(No Model.) 2 Sheets—Sheet 1.

# F. A. BONE.

## ADDING MACHINE.

No. 351,487. Patented Oct. 26, 1886.

Fig. 1.

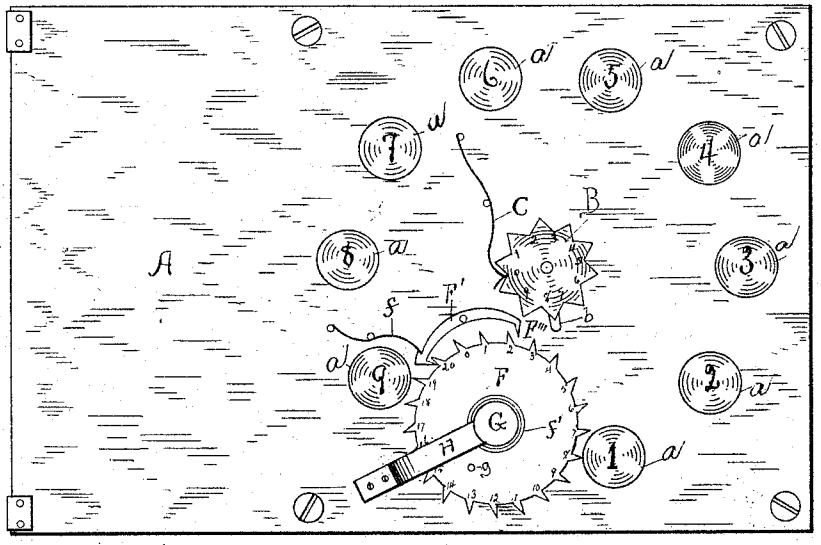



Fig. 2.

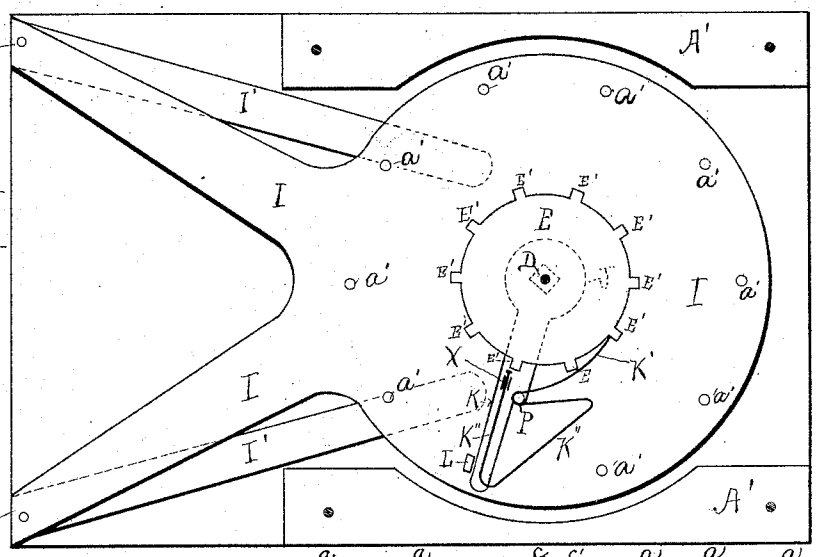
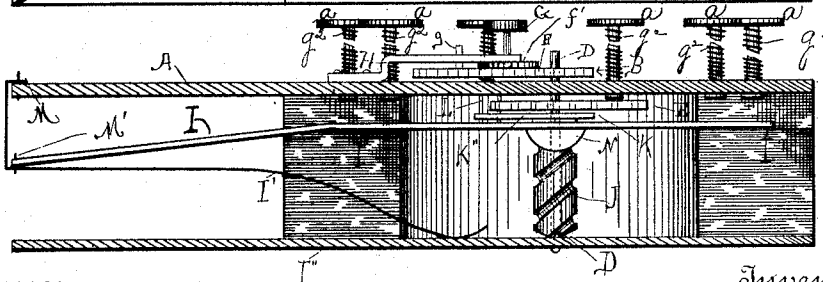



Fig. 3.




