(No Model.) 4 Sheets—Sheet 1.

LA VERNE W. NOYES & A. STARK.

ADDING MACHINE.

No. 308,570. Patented Nov. 25, 1884.

Fig 1.

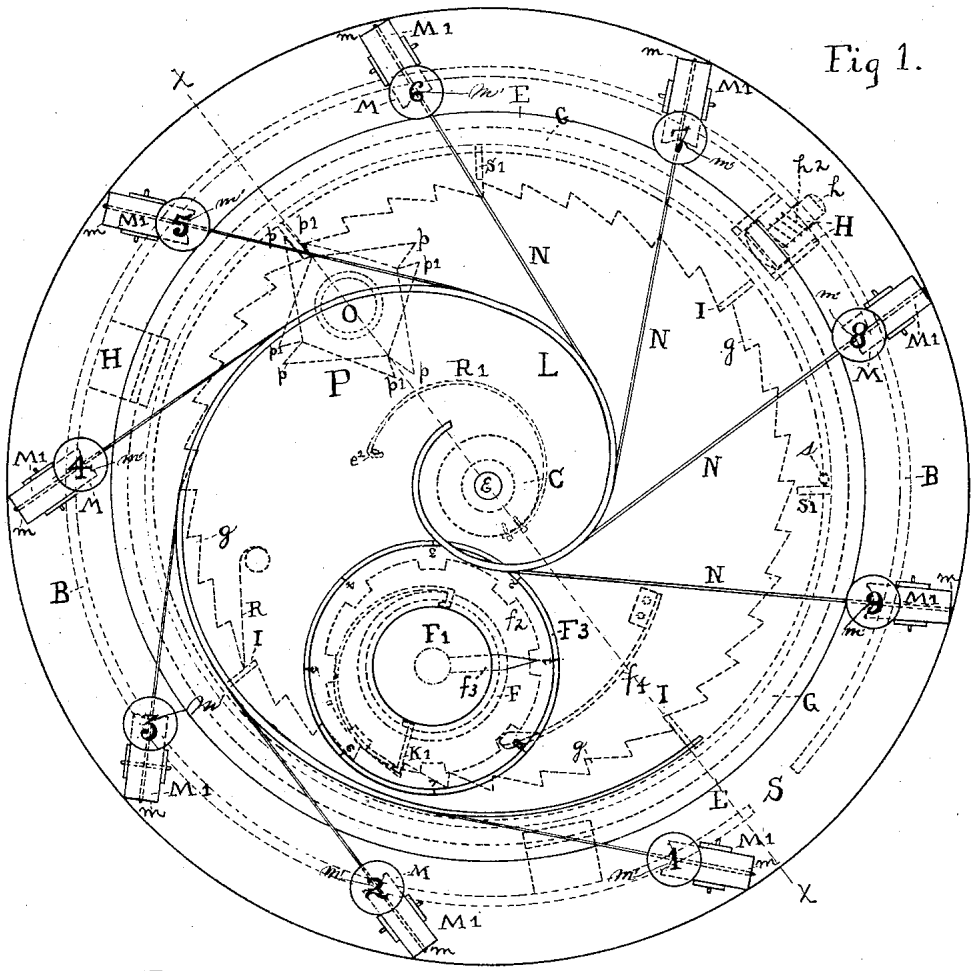
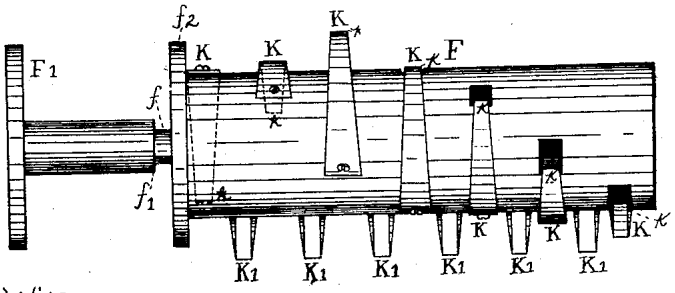
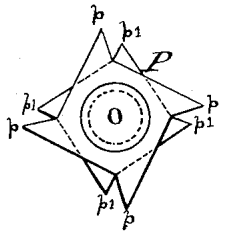


Fig 10.



