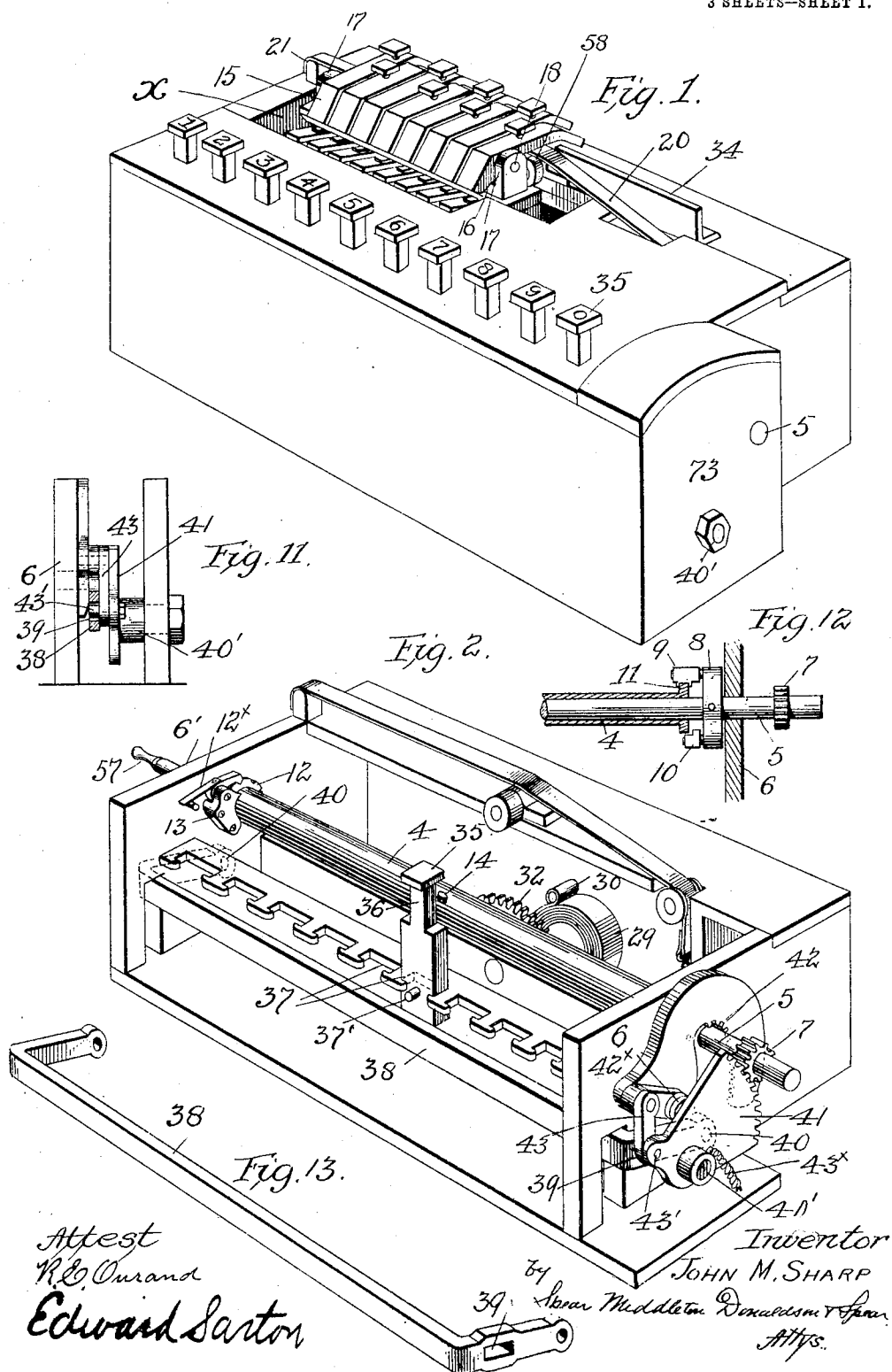


No. 810,090.

PATENTED JAN. 16, 1906.

