J. A. CHEAPE.

ADDING MACHINE.

APPLICATION FILED MAR. 20, 1915.

1,242,921.

Patented Oct. 16, 1917.

3 SHEETS—SHEET 1.

Fig. 1.

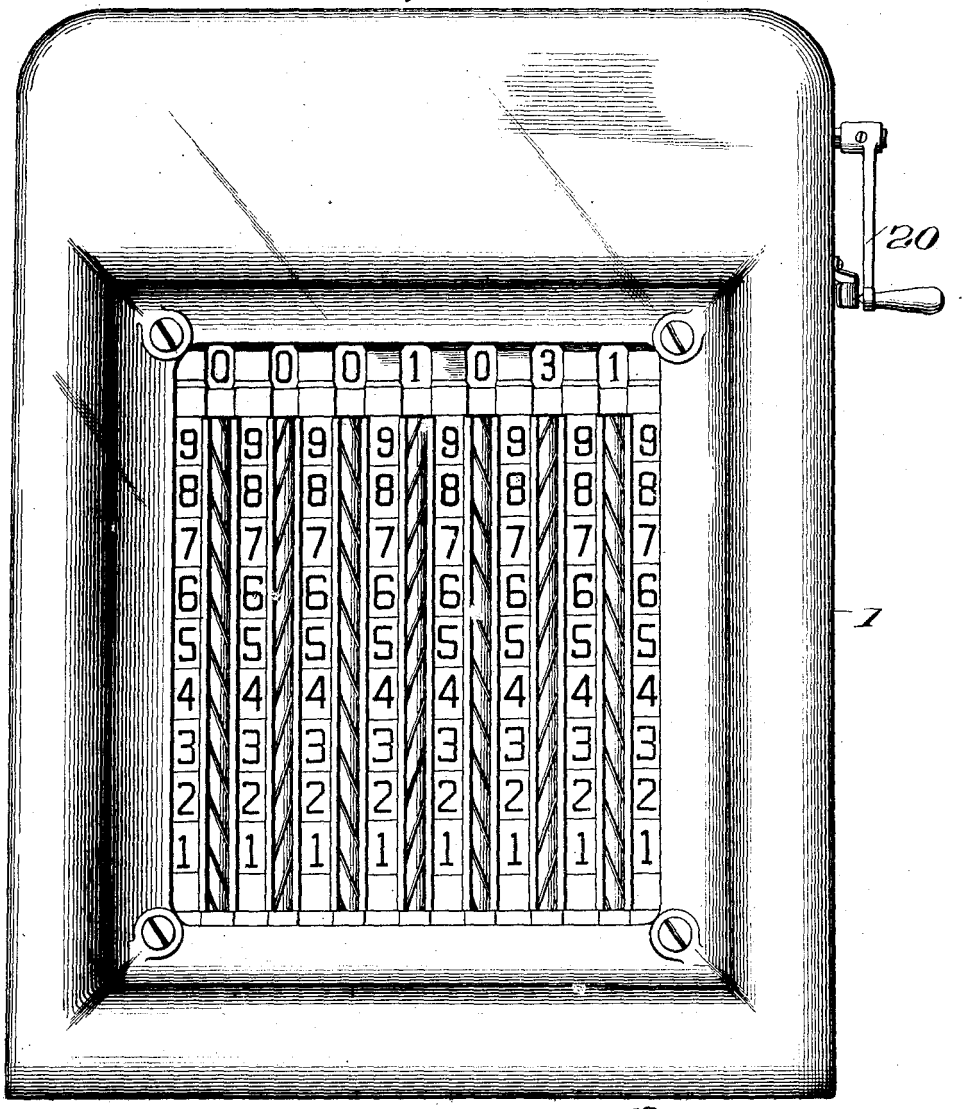


Fig. 7.

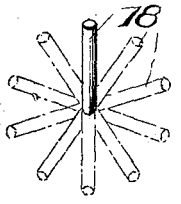
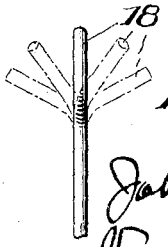


Fig. 8.