Witnesses

C. F. Dorner

C. E. Allen

Inventor

Frank A. Bone

By his Attorney

J. M. Kalb

N. PETERS. Photo-Lithographer, Washington, D. C.

(No Model.) 2 Sheets—Sheet 2.

# F. A. BONE.

## ADDING MACHINE.

No. 351,487. Patented Oct. 26, 1886.

Fig. 4.

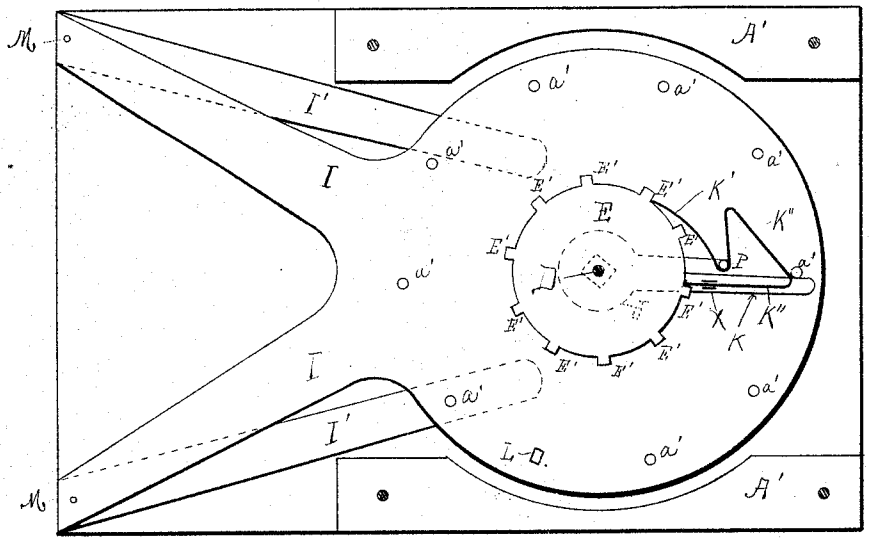
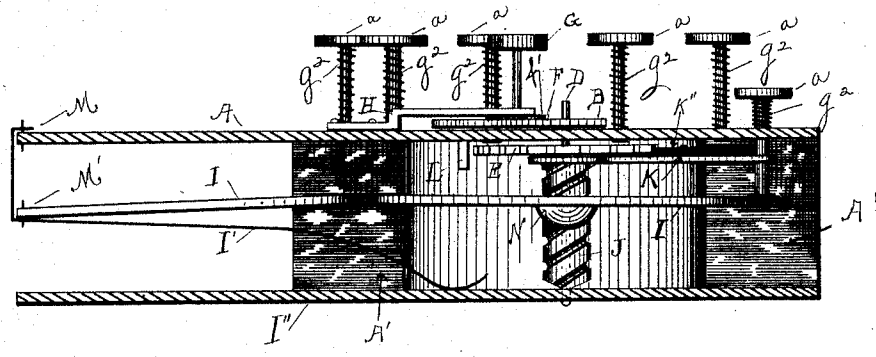



Fig. 5.




Witnesses
L. S. Somes
C. E. Allen

Inventor
Frank A. Bone
By his Attorney
F. M. Kalb

N. PETERS, Photo-Lithographer, Washington, D. C.

# UNITED STATES PATENT OFFICE.

FRANK A. BONE, OF LEBANON, OHIO.

## ADDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 351,487, dated October 26, 1886.

Application filed December 14, 1885. Serial No. 185,656. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK A. BONE, of Lebanon, in the county of Warren and State of Ohio, have invented a new and Improved Adding-Machine, of which the following is a full, clear, and exact description.

The object of my invention is to provide a new and improved machine for adding numbers by means of the manipulation of nine keys representing the nine digits, 1, 2, 3, 4, 5, 6, 7, 8, and 9, which machine is simple, gives reliable results, and can be operated very easily and rapidly and with little mental effort to the operator.

