J. A. CHEAPE.

ADDING DEVICE.

APPLICATION FILED MAR. 12, 1908.

924,320.

Patented June 8, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

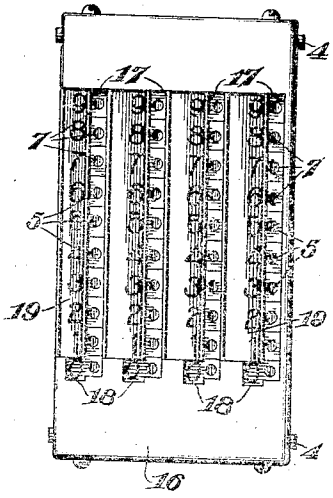


Fig. 6.

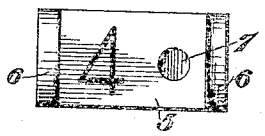


Fig. 7.

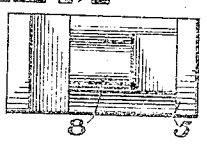


Fig. 8.

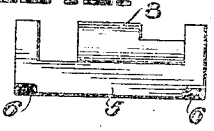


Fig. 2.

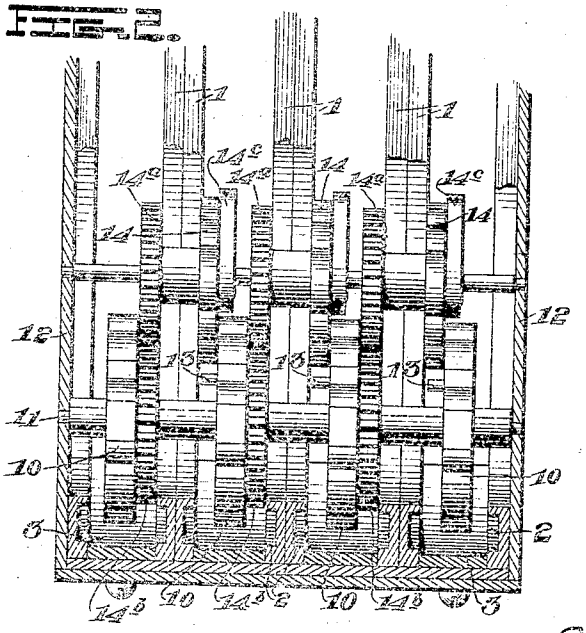
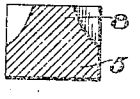


Fig. 9.

Fig. 10.



Witnesses
Lloyd W. Patch
J. P. Campbell

Inventor
John Albert Cheape
By Orson Eddy & Co
His Attorney

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2 SHEETS—SHEET 2.

FIG. 3.

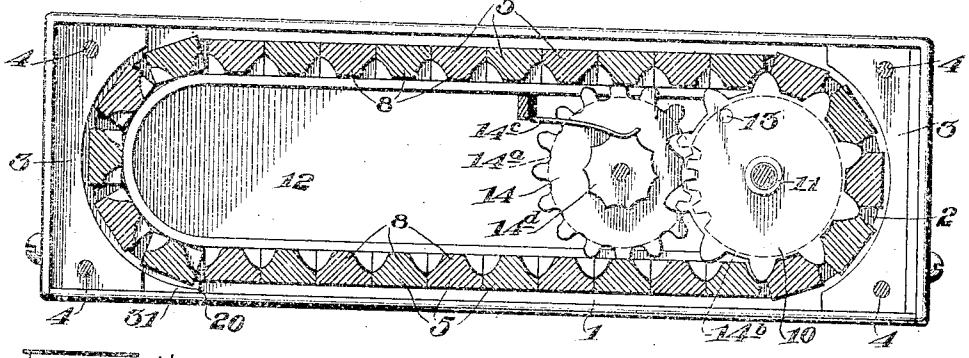


FIG. 4.

