F. S. BALDWIN.

Adding-Machines.

No. 153,522. Patented July 28, 1874.

FIG. 1.

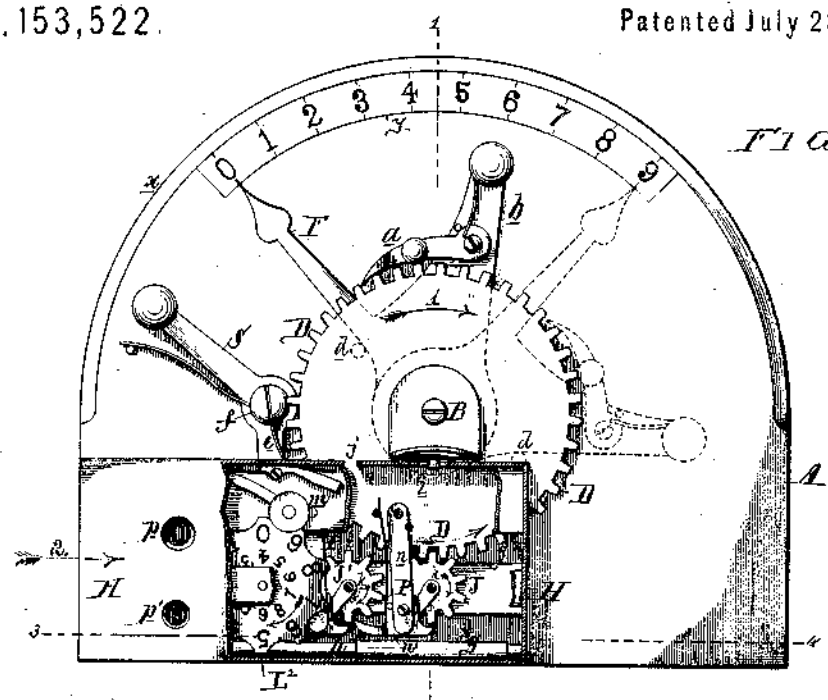


FIG. 2.

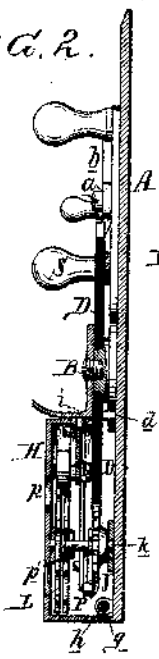


FIG. 5.

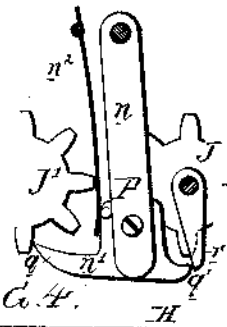


FIG. 3.

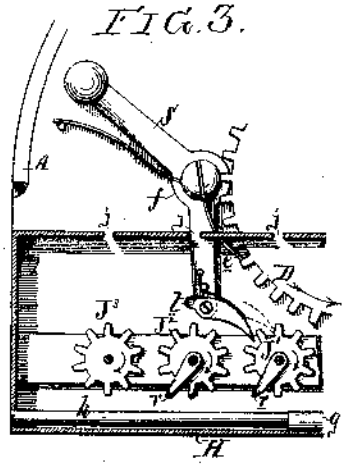
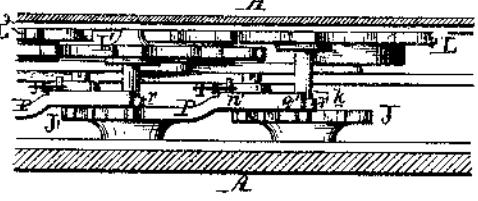


FIG. 4.



Witnesses,
Wm. A. Steel
Thomas N. Sloan

Frank S. Baldwin
by his Attys.
Howson and Son.

UNITED STATES PATENT OFFICE.

FRANK S. BALDWIN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO HIMSELF AND GEORGE J. DU BOIS, OF SAME PLACE.

IMPROVEMENT IN ADDING-MACHINES.

Specification forming part of Letters Patent No. **153,522**, dated July 28, 1874; application filed April 1, 1874.

To all whom it may concern:

Be it known that I, FRANK S. BALDWIN, of Philadelphia, Pennsylvania, have invented an Improved Adding-Machine, of which the following is a specification:

The object of my invention is to enable accountants and others to add long columns of figures with rapidity and accuracy by the machine which I will now proceed to describe, reference being had to the accompanying drawing, in which—

Figure 1 is a front view of the machine, partly in section; Fig. 2, a sectional view on the line 1 2, Fig. 1; Fig. 3, a detached view, partly in section; Fig. 4, an inverted sectional view on the line 3 4, Fig. 2, drawn to an enlarged scale; and Fig. 5, a detached view.