J. M. SHARP.
CALCULATING MACHINE.
APPLICATION FILED APR. 23, 1904.

3 SHEETS—SHEET 1.

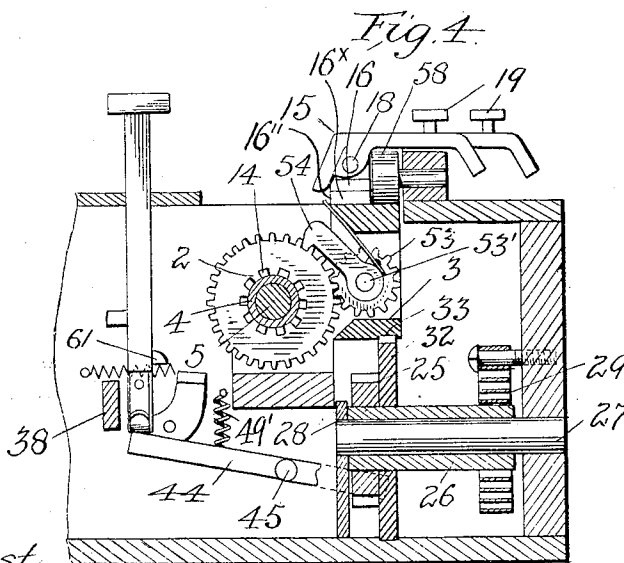
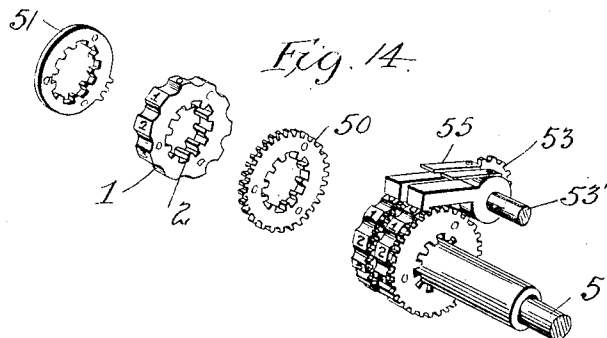
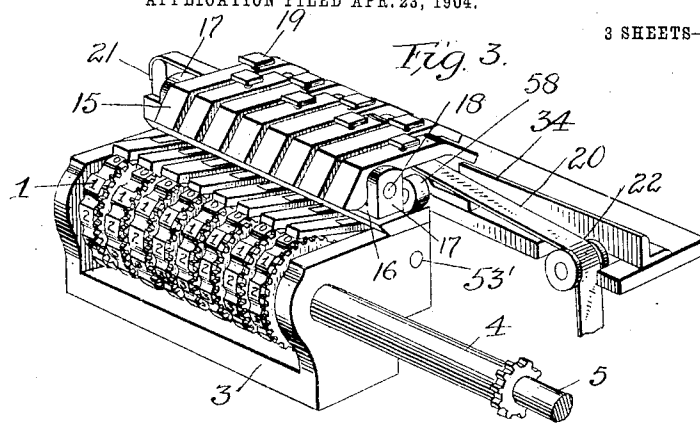