Reference is had to the accompanying drawings, forming a part of this specification, and which illustrate what I consider the best means for carrying my invention into practice.

Figure 1 is a plan view of my improved adding-machine. Fig. 2 is a plan view of the same with the top plate and mechanism above removed. Fig. 3 is a longitudinal elevation of the same with the side of the frame nearest the observer removed. Fig. 4 is a view similar to Fig. 2, showing the condition of parts with key No. 3 depressed. Fig. 5 is a view similar to Fig. 3, showing condition of parts with key No. 3 depressed.

Similar letters of reference indicate corresponding parts in all the figures where they occur.

The top plate, A, of the machine is pierced with nine holes placed in a circle at about equal distances apart and at a convenient distance from the center of said circle. Into these nine holes are placed numbered keys or push-pins *a a a*, beginning at No. 1 and running to No. 9, leaving a space of seventy-two degrees, or twice the space between the other keys, between No. 9 and No. 1. These keys move freely in the holes, and are kept up by a spiral, $g^2$, or other spring, arranged in any suitable manner, preferably pressing under the heads of the keys. An enlargement at the lower end of the key-stem prevents the spring from forcing the keys entirely out of the holes in the plate. In the center of the circle of keys and placed on top of the plate A is the small wheel B, with ten equal-spaced notches or cogs on the circumference thereof, the notches being numbered from 0 to 9. The spring-pawl C keeps the wheel B from revolving too freely and helps press it into the right place when a key is struck or pressed, and also serves as an index or point to place zero when beginning to add. The wheel B is rigidly fixed to the axis D, which passes entirely through the frame of the machine, and is shown by dotted lines in Fig. 3; also, rigidly fixed to the central axis, D, beneath the plate A, is the ratchet-wheel E, having ten small rectangularly-shaped projections or teeth, E′, E′, corresponding in number with the depressions upon and revolving in unison with wheel B.

The wheel F is for the purpose of marking or registering the tens added, and has twenty or more ratchet-teeth, numbered consecutively from zero up. Connected with this wheel is the escapement or pallet F′, with spring *f* pressing on it. The point of the pallet nearest the small wheel B is used as the zero or starting point for the wheel F. A spiral spring, *f*′, tends to press the wheel F forward at all times. So long as the escapement or pallet is undisturbed, the wheel F is held, but when the escapement or pallet is released from the wheel the spring *f*′ will impel it forward. The escapement is released for each ten counted upon the machine, or, what is the same thing, at each revolution of the wheel B. This is effected by a projection, *b*, which is secured or formed upon wheel B at a proper point to strike the free end of pallet F′ when brought to the proper point of revolution. This free end of pallet F′ is made of such form as to engage the next tooth to it, so as to prevent the escape or passage past the engaging end of the pallet of more than one tooth at each trip or release thereof. The milled head G, fixed to the wheel F by a stem, is for the purpose of setting said wheel F back to zero (or any other number that is wished) after a column of figures has been added. The pallet has its head rounded or sloped on one side, and the teeth on wheel F are also inclined on one side, which construction allows wheel F to be turned backward, but not forward, by the head G. The check-pin *g*, which projects up from the wheel F, prevents the said wheel from passing the zero-point when it is turned back after adding a column. The arm or bracket H is for the purpose of keeping the wheel F in place.

A screw, J, is mounted on the rod or axis D under wheel E, and revolves freely on it. Rig-

idly fixed to the top of the screw J is the arm K, and attached to the arm K at P is the spring-pawl K′, which engages the teeth E′ on the wheel E to push it forward when a key is pushed or struck; also, attached to the arm K at point P is the check-spring K″, which engages in path of projections on the wheel E to stop it at the finishing part of a push or stroke on a key, and thus prevent the momentum of the wheel E from carrying it past the number struck, as it is, without said check, liable to do when a key is struck quickly.

The check-pin L, attached to the under side of the top plate, is to stop the arm K from returning back farther than the zero or starting point after a stroke on a key is finished and the finger of the operator is raised.