Witnesses

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3 SHEETS—SHEET 2.

Fig. 2.

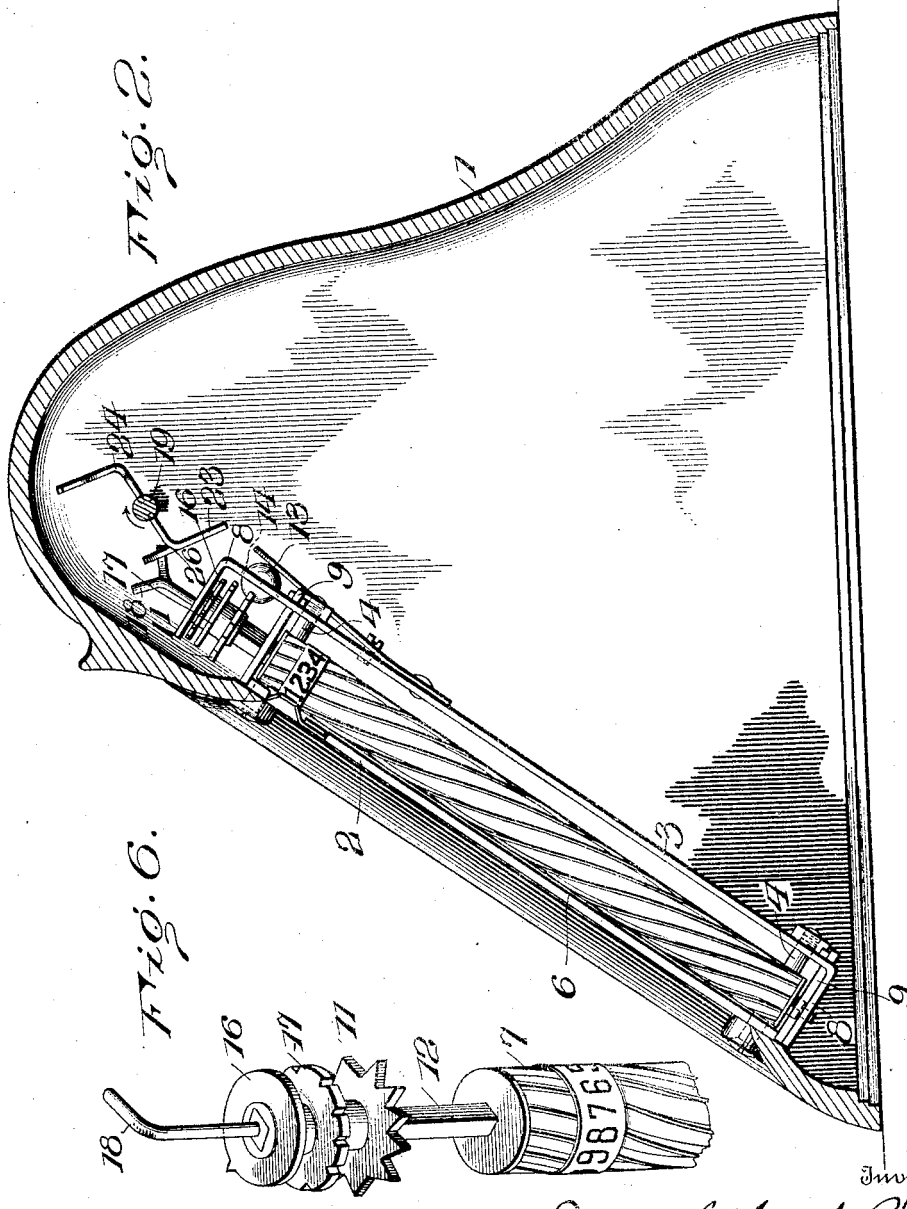

Fig. 6.

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3 SHEETS—SHEET 3.

Fig. 3.