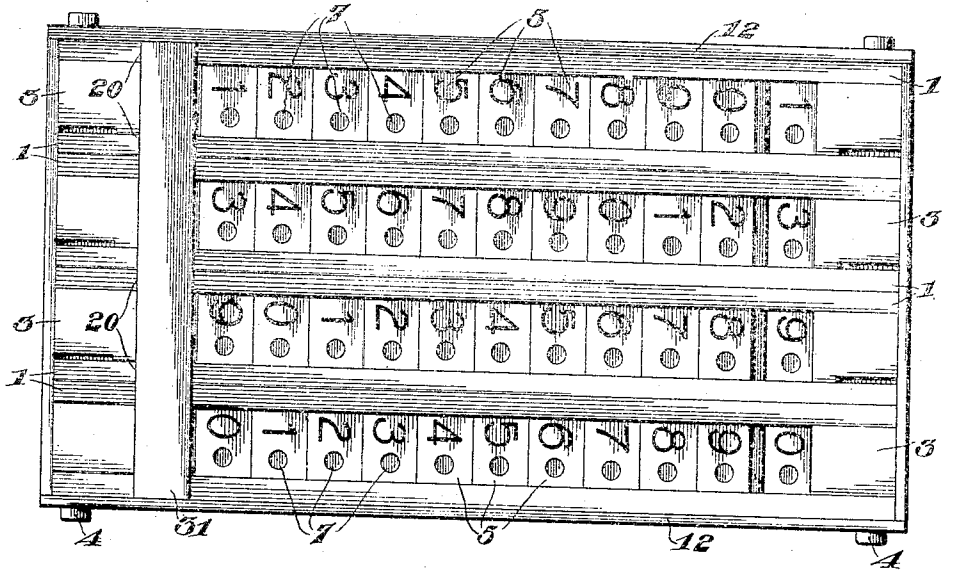
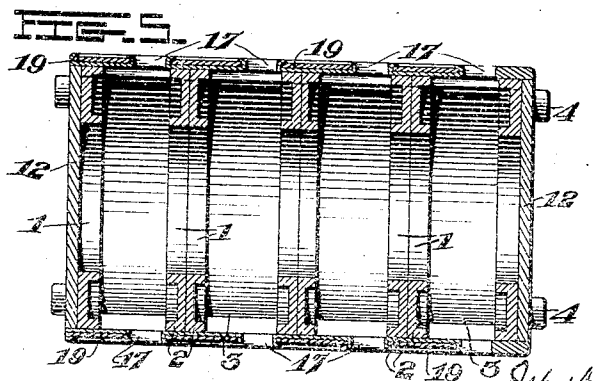


FIG. 5.



Witnesses

Lloyd W. Patch

J. P. Campbell

Inventor

John Albert Cheape

By Dewey & Co

His Attorney

UNITED STATES PATENT OFFICE.

JOHN ALBERT CHEAPE, OF CHARLOTTESVILLE, VIRGINIA, ASSIGNOR TO SIMPLEX ADDER COMPANY, OF CHARLOTTESVILLE, VIRGINIA.

ADDING DEVICE.

No. 924,320. Specification of Letters Patent. Patented June 8, 1909.

Application filed March 12, 1908. Serial No. 420,570.

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 Devices, of which the following is a specification.

My invention relates to an improvement in adding devices, and the object is to provide a simple device for adding, which shall be composed of few parts not liable to get out of order and of such a nature that they may be manufactured at a small initial cost and easily assembled in the complete machine, the various parts being of such a nature that the wear upon them is slight and consequently the machine is rendered both efficient and durable.

Another object is to provide a device of this character in which the calculating mechanism may be easily and quickly reversed for correcting a mistake, that is to say any number carried forward by mistake may be returned without resulting in miscalculation or any disorder to the operating mechanism.

Still another object is to provide an adding machine which is readable from either side by simply reversing the device endwise.