Witnesses
E. L. Burton
H. Kehrig

Fig 11.



Inventors
A. Stark
L. W. Noyes
By Burton & Parker
Attorneys

(No Model.) 4 Sheets—Sheet 2.

LA VERNE W. NOYES & A. STARK.

ADDING MACHINE.

No. 308,570. Patented Nov. 25, 1884.

Fig. 2.

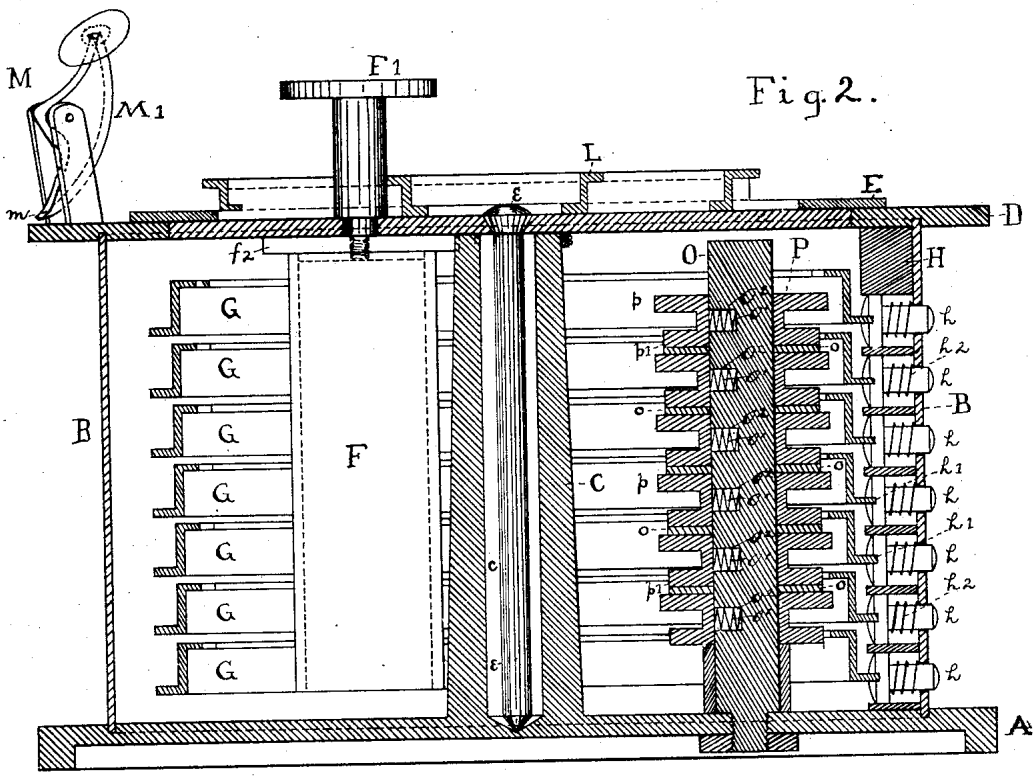


Fig. 4.

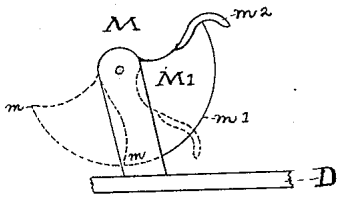
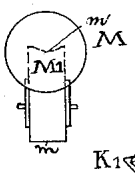


Fig. 3.



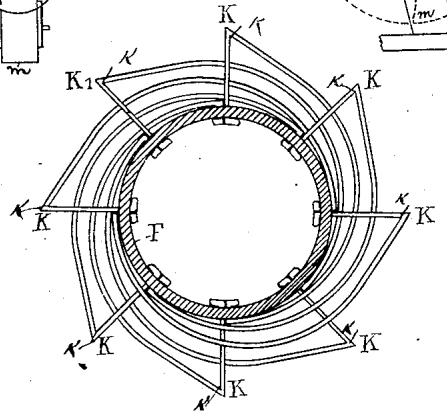


Fig. 9.

Witnesses
E. F. Burton
H. Kehrer

Inventors
A. Stark
L. W. Noyes
By Burton & Parker
Attorneys

(No Model.) 4 Sheets—Sheet 3.

LA VERNE W. NOYES & A. STARK.