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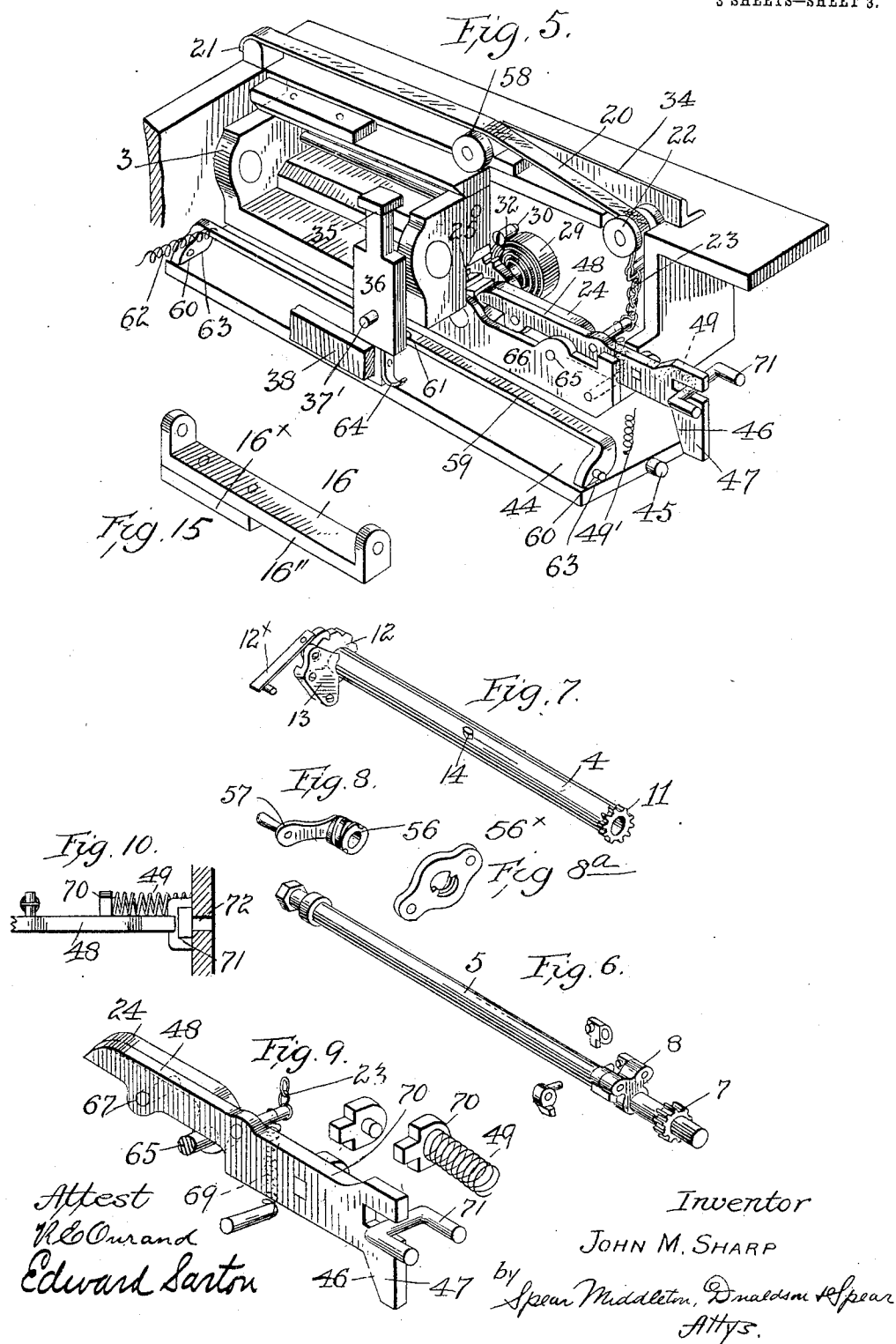


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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

JOHN M. SHARP, OF CHATTANOOGA, TENNESSEE.

CALCULATING-MACHINE.

No. 810,090.

Specification of Letters Patent.

Patented Jan. 16, 1906.

Application filed April 23, 1904. Serial No. 204,582.

To all whom it may concern:

Be it known that I, JOHN M. SHARP, a citizen of the United States, residing at Chattanooga, Tennessee, have invented certain new and useful Improvements in Calculating-Machines, of which the following is a specification.

My invention relates to calculating-machines, and is designed to provide a simple, inexpensive, and easily-operated machine, whereby addition and subtraction may be conveniently and expeditiously performed.

The invention includes generally a series of number-wheels supported on a carrier, which is controlled by escapement mechanism and order-keys, so that the carriage, with its number-wheels, may be set in position corresponding to the order of the number to be added or subtracted, and when so set the operator by striking digit-keys corresponding in value to the digits of the number will cause the appropriate number-wheels to be turned to expose the digits at the display or sight opening, the carriage moving automatically from right to left as the digit-keys are struck. The number-wheels on the carriage are provided with internal teeth, which are adapted to be engaged by a projection on a sleeve passing through the number-wheels and carriage, the said sleeve being operated circumferentially, but held longitudinally against movement, the circumferential movement being derived from the operation of the digit-keys and causing the number-wheel in engagement with the projection or stud to be turned to expose the desired digit at the display-opening. The arrangement is such that the shifting of the carriage will bring different ones of the number-wheels into engagement with the stud or projection to be turned thereby.