With the foregoing and other objects in view, my invention comprises two or more flexible number carrying racks and internal gears combined, composed of independent members each of which carry a number, in connection with endless guide ways in which the ends of said members slide or travel whereby the same face of said members are always presented outward.

My invention also consists in means for readily assembling or removing these independent members in putting the machine together or taking it apart, and it further consists in driving and transmission gears for imparting periodical motion from one of these flexible racks and internal gears to another.

My invention still further consists in certain novel features of construction and combinations of parts which will be hereinafter described and pointed out in the claims.

In the accompanying drawings:—Figure 1 is a plan view of the device. Fig. 2 is a view with parts broken away. Fig. 3 is a longitudinal sectional view. Fig. 4 is a bottom view with the plate removed. Fig. 5 is a transverse section. Figs. 6, 7, 8, 9, and 10 are details of the members.

The frames 1, 1, are arranged in pairs with endless or O-shaped guide-ways 2, 2, formed in their inner faces, whereby two of these grooves face each other, these frames being held apart by spacing blocks 3, 3, and the several frames and spacing blocks being conveniently connected together by bolts or similar means 4, 4, extending through the ends of the device.

The adding mechanism is in the form of flexible racks and internal gears, of which there may be two, four, or in fact any number, each composed of a plurality of independent number-carrying members 5, 5. These independent members are all alike excepting the numbering which is from zero to nine in consecutive arrangement. The ends of each member are provided with rounded bearings 6 on their outer surfaces adapted to approximately fit the curvature of the ends of the guide-ways. An orifice 7 opposite the number is adapted to receive a stylus or other pointed instrument for shifting the members. Each member is provided with a central, inwardly projecting approximately V-shaped tooth 8 whereby to drive or be driven. In the construction illustrated there are just thirty of these independent members to each column or guide-way, in other words, ten on each side and five at each end of the guide-way, so that when one of the members containing the number desired to be added is carried forward, all the rest of the members in the row are correspondingly actuated, each one pushing the next one forward.

As a convenient means for inserting the number-carrying members 5, 5, in the guide ways, the notches 20, 20, are provided, these being cut through the outer flanges of the guide-ways, and after the entire complement of number-carrying members are inserted in the ways, that is to say, three complete sets from zero to nine in the guide-way, making thirty in all, a filling block 31 is inserted in the notches to prevent the members 5, 5, from displacement.

As a means for transmitting motion from the units column to the tens and from the tens to the hundreds and from the hundreds to the thousands and so on, suitable transmission gearing is provided. This consists

in a sprocket wheel 10 for each row or set of members. In the device illustrated, these each have ten teeth, and they are loosely mounted on a supporting shaft 11, common to them all, the ends of the shaft being supported in the plates 12, 12, forming the opposite sides of the adding device. These sprocket wheels are either driven or drive wheels accordingly as they are actuated by the row of members, or a row of members is actuated by one of them. Now this transmission of motion is brought about in the following way. Each sprocket wheel is provided with a pin 13 extending to the left parallel with the axis and the location of this pin is such that just as the zero in any column is brought down to the slot 18 this pin moves the next sprocket wheel to the left the distance of one tooth and member. A star wheel 14 is loosely mounted on the shaft 15 and on one side of this star wheel there is a smaller gear wheel 14^a, and one of these combined star-wheels and gear is located between each two sprocket wheels, so that the teeth of the star wheel are in the path of the pin 13 whereby once during each revolution of the sprocket wheel the star wheel is moved the distance of one tooth. The gear wheel 14^a is meshed with a pinion 14^b on one face of the next sprocket wheel 10 to the left so that when the pin 13 on the units sprocket wheel engages between two teeth of the star wheel 14, the next sprocket wheel 10 will be moved the distance of one tooth. This transmission of motion occurs only with each complete revolution of the immediate sprocket wheel to the right. Thus with each complete revolution of one of the sprocket wheels to the right, the next one to the left is turned the distance of one tooth, and with a complete revolution of that wheel the next sprocket wheel to the left is turned one tooth and so on. On the other hand, it may be mentioned in this connection that the construction is such that while each sprocket wheel will transmit motion to all the sprocket wheels to the left, the mechanism is so constructed that none of the sprocket wheels will transmit motion to any of the other sprocket wheels to the right.