ADDING MACHINE.

No. 308,570. Patented Nov. 25, 1884.

Fig. 7.

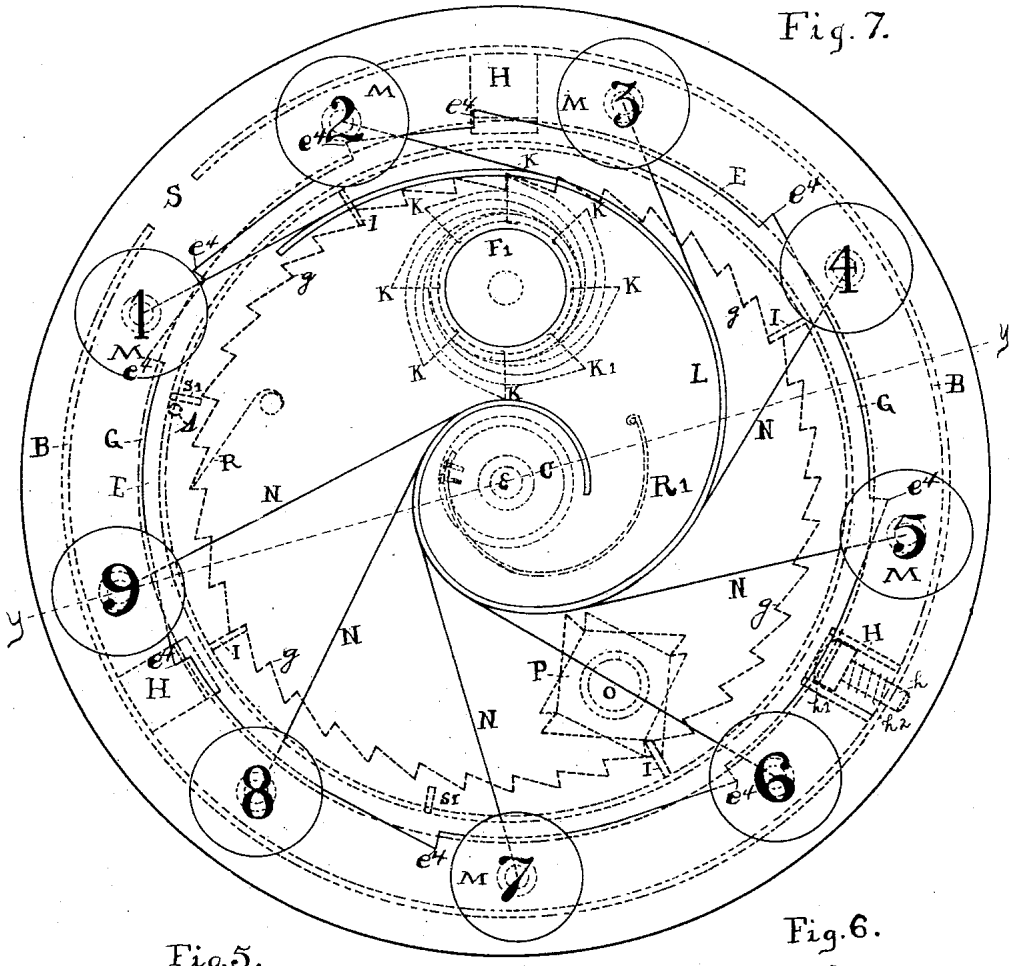
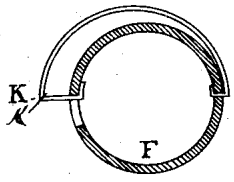


Fig. 5.



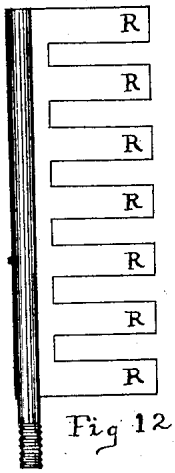
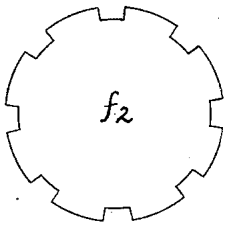


Fig 12.

Fig. 6.



Witnesses
E. F. Burton,
H. Kehrel

Inventors
Andrew Stark
L. W. Noyes
By Burton & Parker.
Attorneys

(No Model.) 4 Sheets—Sheet 4.