The invention consists in the features and combination and arrangement of parts hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a perspective view of the invention complete. Fig. 2 is a perspective view with the outer casing omitted and omitting also the number-wheels, order-keys, some of the digit-keys, and other parts. Fig. 3 is a perspective view showing the number-wheel carrier with the order-keys associated therewith and adjacent parts. Fig. 4 is a sectional view through the machine from front to rear. Fig. 5 is a perspective view of the number-wheel

carriage, means for operating the same, and parts of the frame. Fig. 6 is a perspective view of the central shaft of the machine and pawl-and-ratchet mechanism. Fig. 7 is a view of a sleeve to fit on the central shaft of Fig. 6. Fig. 8 is a detail of means for adjusting the central shaft, Fig. 8^a a detail of a nut for the said means. Figs. 9 and 10 are details of means for operating the number-wheel carriage. Figs. 11, 12, 13, and 14 are views of details. Fig. 15 is the plate for holding the order-keys.

In the drawings, 1 indicates the number-wheels, which, as shown more particularly in Figs. 4 and 14, are provided with internal teeth 2 and have the digits disposed around the periphery. These number-wheels are arranged in a carrier 3 in the form of a box, with its upper and front sides open, as shown in Fig. 3, and they are arranged to slide when the carrier is moved upon a sleeve 4, which in turn is supported upon the main shaft 5 of the machine, Fig. 6, which shaft is journaled in the wall 6 of the case of the machine. The shaft 5 carries fixed thereto a pinion 7, through which the shaft 5 is turned, as will be hereinafter described. It also carries a pawl-block 8, Figs. 6 and 12, fixed thereto, carrying pivotally the pawls 9 and 10, which are to engage a toothed wheel 11, fixed to the sleeve 4 before described. This pawl-and-ratchet mechanism is located on the inner side of the side 6 of the frame, and the sleeve 4 extends only from near the inner side of one side wall of the frame to the inner side of the opposite wall, and at the latter point it is provided with a circular shoulder or collar in the form of a toothed wheel 12, engaged by a block 13, Figs. 2 and 7, fixed to the inner side of the wall 6'. The sleeve, while permitted free rotary movement, is thus held against longitudinal movement, and it carries a stud or projection 14 at about its center adapted to be engaged by the internal teeth 2 of the number-wheels when the number-wheel carriage is shifted into position to make the desired number-wheel engage the said stud or projection with its internal teeth.

The normal position of the number-wheel carrier is at the extreme left-hand side of the machine, as indicated in Fig. 1, which shows a group of order-keys 15, which are supported on the carrier, as being located at the left-hand side of the apparatus, and for setting the carrier toward the right to make the appropriate number-wheel engage the turning

stud or projection 14 the following mechanism is provided. As just stated, the number-wheel carrier has the order-keys 15 supported thereon, and for this purpose the carrier has fixed thereto a plate 16, Fig. 3, having upturned ears 17, through openings in which a bar 18 is passed, serving as a pivot, as indicated in Fig. 4, for the order-keys. These order-keys are provided with finger-buttons 19, by which they may be depressed. When either of the order-keys is so depressed, it will strike a band 20, attached rigidly at one end 21 to the frame of the machine and passing over a roller 22 to connect in any suitable manner, as at 23, with a pawl 48, to lift the same, and also a pawl 24, hereinafter described. This detent engages with an escapement ratchet-wheel 25, which is fixed to a sleeve 26, arranged to turn on a pin or shaft 27, held in the frame at 28, Fig. 4, the said sleeve being under tension of a spring 29, one end of which is attached thereto, while the other end is attached at 30 to the frame of the machine. The sleeve also carries a segmental gear-wheel 32, meshing with a rack 33 on the number-wheel carrier, and it will thus be seen that when the order-key is depressed, as above stated, the band 20 will be drawn open, lifting the detent 24 and pawl 48 out of the escapement-wheel and allowing the spring 29 to turn the sleeve 26 and the gear-wheel 32 to move the number-wheel carrier to the right, and this movement will continue until the side of the depressed order-key strikes a stop 34, suitably supported upon the top of the casing of the machine, said stop being in the form of an angular bar attached to the top plate and presenting its end to be struck by the side edge of the depressed order-key. Supposing, for instance, the number "4321" is to be displayed at the opening X in the casing or that this number is to be added with some other number, the operator will first determine the order of the number, in this case thousandths, and he will then depress the corresponding order-key, which of course in the present instance would be the fourth key from the right of the group shown in the drawings, and the number-wheel carrier having been shifted, as above described, by the depression of this key will have brought the fourth numeral-wheel, still counting from the right of the group, into engagement by its internal teeth with the turning stud or projection 14 on the sleeve 4, and the machine is now set ready to receive the successive manipulations of the digit-keys 4 3 2 1 to display the number "4321" at the opening X, as will now be described.