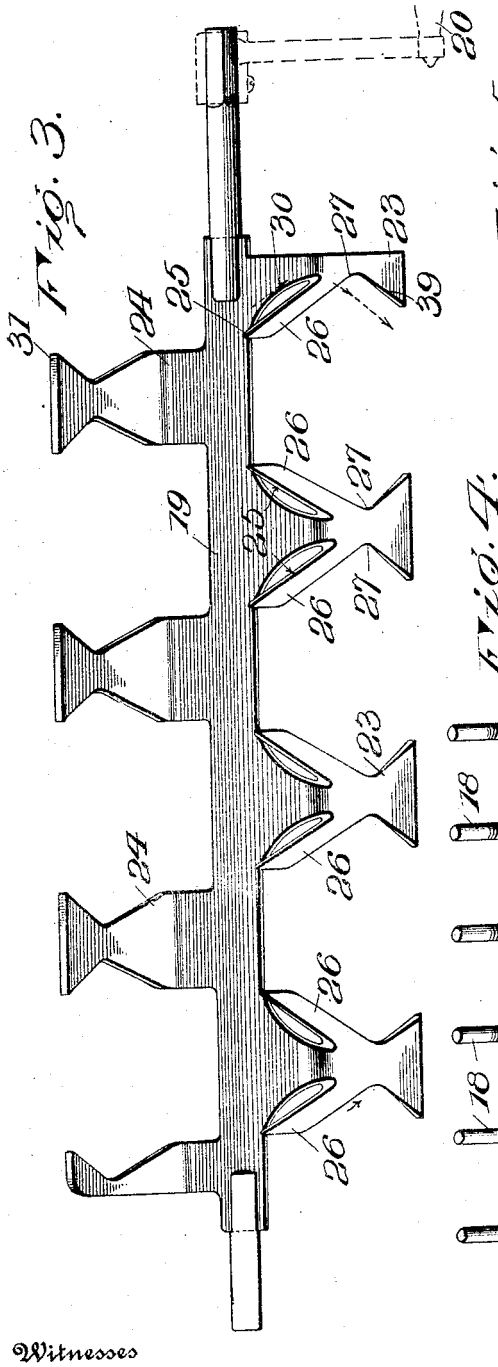


Fig. 5.

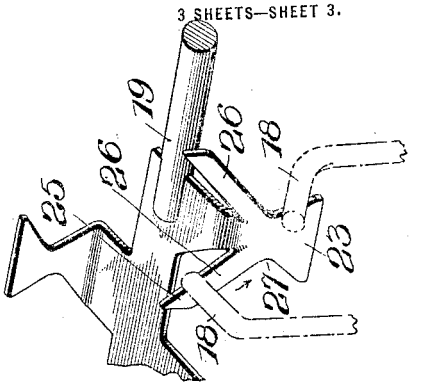
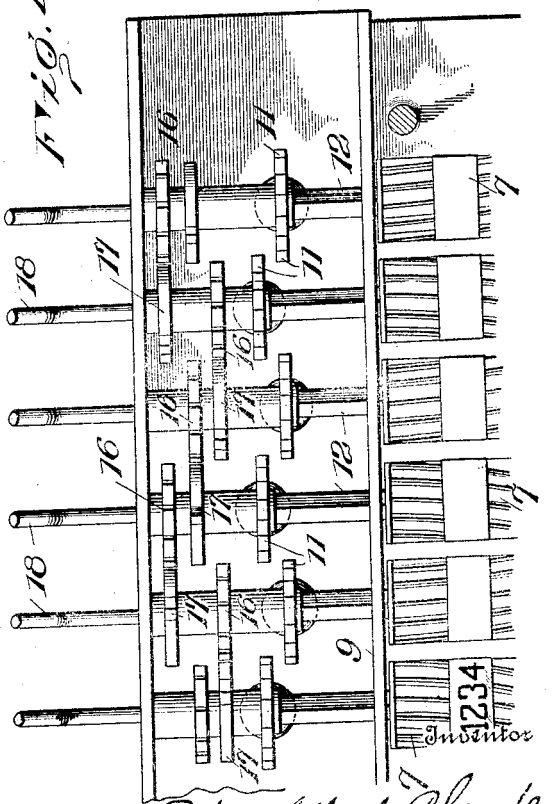


Fig. 4.