LA VERNE W. NOYES & A. STARK.

ADDING MACHINE.

No. 308,570. Patented Nov. 25, 1884.

Fig 13.

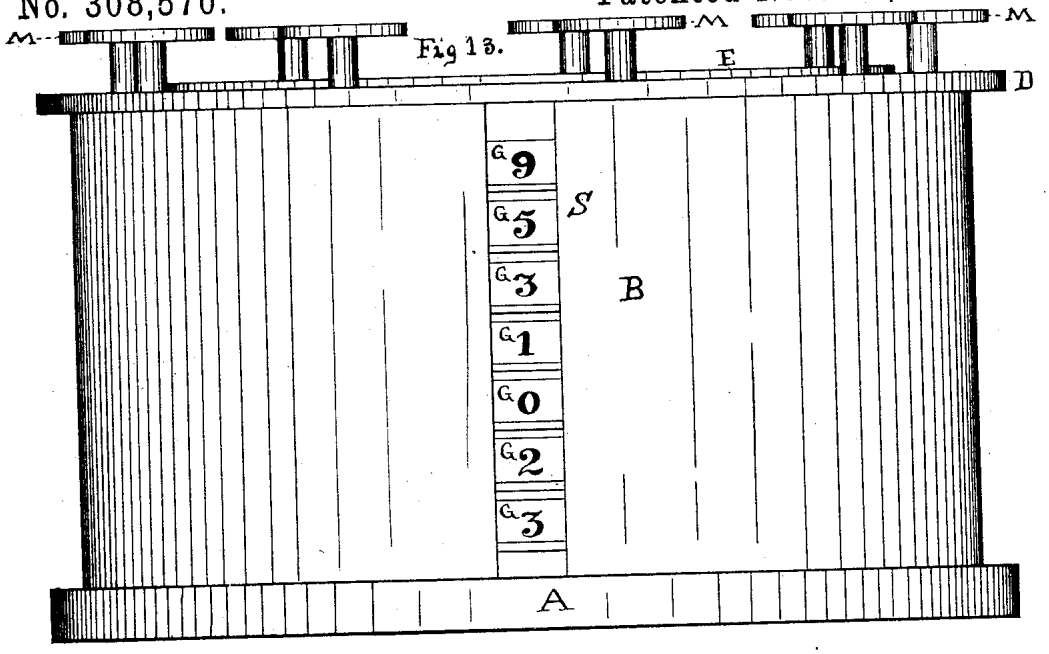
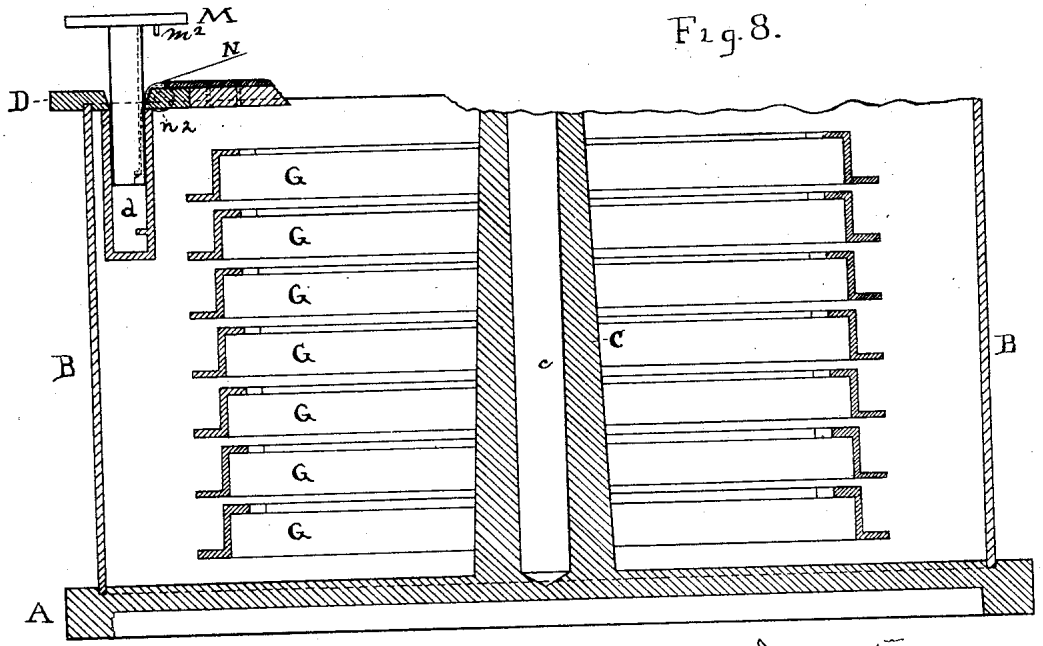


Fig. 8.