The digit-keys are illustrated at 35, and they comprise buttons or finger-pieces on the upper ends of stems 36, movable vertically in guides 37, forming part of the frame, Fig. 2, the said stems carrying each a projecting

pin 37', overlying a bar 38, forming part of a frame which is pivotally supported on short studs or pins 40 on the outer sides 6 of the casing. The studs 37 are arranged at different elevations in respect to the upper edge of the bar 38, according to the value of the digit which each key represents, the projection for the key carrying the digit "9" being closest to the upper edge of the bar, so that a maximum movement of the said bar will take place while this key is operated, while for the key representing the digit "1" the projection thereon will be at the greatest height on the said key-stem, so that the greater portion of the movement of this key will be lost and the bar 38 will be operated to a minimum extent. The stem of the 0 key is not provided with any projection, so that when this key is operated no movement of the bar 38 will take place.

A toothed segment 41 is associated with the pivot-frame 38, being pivoted on the stud 40' and arranged to engage the pinion 7 on the main shaft 5. A second segment, but having its teeth arranged internally thereof, as at 42, is linked at 43 to the first segment 41 and is also arranged to engage the pinion when said pinion is properly adjusted for this purpose. The link 43 has its pin 43', which connects with the segment 41, also connected with the frame 38 by entering a slot 39 in the said frame. The segment 42 is pivoted at 42^x to the frame 6 and is called into action when subtraction is to be performed, while the segment 41 is for the purpose of performing addition. Both segments are moved on their pivots each time the frame 38 is depressed, but only one segment is effective at a time. As shown in Fig. 2, the shaft 5, which is movable longitudinally, is in its extreme right-hand position, so that pinion 7 is now engaged by the adding-segment 41, and whenever the digit-key is operated the frame 38 will be moved, causing the segment 41 to turn the shaft 5 through the pinion 7, and this action through the pawl 9, carried by the said shaft 5, as before described, will in conjunction with the toothed wheel 11 turn the sleeve 4 and cause the turning or setting stud 14 to turn the number-wheel in engagement therewith an amount sufficient to bring the digit on the said number-wheel corresponding in value to the digit on the key to the display-opening X. When the key is released, the parts return to normal position, excepting the sleeve 4 and the number-wheel—that is to say, the shaft 5 and segments 41 and 42 will be turned back under the pressure of the spring 43^x, Fig. 6, and the frame 39 will also be raised from the spring-pressure.

The depression of the digit-key just described performs another function in addition to that of turning the number-wheel, and for this purpose a lever-plate 44, Figs. 4

and 5, is pivotally supported at 45 within the frame, its front edge being below the lower ends of the digit-key stems. When, therefore, the digit-key is depressed, the rear end of the lever-plate will be lifted, and acting upon an incline 46 on the tailpiece 47 of the pawl 48 will retract the said pawl against the tension of its spring 49, so that the said pawl will engage a new tooth in the escapement-ratchet 25, thus setting the parts to move the number-wheel carriage one step to the left when the digit-key is released, this leftward movement being effected by the withdrawal of the lever-plate 44 from the incline 46, leaving the spring 49 free to exert its force and thrust the driving-pawl 48 to the left to turn the ratchet 25, and thus turn also the toothed wheel 32, which meshes with the rack 33 on the carriage. In this way the number-wheel which has just been rotated is moved longitudinally along the sleeve 4 to carry its internal teeth out of engagement with the setting-stud 14 and to bring the internal teeth on the next number-wheel at the right of the group into engagement with the said stud, so that upon depression of the next digit-key this number-wheel will be turned to display the appropriate digit thereon through the opening X. The lever-plate 44 is raised when the digit-key is released by means of a spring 49'.