As a simple means for retaining the transmission mechanism in the position to which it is turned by the pins on the sprocket wheels, a spring 14^c bears yieldingly upon a cam wheel 14^d on one side of each star wheel and each cam wheel is provided with as many cam teeth as there are teeth on the sprocket wheel.

In the arrangement illustrated of the relative position of the members composing the flexible racks and internal gears of the sprocket wheels, the teeth 8, 8, projecting inwardly from the centers of the members 5, 5, are adapted to be received between every two teeth on the sprocket wheels and owing to the fact that these teeth are brought closer together on the curve than when they are received by the sprocket wheel just as they are leaving the straight part of the guide-way and owing to the fact that they approximately fit the teeth of the sprocket wheel on the curve, ample clearance is left when they are spread apart on the straight part of the guide-way to allow the receiving tooth of the sprocket wheel to engage and as it were to pick up the next tooth of the flexible rack even though the next tooth by reason of its being the last should be some distance back owing to faulty construction or wear of the members.

The face plate 16 of the device is provided with elongated slots 17, 17, corresponding to each space between guide-ways, and in position to expose the orifices in the members 5, 5, and at the lower end of each slot there is either an enlargement or an exposure slot 18 at one side of the main slot and in line with the column of figures 19, through which the numbers on the members 5, 5, are exposed.

In operating the adder, at the start all the zeros are brought down until they appear through the slots 17, 17. This may be done by first operating the units, then the tens, and then the hundreds column as each set of numbers may be operated independently and to the right, as previously explained. This will bring corresponding numbers directly beneath each other on the face plate. Suppose it is now desired to add four and five, the operator inserts some pointed instrument in the orifice, opposite the figure four in the units column, and carries this member down as far as it will go. Figure four then appears in the right hand slot 18. Now to add five to the four, the operator inserts his pointed instrument in the orifice opposite five and repeats the operation. The numeral nine will then appear in the right hand slot 18. Suppose to this nine he desires to add four; he inserts the instrument in the orifice opposite four and pulls the member down and just as the zero appears through the slot 18 the transmission gear is operated to move the second column to bring the numeral one in the second slot 18. The operator by pulling the member down as far as it will go, thus brings the number which was beneath four in the slot 17 to the right, the result of adding four to nine will appear in the two slots as thirteen. By turning the device over endwise, it could be operated in the same way from the other side, thus making it very convenient if desired to calculate from either one end or the other. In this way, I have provided a very simple mechanism of comparatively few parts which at the same time are effectual in performing their functions. As has been previously mentioned, the number-carrying

members may be reversed at any time and at any point in order to correct a mistake, or what not. In short they may be moved in either direction without damage to the device.

It is evident that more or less slight changes might be resorted to in the form and arrangement of the several parts described, without departing from the spirit and scope of my invention, and hence I do not wish to limit myself to the exact construction herein set forth, but:—

Having fully described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. An adding machine having endless guide-ways or races therein, and a continuous row of independent members filling said guide-ways or races.

2. An adding machine having endless guide-ways or races therein, and a continuous row of independent number-carrying members filling said guide-ways or races.

3. An adding machine having endless guide-ways or races therein, and a continuous row of independent members filling said guide-ways or races, said members having means thereon for moving them.

4. An adding machine having endless guide-ways or races therein, and a continuous row of independent number-carrying members filling said guide-ways or races, said continuous row of number-carrying members being movable in either direction.