A plate, I, made of thin stiff material, is fastened to the top plate, A, at M M, by means of hinges, which act as a pivot at M′, and allow a vertical motion of the plate I at its unhinged end. The springs I′ I′, attached at one end to the plate I, their free ends resting on the bottom plate, I″, tend to push the plate I upward at all times. A nut, N, is rigidly fastened to the plate I, and moves with it up and down the screw J when said plate is depressed by the descent of a key, and again moves up the screw when the key is released, and the springs I′ I′ are allowed to exert their normal force to throw the plate I upward. This down-and-up motion of the plate I and nut N turns the screw J, carrying its arm K forward and back again to the stop L. The small circles *a′ a′ a′* show where each of the keys *a a a* strike the plate I when they are pushed down by the finger of the operator.

It will be observed that when any key—say No. 3—is pushed down it will strike the plate I at *a′*, and cause said plate to descend with the nut N, working on the screw J, and causing said screw to revolve, carrying its arm K toward key No. 3; but when the arm K reaches key No. 3 it must stop, as said key at that moment projects down through the top plate and intercepts it. Now, the arm K has in this case passed over three-tenths of the circle, and by the means of the spring-pawl K′ has also pushed the ratchet-wheel E, with its corresponding wheel, B, three-tenths of the circle, or three notches forward. When the finger of the operator is raised from the key, it springs up, allowing the plate I to rise, and thus force the arm K back to the zero-point against the check or stop pin L; and thus any key struck will cause the arm K to turn toward it, but will intercept and stop said arm at one, two, three, four, five, six, seven, eight, or nine tenths of the circle, depending, respectively, on the number of the key struck, No. 1 allowing it to move one space, No. 2 two spaces, &c. The index spring-pawl C keeps the wheel B from turning back to zero when the arm K returns to its zero or starting point, and also points to the number of notches the wheel B has been pushed forward, which, in the case of striking key No. 3, has been three. If the key No. 2 should next be struck, the wheel B would be moved forward two more notches, and the index-spring C would then point to 5 on the wheel, which is the sum of the figures on the two keys which have been struck.

It will be noticed when a key is pushed down that just before the arm K in its revolution reaches the key that is struck and that intercepts said arm, the check-spring K″ will strike the said key, and the point of the spring will be forced into the wheel E just in front of projections E′, thus preventing the momentum of the wheels E and B from carrying them past the point where the arm K is intercepted and stopped by the key struck. Near the point of the check-spring K″ is a keeper or guide, X, located on arm K, which confines the spring and prevents any movement of the spring at that point, except that which is parallel with the length of the arm K.

The check-spring K″ may be made of different shapes or forms; but its purpose is to stop the wheels B and E at the end of a stroke on any of the keys.

As thus constructed and equipped the operation of the machine is as follows: The machine is placed with the end having the keys thereon nearest the operator. The wheel B is set so that the zero will be under the point of the index-spring C. The wheel F is set with zero under the point of the pallet F′, nearest the wheel B. Suppose the numbers 36, 49, and 68 are to be added, the units-column is added first. Beginning at the top, the key No. 6 is first struck, which turns the wheel B six spaces, and to the position where figure 6 will be under the point of the index-spring C. Next key No. 9 is struck, which forces B nine notches farther forward, and to a position where figure 5 will be under the point of index-spring C. At the moment figure 9 of wheel B passes from under the point of the index-spring the projection *b* frees the pallet F′ from ratchet F and allows the wheel F to move forward one tooth and bring figure 1 under the point F‴ of the pallet. Now, we can read as the sum of the figures added, one ten under the point F‴ of the pallet and five under the point of the index-spring C, making fifteen units. Next key No. 8 is struck, which forces the wheel B forward eight more notches and shows figure 2 (tens) under point of pallet on wheel F and figure 3 (as units) under index-spring C on wheel B, making twenty-three units as the sum of the units-column. The figure 2 is set down under its column, as usual, and the two tens carried to the next column. Now, we want the figure 2 to show under the point of the index-spring, as that is the number carried, and we want to start with it. We want to change figure 3, that is under it, to figure 2. This can be done by striking key No. 9, and it matters not what figure is under the index-spring C, any other one of the digits may be brought under it by striking one key. The number of the key struck must be such that, when added to the figure already under the index-spring,