Witnesses
E. F. Burton
A. Kehrer,

Inventors
A. Stark
L. W. Noyes
By Burton and Parker
Attorneys

UNITED STATES PATENT OFFICE.

LA VERNE W. NOYES AND ANDREW STARK, OF CHICAGO, ILLINOIS; SAID STARK ASSIGNOR TO SAID NOYES.

ADDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 308,570, dated November 25, 1884.

Application filed October 9, 1883. (No model.)

To all whom it may concern:

Be it known that we, LA VERNE W. NOYES and ANDREW STARK, citizens of the United States, and residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Adding-Machines, of which the following is a full and accurate specification.

This invention is a machine for adding numbers and producing visible registration of their sum.

Our purpose is to provide a machine for adding having a finger-key for each digit, and such keys connected with mechanism so arranged that the length of stroke of all the keys will be the same, although registering different numbers. Another purpose is to provide an automatic carrying device which shall be completely operative without the assistance of any spring movement or connection.

Our invention consists, further, in special devices and details of construction, which are fully pointed out in the claims.

Figure 1 is a plan of our machine, interior parts being shown in dotted outline. Fig. 2 is a vertical section along line X X in Fig. 1. Figs. 3 and 4 are detail views of the finger-keys. Fig. 5 is a detail view of the spring-pawl. Fig. 6 shows in detail a notched disk attached to the pawl-cylinder for the purpose of setting from column to column. Fig. 7 is a plan, and Fig. 8 is a broken vertical section through the line Y Y, of a form of my machine employing a modified form of finger-key mechanism for communicating its motion. Fig. 9 is an enlarged plan of the pawl-cylinder and its pawls. Fig. 10 is a perspective of the pawl-cylinder and pawls detached from the machine and lying on its side. Fig. 11 is a detail plan of one of the double spur-wheels which constitute the carrying device. Fig. 12 is an elevation of the detent-pawls in connection with their common stem. Fig. 13 is an elevation of my machine, the form being that having the finger-keys, as shown in Figs. 7 and 8, the cords and helix being omitted for perspicuity, the purpose of the figure being to show the slot in the case through which the numeration can be read.

A is the base of the machine.

B is the vertical inclosing-case.

C is the central bearing-post, rooted rigidly in the base A.

D is the top binding-rim, which also sustains the finger-keys.

E is the top plate. It has the axis *e*, which extends into the socket *c* in the post C, and thereby is adapted to be accurately revolved about that center.

To the plate E is secured the pawl-cylinder F by the thumb-screw F′, having the neck *f*, which is passed through a hole in the plate E and screwed into the cap f^2 of the pawl-cylinder, so that the shoulder f' of the thumb-screw forms a bearing above the plate, while the cap f^2 performs a similar service below the plate, so that the pawl-cylinder has a close bearing in the plate, and has a motion about its own axis in such bearing.

G are the number wheels or rings. They are provided with interior ratchet-teeth, *g*, ten or some multiple of ten in number on each ring. They have their bearings in grooves in the case B, or in three or more vertical ribs, H, on said case. In one of such ribs we provide small plungers *h*, having the slots *h*′ across their interior heads, in which slots the rings G have their bearing. The plungers *h*, being forced inward by coil-springs h^2, tend to keep the rings accurately centered without binding, permitting ease without uncertainty of action. Under the point of every tenth tooth we provide a supplemental tooth, I, which, on account of its function, we denominate the "carrying" or "decimal" tooth.