In the example given above, where the number "4321" is to be displayed or added with some other number, it will be seen that it will only be necessary to select the order-key and press this down, this being the fourth one of the group, counting from the right in this instance, and this will bring the fourth numeral-wheel to engage the setting-stud, and after this the digit-keys 4 3 2 1 will be pressed in the order named. The depression of the digit-key 4 will cause the fourth numeral-wheel to be turned so as to display the digit "4," and when this key is released the number-wheel carrier will be automatically moved one step leftward by the pawl 48, as above described, so as to bring the third numeral-wheel into engagement with the setting-stud, and upon the depression of the digit-key 3 this numeral-wheel 3 will be turned to display the digit "3" at the opening X, and similar operations will be performed in respect to the digit-keys 2 and 1. As a result of this operation just described there would appear at the opening X the following number "00004321," and supposing we desire to add to this another number, say "9784," we would proceed by again depressing the fourth order-key, which would set the fourth numeral-wheel again in engagement with the setting-stud, and we would next depress the 9 digit-key, then the 7, the 8, and the 4. When the 9 key was struck, the fourth numeral-wheel would be turned through nine spaces, and it having been already turned four spaces as the result of the first operation a carrying opera-

tion would be called into action to carry the result onto the next wheel of higher order in a manner generally well known. This carrying mechanism in my machine comprises a full thirty-toothed wheel 50, Fig. 14, and a three-toothed wheel 51 arranged side by side and between the numeral-wheels, one being attached to one numeral-wheel and the other to the adjacent numeral-wheel, and both being arranged to engage a carrying-wheel 53, arranged to turn on a shaft 53', supported in the end walls of the number-wheel carrier, it being obvious from this construction that when one numeral-wheel completes a full revolution the three-toothed wheel associated with it will engage the carrying or transfer wheel 53, and this engaging the full thirty-toothed wheel 50 of the next number-wheel will turn the same, and thus transfer the digit to be carried onto the next wheel. In order to hold the number-wheels in the positions to which they are moved, detents 54 are provided, pivoted on the shaft 53 and pressed into place by springs 55, bearing upon a suitable part of the carrier-frame.

For performing subtraction the shaft 5 is shifted longitudinally to the left, Fig. 6, as heretofore intimated, and for this purpose I provide a screw-threaded head 56 on the said shaft, having a handle 57 and adapted to engage a suitable fixed nut 56, so that by turning the screw-threaded head the shaft may be shifted to make the pinion 7 engage either with the adding-segment or the subtracting-segment 52. The operation for subtracting is carried out in the same manner as the parts are operated for addition, excepting that the movement of the numeral-wheels takes place in the opposite direction from that described above, and in this subtracting operation the pawl 10 is brought into action instead of the pawl 9.

The number-wheel carriage is guided by its rack, and also by the sleeve 4 passing through it, and, further, by a roller 58, Fig. 4, bearing upon a suitable portion of the said carrier.

In order to provide a key-lock, a rocking frame 59 is employed, pivoted to the frame at 60 and having its main bar arranged to engage projections or teeth 61 on the stems of the digit-keys. The locking-frame is drawn toward the said teeth by a spring 62; but the action of this spring is normally opposed by the lever-plate 44, which acting upon the portions 63 of the ends of the said locking-frame serves as stops to prevent the locking-frame being drawn into engagement with the teeth of the key-stems; but when any key-stem is operated and the lever-plate is pressed downwardly at its front end the spring 62 is then free to draw the bar 59 into engagement with the teeth of all the key-stems which have not been operated, thus locking them in position until the operated

key returns to normal position. The idle keys are supported to keep them from falling until they are locked by the bar 59 by leaf-springs 64, normally slightly bent or compressed. The order-keys may have two rows of colors on their front inclined faces, the upper row being for dollars and cents and the lower row for other numbers.