5. An adding device having an endless guide-way or race, number-carrying members filling said guide-way or race, each and every member capable of being slid in either direction to continuously move the remaining members filling the guide-way or race, whereby the movement of one member causes a corresponding movement of all the rest of the members contained in said guide-way or race.

6. An adding device having an endless guide-way or race, a continuous row of number-carrying members filling said guide-way or race, a face plate over the members so constructed that the whole row of members may be moved the distance of nine members in either direction by sliding in one of the members.

7. An adding device having a plurality of endless guide-ways or races, a continuous row of independent number-carrying members filling said guide-ways, said members having a digit on one end and an orifice on the other, and a face plate having slots which expose one digit and ten orifices, the portions of the face plate between slots having digits inversely arranged.

8. An adding machine having a plurality of continuous guide-ways or races, of number-carrying members filling said guide-ways or races in continuous rows, said number-carrying members in the form of an internal gear on their inner surfaces, and transmission gearing, the teeth of which register with said members for transmitting motion from one row of number-carrying members to the other.

9. An adding device comprising a frame having endless guide-ways and a continuous series of number-carrying members guided by said guide-ways, their construction being such that they are prevented from revolving during transit of the guide-ways, said members capable of being moved in either direction.

10. An adding device comprising a frame having O-shaped guide-ways, and a continuous series of number-carrying members, the ends of which are fitted to said guide-ways and constructed and adapted to traverse the same without rotating with respect to the guide-ways, said members having openings formed therein whereby they are capable of being moved.

11. An adding device comprising a frame having endless guide-ways, a series of independent number-carrying members received in said guide-ways, slotted face plates on opposite sides of the device in which the members travel, and means for operating the members whereby the total of the different amounts will be recorded by the members at one end of the face plates.

12. An adding device comprising frames having endless guide-ways, said guide-ways being notched at suitable points and number-carrying members adapted to be inserted into or moved through said notches or from the guide-ways, whereby the device may be assembled or disassembled, and a filling piece conforming to the shape of the guide-ways for closing said notches.

13. In an adding machine, the combination with frames having guide-ways, and independent number-carrying members fitted to said guide-ways, of a reversible sprocket wheel adapted to be driven by or drive said members, said members each having an approximately V-shaped tooth centrally located on its inner face in position to enter between the teeth on the sprocket wheel.

14. In an adding machine, the combination with frames having O-shaped guide-ways, and a reversible sprocket wheel journaled concentric with one end of said guide-way, of a continuous row of independent number-carrying members adapted to fit and be guided by the guide-way, and each provided with an approximately V-shaped tooth on its inner face of such construction that two of them approximately embrace the sprocket teeth on opposite sides while rounding a curve in the guide-way with which the sprocket wheel is concentric and whereby these approximately V-shaped teeth leave sufficient space when on the straight portions

of the guide-way to afford clearance for the tooth of the sprocket wheel entering between two of the members, thus preventing the teeth from hitting or jamming upon end.

15. In an adding machine, the combination with frames having O-shaped guide-ways in the form of grooves, of number-carrying members having flattened bearings at their ends with rounded outer surfaces approximately fitting said grooves whereby to travel through the latter without turning axially therein.

16. In an adding machine, the combination with frames having guide-ways, a suitable casing, shafts therein, and several endless series of independent number-carrying members fitted to and guided in said guide-ways, of a sprocket wheel for each series of members, teeth on the members adapted to be engaged by the sprocket wheels, and means for transmitting motion periodically from one of said sprocket wheels to the other.

17. In an adding machine, the combination with frames having guide-ways, and number-carrying members guided by said guide-ways, of driving and driven sprocket wheels, teeth on the members adapted to be engaged by the sprocket wheels, and transmitting mechanism from one wheel to the other, whereby one series of members is a driver while the other is driven, any one of said series capable of being reversed at any time.

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

JOHN ALBERT CHEAPE.

Witnesses:

G. CASSARD TRAPER, Jr.,

J. MERCER GARNETT, Jr.