To the pawl-cylinder F are secured spring-pawls K, so arranged that their points *k* stand in a spiral line around the cylinder F, each pawl being horizontally opposite to and adapted, so far as its vertical position is concerned, to engage the ratchet-teeth of one of the number-wheels. The cylinder is further provided with another series of spring-pawls, K′, alternating in vertical position with the first series, and arranged with their points all in a vertical line between the ends of the spiral series K.

Upon the upper surface of the top plate, E, is secured the helical sheave-rib L.

Around the circumference of the machine, and pivoted to supports rooted in the binding-flange D, are nine finger-keys, M, numbered

by the nine numeral digits. By reference to Figs. 3 and 4 their form will be understood as being each a sector, M′, pivoted at its center, swinging in a vertical plane, and having a grooved periphery, m', for a purpose hereinafter explained.

O is a post rooted in the base A, and serving as the axle for spur-wheels P, which have a horizontal rotation on it and perform the function of carrying, as hereinafter explained. These spur-wheels have two series of teeth, p and p', respectively, as shown, four in each series, one series below the other, so that while one series is adapted to be engaged by the carrying-teeth I of one number-wheel the other series is on a level with and adapted to engage with ratchet-teeth g of the next number-wheel; and the carrying-wheel P, rotated by the first number-wheel, by the engagement of the carrying-tooth I with a tooth of the first series, p, itself, by the engagement of a tooth of the second series, p', with a ratchet-tooth of the next number-wheel, rotates that next number-wheel the distance of one ratchet-tooth.

Between the consecutive carrying-wheels on the stem O are interposed washers o, which will not turn with the wheels, and so will prevent the motion of one being communicated to the next.

To prevent the accidental rotation of the carrying-wheels, I provide small friction-springs o', set in transverse sockets o^2 in the post O, and acting so as to increase the friction of the wheel on the post.

At the angle m of each of the finger-keys M is fastened a chain or thread, N, having its outer end connected to some point of the helical sheave L. I provide, also, a spring, R′, having one end fastened to the plate E, as shown at E^2, and the other end to the post C, as shown, or to any rigid part of the case, so that the rotation of the plate E will flex or coil the spring and act to return the plate to the original position. The depression of the keys M winds the chain N into the groove m' of the sector M′, and withdraws it from the helix L, and in so doing rotates the helix and the plate E, to which it is affixed, an amount dependent upon the radius of the helix at the point at which the chain being operated is tangent to it. The helix is of such form and the keys in such position that these amounts vary as the numerals from 1 to 9. The rotation of the plate E, carrying the pawl-cylinder F, causes it to rotate the number-wheels with which it is set to engage an equal distance—that is, a distance corresponding to the key struck.

The finger-keys are provided with a projecting point, m^2, and the plate E has stop-teeth e^1 so distributed on its periphery that distant from each key as many numeral spaces as the key represents is a stop-tooth, so that when any key is depressed to its full depth its stop-point m^2 will collide with the proper stop-tooth on the plate E and arrest the motion of the plate, so preventing it from being carried too far by the momentum derived from the stroke given the key, thereby insuring accurate registration. At every tenth tooth a carrying-tooth, I, being encountered, rotates the carrying-wheel P one point, and, as above explained, causes it to advance the next number-wheel one point, so effecting the carrying.

To prevent accidental retrogression of any number-ring, I provide the detent spring-pawls R, one for each ring, which act in the usual manner of detent-pawls, engaging behind the teeth g of the number-rings.

On the periphery of the number-rings G are imprinted figures, (not shown in drawings,) one opposite each ratchet-tooth, in series from 0 to 9, inclusive, and at any convenient point a rift, S, is provided in the case B, through which the registration may be read.

In operating this machine, starting with all the number-wheels so set that the zeros are visible through the rift S, the pawl-cylinder being so set that the top pawl will be in engagement with the ratchet-wheel opposite it—which is the units-wheel—and keys corresponding to the numbers to be added in the units-column being successively struck and depressed, the process of registering the sum and carrying will proceed to any extent, the carrying being automatically effected to succeeding columns, however many figures the sum of the column being added may contain. When the units-column has been added, the pawl-cylinder should be rotated one notch, thereby bringing the pawl which is horizontally opposite the second or tens number-wheel into engagement with that wheel. Proceeding as before with the figures on this column, the addition and proper carrying will be automatically effected, the units-column remaining undisturbed, and in like manner with each successive column until the entire sum is ascertained.