It will be understood that the sleeve moves continuously in one direction during addition, but no matter where the stud 14 stops it is always in position to be engaged by the internal teeth of the number-wheels.

The detent 24 before mentioned is pivoted on a pin 65, extending from a part of the frame 66, Fig. 5, and this detent is raised at the same time the pawl 48 is raised by a pin 67, Figs. 5 and 9, extending from the pawl beneath the detent. The pawl is drawn normally down by a spring 69, Fig. 9. The spring 49 for moving the pawl lengthwise bears upon a stud 70, extending from the pawl. The pawl pivots and slides upon a staple 71, fixed to the casing or frame, which may be provided with an opening at 72, detail plan view Fig. 10, for the pawl end to pass through. The segments may be inclosed in a secondary casing 73, Fig. 1, in the wall of which the pivot pin 40' for the segment 41 is supported.

The sleeve 4 will be held against undue displacement by a detent 12^x engaging the toothed collar.

The function of the springs 64, attached to the digit-key stems, is to hold the unoperated keys up long enough for the locking-bar 59 to engage their teeth 61. The springs are normally under compression or are bent by the upward pressure from the plate 44; but when this plate swings down the springs straightening out will still hold up the stems of the unoperated keys long enough for the locking-bar to get into locking-position.

Fig. 15 shows the plate 16, which carries the pivot-rod 18 of the order-keys. This plate is supported upon a block or ledge 16^x on the carriage, so that a space 16'' will be left under the right-hand portion of the plate to enable it to clear the top plate of the casing of the machine.

I claim—

1. In combination in a calculating-machine, a series of number-wheels, a carrier therefor spring means for moving the carrier in one direction, order-keys controlling the said means, a device for moving the carrier positively in the opposite direction digit-keys and connections therefrom for turning the number-wheels and for operating the said device, substantially as described.

2. In combination in a calculating-machine, a series of number-wheels, a shifting carrier therefor, said number-wheels having internal teeth, a setting or turning device to engage said internal teeth and held against

movement axially of the number-wheels, order-keys with means controlled thereby for moving the carrier to bring the number-wheel of the desired order to engage the setting device and digit-keys with connections therefrom to the turning or setting device to turn the number-wheel to expose the desired digit, said connections including an adjustable part whereby the machine may be made to add or subtract, substantially as described.

3. In combination in a calculating-machine, a series of number-wheels, a shifting carrier therefor, said number-wheels having internal teeth, a setting or turning device to engage with said internal teeth, order-keys with means controlled thereby for moving the carrier to bring the number-wheel of the desired order to engage the setting device and digit-keys with connections therefrom to the turning or setting device to turn the number-wheel to expose the desired digit, substantially as described.

4. In combination in a calculating-machine, a series of number-wheels having internal teeth, a carrier for the number-wheels a turning or setting device to engage the internal teeth, order-keys with means controlled thereby for shifting the carrier to bring the desired number-wheel to engage the setting device, digit-keys with connections to the setting device for operating the same and means controlled by the operation of the digit-keys for shifting the carrier one step for each operation, to cause the number-wheels to successively engage the setting device, substantially as described.

5. In combination in a calculating-machine, a series of number-wheels, one for each order of digits, a shifting carrier therefor, a rotary shaft along which the carrier shifts, said shaft having associated therewith a number-wheel-setting device order-keys with means for arresting the carrier to correspond with the order-key operated and digit-keys with connections to said shaft for turning the number-wheels, substantially as described.

6. In combination in a calculating-machine, a series of number-wheels, a carrier therefor, said wheels having internal teeth, a shaft passing through the number-wheels and along which the group of number-wheels may shift, a setting device comprising a pin or projection associated with the said shaft and adapted to engage the internal teeth of the number-wheels, order-keys with means associated therewith for setting the number-wheel of the desired order into engagement with the said pin and digit-keys for turning the said shaft with the pin and thus turning the number-wheel to expose the digit desired, substantially as described.