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UNITED STATES PATENT OFFICE.

JOHN ALBERT CHEAPE, OF CHARLOTTESVILLE, VIRGINIA.

ADDING-MACHINE.

1,242,921. Specification of Letters Patent. Patented Oct. 16, 1917.

Application filed March 20, 1915. Serial No. 15,820.

To all whom it may concern:

Be it known that I, JOHN ALBERT CHEAPE, a subject of the King of Great Britain, residing at Charlottesville, in the county of Albemarle and State of Virginia, have invented certain new and useful Improvements in Adding-Machines, of which the following is a specification.

My invention relates to an improvement in adding machines, and it has in consideration:—

First, accuracy and ease in operation;

Second, the question of simplicity of construction;

Third, economy in manufacture;

Fourth, fewness of parts.

My invention consists primarily in the application of the principle of the Archimedes screw to an adding machine, the adding or subtracting being accomplished by running a stylus or equivalent instrument down or up through guide slots for the purpose, in contact with the screw or screws, in that way transmitting a rotary motion to the screw and presenting the resultant number, to view, of the addition or subtraction.

My invention further consists of mechanism for clearing or returning to zero or starting-point, also in mechanism for carrying from column to column, and also in locating means.

In the accompanying drawings:—

Figure 1 is a view in front elevation;

Fig. 2 is a longitudinal vertical section;

Fig. 3 is a detail view of the clearing mechanism;

Fig. 4 is a fragmentary view of the carrying mechanism;

Fig. 5 is a fragmentary view in perspective showing the operation of the clearing mechanism;

Fig. 6 is a fragmentary view in perspective showing the upper end of one of the screws with the locating, carrying and clearing means;

Fig. 7 is a diagrammatic plan view to illustrate the various positions of the stem in dotted lines and in full lines when cleared to zero; and

Fig. 8 is an elevation of the same.

The numeral 1 represents the hollow frame or case of the machine, preferably in the general form of a triangle with an inclining front, as shown in Fig. 2. The front or face has a rectangular opening 2 in its center, and all of the operating parts are supported by the frame 3 secured in place within the case back of this opening by means of bolts 4, 4, of which four are shown in Fig. 1, one conveniently located at each corner of the opening 2.

The space inclosed by the opening 2 is subdivided by means of the vertically disposed parallel bars 5, 5, upon which the numerals from 1 to 9 are placed in reverse order, as shown in Fig. 1, and between which bars the guide-slots 6, 6, are provided to receive the stylus or other instrument by which the adding or subtracting is done.

A spiral screw 7 of the Archimedes type is located directly back of each guide-slot, as shown in Fig. 1, the ends thereof being rotatably supported in the upper and lower flanges 8, 8, of the frame 3, as shown in Fig. 2. Plates 9, 9, are provided with slots 9^a which straddle the stems of the screws and are provided with notches which receive and support the opposite ends of the vertically disposed parallel bars 5, 5.

Each screw has ten grooves, and these are numbered successively from zero to nine, and these numerals are visible through openings 10 at the top where the total is to be seen and read.

As a simple locating means to insure the screws stopping to invariably display a figure, and not at an intermediate point, the star-wheels 11 are provided, one being secured on the stem 12 of each screw, as shown in Fig. 4, each star-wheel having a notch for every groove of its screw 7, and a ball 13 is held in an opening 14 in the back of the frame 3, where a spring 15 pressing upon the ball holds it yieldingly in a notch between two teeth of the star-wheel opposite, there being a ball and spring, of course, for each star-wheel.