To reset the machine at zero, rotate the pawl-cylinder until the line of pawls K′ is at the front. These pawls, alternating with the pawls of the spiral series K, are in such vertical position as to engage with the carrying-teeth of the number-wheels. Now, using the thumb-screw as a handle, the plate E being rotated a full quarter-turn, the distance of ten ratchet-teeth, the pawls K′ will bring the carrying-teeth of the entire series of number-wheels into line, and so will bring all the zeros into line. We provide a pin, s, on the plate E and the two stops s' on the rim, so as to limit the rotation of the plate E to the proper distance to cover ten ratchet-teeth, and to end the motion at such point as will leave the zero-line at the rift S, thus leaving the register at zero, as at starting.

In the form shown in Figs. 7 and 8 the finger-keys are made as plungers, playing in sockets d in the rim D of the case. The chain or cord N is attached to the plungers, and runs over a small pulley, n^2, at the edge of the socket d. The action of this form will be understood without further explanation.

For convenience of ascertaining the position of the pawl-cylinder F—that is, what wheel it is in engagement with—and of setting it to engage any wheel desired corresponding to the column to be added, or to engage with all at once and return them to zero, I provide the thumb-screw F′ with an index-finger, f^3, and around the thumb-screw upon the plate E a graduated dial, F^3, having one more space than the number of number wheels or rings, and number such spaces 0, 1, 2, &c., up to the number of wheels. I also provide, preferably below the plate E, as shown, the notched disk f^2 and the detent spring-pawl f^4, to engage in such notches, whose number and position correspond to the spaces on the dial F^3. When placed below the plate E, this disk may take the place of the cap f^2. The zero-point on the dial is such that when the index-finger is placed over it the pawls K′ are at the front and engaging with the carrying-teeth, and upon the rotation of the plate E, as described, they will bring the register to zero throughout; and when the index is set at "1" on the dial the pawl-cylinder is engaging with the units-wheel, when at "2" with the tens-wheel, and so on.

We claim—

1. In an adding-machine, in combination with the registering mechanism and its actuating mechanism and with the finger-keys, a helical sheave connected to the actuating mechanism, and a series of cords wound thereon and departing therefrom at different tangents to the finger-keys, substantially as and for the purpose set forth.

2. In an adding-machine, in combination with the adding-wheels, a helical sheave and actuating mechanism connected thereto and moving therewith about the center thereof, cords wound upon such sheave, and finger-keys attached to such cords, having all an equal range of motion, substantially as set forth.

3. In an adding-machine, in combination, a series of number-wheels adapted to revolve about a common axial line, a circular series of ratchet-teeth on each of such wheels, a pawl mechanism adapted to be engaged with any one of such ratchet number-wheels at will, a helical sheave having its center and axis in the axial line of such wheels, and connected to and carrying with it the pawl, a series of cords wound on such sheave and departing from it along different tangents, and a series of finger-keys attached one to each of such cords, and adapted to draw upon them, and all having the same range of motion, substantially as set forth.

4. In an adding-machine, in combination, a series of number-wheels adapted to revolve about a common axial line, a circular series of ratchet-teeth on each of such wheels, a spiral series of pawls fixed on a common axis parallel to the axis of the number-wheels, and means for effecting at will the adjustment of the pawl series about its axis, substantially as set forth.

5. In an adding-machine, the combination of the ratchet-wheels G, having the auxiliary decimal teeth I, the pawl-cylinder F, having the spiral series of pawls K and the rectilinear series K′ thereon, means for effecting at will circular adjustment of the cylinder F upon its axis, and means for giving it an orbital motion about the axis of the ratchet-wheels, substantially as and for the purpose set forth.

6. In an adding-machine, and in combination with its actuating mechanism, the case B, having the cross-slotted ribs H, the number-wheels G, adapted to have their bearings in such slots, and the spring-actuated plungers L, serving as brakes on said wheels, substantially as set forth.

7. In an adding-machine, in combination, the ratchet-wheels, the actuating pawl-cylinder F, with the pawls K and K′, and the detent-pawls R, substantially as set forth.

LA VERNE W. NOYES.
ANDREW STARK.

Attest:
CHAS. S. BURTON,
FRANC W. PARKER.