7. In combination in a calculating-machine, a series of number-wheels, a carrier therefor, a series of order-keys each arranged

to act as a stop, spring-controlled escapement mechanism for operating the carrier, a band arranged to be pressed by the order-keys for operating the escapement, a setting or turning device for the number-wheels to which they are brought by the movement of the carrier and digit-keys with connections to the said setting or turning device, substantially as described.

8. In combination in a calculating-machine, a series of number-wheels, a carrier therefor, order-keys on the carrier, a stop on the frame, arranged to be struck by any order-key when depressed spring-pressed escapement mechanism for operating the carrier, a band controlling the same arranged to be operated by the depression of an order-key, a turning or setting device for the number-wheels, digit-keys and connections therefrom to the turning or setting device, substantially as described.

9. In combination in a calculating-machine, a series of number-wheels, a carrier therefor said wheels having internal teeth, a turning or setting device for engaging the internal teeth an escapement mechanism for moving the carrier order-keys controlling the escapement, stop means, digit-keys connections therefrom to the setting device, and means for operating the carrier from the digit-keys comprising a pawl to act on a part of the escapement, and a lever-plate operated by any one of the digit-keys and serving to set the pawl ready to act said pawl having a spring to move it when the digit-key is released, substantially as described.

10. In combination in a calculating-machine for addition and subtraction, a series of number-wheels a carrier therefor, said wheels having internal teeth, a setting device to which the carrier moves the wheels consisting of a pin or projection to engage the said internal teeth, rotary means carrying the said pin, digit-keys and connections therefrom for operating the said pin-carrying means circumferentially in either direction, to rotate the pin in either direction to turn the number-wheels for addition or subtraction, substantially as described.

11. In combination in a calculating-machine, a series of number-wheels internally toothed, a sleeve along which the series of wheels may slide, a pin on said sleeve to engage the internal teeth, a shaft passing through the said sleeve digit-keys, connections therefrom for driving the shaft in either one direction or the other and means for transmitting the movement of the shaft to the sleeve, substantially as described.

12. In combination in a calculating-machine, a series of number-wheels, a carrier therefor said number-wheels having internal teeth a sleeve having a pin thereon to engage the internal teeth of the number-wheels a shaft passing through the said sleeve and

movable longitudinally, a pinion on the said shaft, adding and subtracting toothed segments with either of which the said pinion may be engaged by shifting the shaft, digit-keys and means for operating the segments therefrom, substantially as described.

13. In combination in a calculating-machine, a series of number-wheels, a carrier therefor, said number-wheels having internal teeth, a sleeve, a pin thereon to engage the internal teeth, a shaft passing through the sleeve, digit-keys with means for driving the shaft in either direction from the said digit-keys and pawl-and-ratchet mechanism between the shaft and sleeve, substantially as described.

14. In combination in a calculating-machine, a series of number-wheels a carrier therefor, said wheels having internal gear-teeth, a sleeve having a pin to engage said gear-teeth a shaft within the sleeve arranged to be shifted longitudinally digit-keys, means for turning the shaft from the digit-keys in either one direction or the other according to the longitudinal position of the shaft and a screw-threaded head on the said shaft with a handle for turning the same said head turning in a fixed part to move the shaft longitudinally, substantially as described.

15. In combination in a calculating-machine, a series of number-wheels, a turning or setting device therefor, digit-keys for operating the said turning device, a carrier for the number-wheels, connections for moving the said carrier from the digit-keys and a key-lock arranged to be controlled by the operation of the said connections, substantially as described.

16. In combination in a calculating-machine, a series of number-wheels, a carrier therefor, digit-keys, connections for operating the carrier from the digit-keys comprising the lever-plate arranged below the keys to be operated thereby, and a key-lock comprising a pivoted frame held normally away from the keys when the lever-plate is in its upper position, substantially as described.

17. In combination in a machine of the class described, a series of vertically-extending keys, a number-wheel carriage, a lever with means between the same and the number-wheel carriage for operating it, said lever being arranged to be depressed by the keys, a key-lock, and springs for holding the unoperated keys up until the lock is set, said springs being normally compressed by the lever when in its uppermost position, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN M. SHARP.

Witnesses:

OLIVER P. STEWART,
D. J. SAUL.