To carry from one screw or column to the next, a spur-wheel 16 is secured on the shank of each screw. These spur-wheels each have a single tooth in position to engage a tooth of a wheel 17 on the next adjacent screw-shank, whereby with each complete revolution of screw to the right, the one to the left is moved the distance of one numeral, and so on from one to another, as well understood. In other words, on completing a revolution of the screw to the right between the ninth and tenth spaces it causes the next to the left to turn one notch, or from one numeral to another, and that one in turn on completing a revolution imparts a one

notch movement to the next screw to the left, and so on from the units to the tens, and from the tens to the hundreds, from the hundreds to the thousands, the thousands to the ten-thousands, and so on.

The operation of addition is very simple. The stylus is placed in the slot to the right of the row of figures opposite the number to be added. If it be units, in the right-hand guide-slot; tens in the next to the left; hundreds in the third; and so on, and then moved down to the bottom. For instance, to exhibit the number "35," it would be done by inserting the stylus opposite the "3" in second column from right and pulling it to the bottom, and then in the right-hand guide slot opposite "5" pulling that to the bottom. Now "35" is indicated as the total at the top, and it is desired to add two more. The stylus would be inserted opposite the right-hand "2" and pulled to the bottom, and "7" would appear in place of "5," thus giving the total of "37."

As a formula of operation, as it were; if you add "1," you turn the spiral one-tenth of a revolution bringng "1" in the total. Now add "1" again, and you again turn the spiral one-tenth, adding "1" to the total "1," making "2." Now add "7" to this, and you turn the spiral seven-tenths of a revolution, which brings "7" plus "2" equals "9." Add "1" to the "9" and you again turn it one-tenth of a revolution, but in this position (from "9" to "0"), you turn the next column to the left one-tenth through the carrying mechanism, bringing "1" in the next column to the left, and "0" after the "9" in the front column. In subtracting "1" you reverse this operation, bringing the "1" to "0" again, and the "0" to "9."

And to subtract "37," for instance, it could be done by placing the stylus at the bottom of the second slot from the right, and moving it in a reverse direction, or upward, to "3," and then at the bottom of the right-hand guide-slot, moving it up to "7." This would leave zero, in other words subtract "37."

Ordinarily, this would not happen, as other mechanism is provided for clearing to zero, but that illustrates a subtraction of the entire amount. Any similar amount would be subtracted in the same way.

This, however, brings us to the clearing-mechanism. The stem 12 of each screw terminates at the upper end in a finger 18 bent at an angle to the axis of rotation, and which finger extends forward, s shown in Fig. 2 when in its normal position, or in other words when the numerals in the openings 10 are cleared to zero. Figs. 7 and 8 show the various positions one of these fingers takes, the full lines, it is repeated, indicating the position when cleared to zero.

This finger is operated and controlled by the clearing mechanism shown in Figs. 1, 2, 3, and 5. The shaft 19 is journaled in the ends of the case, it being provided with a crank 20 at the right hand end, which is held in place by the spring 21 engaging the pin 22 on the crank. This shaft 19 carries the curved arms 23, 23, and 24 on opposite sides thereof, which, on two complete revolutions of the shaft 19, return the entire set of fingers 18 to their normal position; and within the area indicated by the dotted parallel lines *a*, *a* in Figs. 3 and 7 they will engage and return the finger which they straddle to normal, and the number to zero. In other words, if the finger is in a position out of the path of the arm 23, it must be in the path of arm 24, so that if it escapes one, it is pushed aside by the other.

When the finger is out of its normal position, and in the path of the arm 23, it is first engaged by the edge 25 of the diagonal projection 26, which turns it aside, and upon leaving or disengaging it, the edge 28 extending from the recess 27 to the tip 29 of the arm 23 brushes it still further aside, and, on the end 29 clearing it, leaves it in its normal position, it taking a path somewhat as indicated by the dotted arrow 30, in Fig. 3.