the sum will be the figure desired, or that figure plus ten; and the zero-point may always be brought under the index-spring by striking one key, the number of which is the difference between ten and the figure which is already under it. After striking No. 9 and bringing figure 2 (the number carried) under the index-spring, the wheel F is turned back to zero by means of the head G, and we are ready to add the tens-columns. The keys numbered 3, 4, and 6 are successively struck, and as a result we find figure 1 under the point of the pallet on wheel F and figure 5 under the index on wheel B, showing 15 as the sum of the tens-column, including the two carried, and thus long columns may be added by striking successively the keys corresponding to the figures in the column, and the result will be the sum, and will be registered—the tens on wheel F and the units on wheel B.

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

1. In an adding-machine, the combination, with a series of depressible keys marked with the units of numeration, of a part or disk against which said keys come in contact when depressed, a nut secured to said disk, a rotatable worm or screw over which the nut works, means, substantially as described, for registering or showing the number of added units, and connections, as described, from the worm to the said registering means.

2. In an adding-machine, the combination of the registering-wheel, a series of keys, a depressible nut operated by the keys, a rotatable screw on which the nut works, a radial arm secured to the screw and provided with a pawl, and means, substantially as described, upon which said pawl works, for operating the registering-wheel, as set forth.

3. In an adding-machine, the combination, with a series of spring keys or pins marked with the different units of numeration, a disk or wheel having an index for showing the sum of the added units of the depressed keys, a ratchet revolving with said disk or wheel, a screw revolving independently thereof, having an arm which bears the pawl for operating upon said ratchet, a nut set over the screw and depressed by the descent of the keys, thereby causing said screw to revolve to an amount coincident with the descent of the nut and keys, as set forth.

4. In an adding-machine, the combination of the screw J and the top plate, A, with the plate I, having springs I′ I′, and nut N, working on the screw J, keys for operating plate I, a registering-wheel, and connections, substantially as set forth, from screw J to said registering-wheel, substantially as set forth.

5. In an adding-machine, the rod or axis D, wheel B, with ten equal-spaced notches numbered from 0 to 9, and a ratchet-wheel, E, provided with ten equal-spaced projections, both fixed to the axis D, in combination with the screw J, loosely sleeved upon the rod D, the arm K, and the spring-pawl K′, as described.

6. In an adding-machine, the combination, with the plate A, provided with nine holes, the nine keys arranged to work through the holes in plate A, with the spring-plate I, on which the said keys act, nut N, attached to plate I, and screw J, having arm K and pawl K′, substantially as and for the purpose set forth.

7. In an adding-machine, the combination of the plate I and nut N with screw J, the rod or axis D, keys *a*, and wheel B, and connections, substantially as described, from the screw J to said wheel B, substantially as described.

8. In an adding-machine, the arm K, having spring check or stop K″ to strike the stem of any key that is pushed down, and whereby part K″ is forced into the ratchet-wheel E, in front of a projection, E′, just at the moment that the arm K strikes said key-stem, in combination with the series of keys having stems and a ratchet-wheel, as set forth.

9. In an adding-machine, the combination of keys *a*, top plate, A, having the stop-pin L projecting down from it, plate I, having springs I′ I′ and nut N, screw J, and arm K, whereby, after releasing keys, the arm is caused to return to the stop L and remain there until another key is struck.

10. In an adding-machine, the combination of top plate, A, having nine holes in a circle and keys therein, and two wheels on the face thereof arranged with the mechanism to register the sum of the figures added, with the rod or axis D, having a ratchet-wheel, E, attached thereto, and with the screw J, working on said axis, the said screw having an arm, K, provided with an operating-pawl and a stop-spring pawl, vertically-movable plate I, having nut N, working on screw J, all constructed and arranged to operate as and for the purpose set forth.

FRANK A. BONE.

Witnesses:
W. J. COLLETT,
E. K. SNOOK.