The foregoing action would take place when the finger is in all positions from the line *b*, *b* to the right hand line *a*, *a*, in Fig. 3, which is six out of the ten positions, counting the normal as one, and the arm 24 following from the other side engages the finger when in any of the remaining four positions along its edge adjacent to the arm 23, finally leaving it at normal as corner 31 clears the finger, so that between the two inner or adjacent edges of the arms 23 and 24 the finger is returned to normal, all of which is accomplished by a single rotation of the shaft, as previously mentioned. If, however, the column on the right be engaged and cleared to zero by the arm 23 when the second column from the left is at 4, the act of clearing the first column to zero will through the carrying mechanism bring the second column to "5" which takes it out of the path of the arm 24 and puts it in the path of the next arm to the left which has already passed once. Therefore the handle must be turned another complete revolution to catch it and turn it to zero. The same is applicable to the other columns, therefore it will often take two complete revolutions of crank to clear to zero.

Each arm 23 and 24 moves between two fingers, the adjacent edges in their rotation straddling a given finger, and between them coöperating to return the finger to normal from any of the nine positions out of the normal in which they may have been left.

I claim:

1. The combination of right and left spiral rotatable members held against end-

wise movement, each having numbers arranged circumferentially thereon, a spiral for each number, and means for transferring in either direction.

2. The combination of rotatable spiral members held against endwise movement, each having numbers arranged circumferentially thereon and a spiral for each number, the spirals of adjacent members extending in opposite directions, and means for transferring in either direction.

3. An adding machine comprising a reversible rotatably supported member, the stem of which terminates in a finger which extends laterally of the axis of rotation, and a clearing mechanism comprising two arms which travel astride the finger, and which are constructed and adapted on their inner edges to insure the return of the finger to normal when both arms shall have passed the plane in which the finger is located.

4. A plurality of rotatable members, each carrying numerals, carrying mechanism for imparting motion from one of said members to the other, the axis of each of said rotatable members terminating in a laterally-extended finger, a rotatable member, the axis of which is at an angle to the axis of the rotatable members carrying the numerals, and carrying-arms in position to sweep the fingers back into their normal position with two complete rotations.

5. A re-setting device comprising a rotary shaft carrying arms extending radially from the axis of the rotating devices, in combination with rotatable members carrying numerals and having each a finger which projects out of the axis of rotation in position to be engaged and restored to normal by the sweep of the arms.

6. A re-setting device comprising a rotary shaft carrying two sets of arms extending radially from the axis of the rotating devices, in combination with rotatable members carrying numerals and having each means which projects out of the axis of rotation in position to be engaged and restored to normal by the sweep of the arms, the arms composing each set alternately arranged.

7. A re-setting device comprising a rotary shaft carrying two sets of arms extending radially from the axis of the rotating devices, in combination with rotatable members carrying numerals and having each means which projects out of the axis of rotation in position to be engaged and restored to normal by the sweep of the arms, the arms composing each set alternately arranged, all of the arms having oppositely-located recesses in their edges.

8. A re-setting device comprising a rotary shaft carrying two sets of arms extending radially from the axis of the rotating devices, in combination with rotatable members carrying numerals and having each means which projects out of the axis of rotation in position to be engaged and restored to normal by the sweep of the arms, the arms composing each set alternately arranged, all of the arms having oppositely-located recesses in their edges, one of the sets of arms having diagonal projections on each side thereof.

9. A re-setting device comprising a rotary shaft carrying two sets of arms located approximately on opposite sides of the shaft, the ends of the two sets of arms bent from the main portion thereof in opposite directions and having notched edges, in combination with rotatable members carrying numerals and each having means projecting laterally out of the axis of rotation in position to be engaged and restored to normal by the sweep of the arms.

10. A re-setting device comprising a rotary shaft carrying two sets of arms located approximately on opposite sides of the shaft, the ends of the two sets of arms bent from the main portion thereof in opposite directions and having notched edges, and one set of arms having diagonal projections, in combination with rotatable members carrying numerals, and each having means projecting laterally out of the axis of rotation in position to be engaged and restored to normal by the sweep of the arms.

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

JOHN ALBERT CHEAPE.

Witnesses:
J. K. MOORE,
VERNON E. HODGES.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."