A is a metal plate, having a semicircular upper edge, *x*, described from the center of a short spindle, B, secured to the said plate, and carrying a loose cog-wheel, D, the latter being operated by a spring-pawl, *a*, on an arm, *b*, which is also hung loosely to the spindle, and which is provided with an index, F, the point of the latter being arranged to traverse a graduated segment, *y*, near the upper edge of the plate, and thus indicates the number of teeth which have been passed over by the pawl, or the extent to which the wheel D has been turned by the latter. Stops *d d* on the plate A (indicated by dotted lines in Fig. 1) limit the extent of the movement of the pawl *a* to nine teeth of the cog-wheel, and the yielding of the latter to the movement of the said pawl in the direction of the arrow 1 is prevented by a spring-pawl, *e*, secured to a stud, *f*, on the plate A, as shown in Figs. 1 and 3. A box-like casing, H, is hinged to the plate A by a rod, *h*, secured to the opposite ends of the said casing, and passing through a tubular projection, *g*, of the plate, this hinge permitting the said casing to be turned back from the plate to a sufficient extent to disengage whichever of its pinions J is in gear with the cog-wheel D, and to be then moved longitudinally and turned inward toward the plate, in order to bring another of its pinions into gear with the cog-wheel. The casing, when adjusted, is prevented from moving longitudinally by a stop-pin, *i*, secured to the spindle B directly beneath the center of the cog-wheel D, and adapted to any of a series of notches, *j*, in the edge of the casing H directly above the centers of the pinions J. There are four pinions in the present instance, marked, respectively, J, J^1, J^2, and J^3, each having ten teeth, and each hung to a spindle, K, which has its bearings in the casing, the spindles being arranged at equal distances apart from each other, and being also provided with numbering-wheels L, L^1, L^2, and L^3, which are prevented from turning accidentally by spring-rollers *m*, Fig. 1, adapted to the notched peripheries of the said wheels, the latter having two concentrically-arranged sets of numbers, from 0 to 9 inclusive, marked upon their faces, the said numbers, when the wheels are turned, appearing successively through openings *p* and *p'*, formed in the front plate of the casing H.

The pinions J, J^1, J^2, and J^3, and their numbering-wheels, represent units, tens, hundreds, and thousands; and it is essential to the successful operation of the machine that, when the unit-pinion J is caused to make a complete revolution in the direction of the arrow by the wheel D, the tens-pinion J^1 shall make one-tenth of a revolution in the same direction, and so on through the series, each successive pinion making but one-tenth of a revolution for every complete revolution of the preceding pinion.

I attain this result without the use of intermediate pinions, and without appreciable lost motion, by causing one pinion to communicate motion to another through the medium of a double-pivoted spring-pawl, P, which, as will be seen in Fig. 5, consists of an arm, *n*, hung to the casing, and of a foot, n^1, pivoted to the lower end of said arm, and acted on by a spring, n^2, which tends to maintain the point *q* in contact with the teeth of the pinion to be operated on.

The heel *q'* of the pawl is struck at the termination of every complete revolution of the preceding pinion by an arm, *r*, of the latter, and is thus operated in a manner which will be readily understood on referring to Fig. 5.

Another important feature of my invention is the spring-lever S hung to the stud *f* of the

plate A, and extending into the casing H, where it is provided with a spring-pawl, *t*, (best observed in Fig. 3,) by which the pinion next in advance of that which is under the control of the wheel D may be turned to the extent of one-tenth of a revolution at a time, and for a purpose which will be rendered apparent hereafter.

The operation of the machine will be best understood by following the movements required in adding a column of figures. Suppose, for instance, that the following numbers are to be added together: 345, 678, 812. The parts are brought to the position shown in Fig. 1, and the numbering-wheels L are so adjusted that a row of four noughts shall appear through the openings *p* in the casing H. The machine is then laid upon a desk or table, or directly upon the account-book or paper on which the numbers are marked, so that it can be moved up to the said numbers as they are added together.

The units column is first added by moving the arm *b*, its pawl *a*, and index F back and forth three times, the index being first moved to the graduation 2 of the segment, and then back to zero, which will cause the number 2 of the first wheel, L, to appear through its opening *p* in the casing, after which the index is moved to the graduation 8 and back, and finally to the graduation 5 and back, which will complete the addition of the units column and cause the result, 15, to appear through the openings *p* in the casing, the figure 1 of the latter number being carried to the tens column, or to the second wheel, L^1, by the turning of the latter to the extent of one-tenth of a revolution through the medium of the double-pivoted pawl P and arm *r* of the first pinion, J.

In order to add the tens column of the numbers given above, the hinged casing H is drawn back and moved along the plate A in the direction of the arrow 2, Fig. 1, until its pinion J^1 is brought opposite the wheel D, with which it is thrown into gear by pushing back the casing, as before described. The index F is then moved back and forth to the graduations 1, 7, and 4, precisely as above described in connection with the units column, which will register the number 135 on the first three wheels, L^2, L^1, and L, as the result of the addition of the tens and units columns. The casing H is then shifted a second time, in order to bring the third pinion, J^2, of the series into gear with the wheel D, after which the index is moved back and forth over the segment to the graduations 8, 6, and 3, which will complete the addition of the hundreds column and give the total result, 1835.

The same operation can be continued to tens and hundreds of thousands by the addition of other pinions and numbering-wheels to the machine.

The supplemental lever S and pawl *t* play an important part in adding long columns of figures, as they obviate the necessity of moving the index back and forth for every number, and of charging the memory with any result higher than units. For instance, in proceeding to add the numbers 669, 878, 689, the parts of the machine are set at zero, as before, and are then manipulated as follows: Beginning with the units column, the accountant, knowing that 9 and 8 added together amount to 17, depresses the lever S, and thus moves the tens wheel L^1 to the extent of one tooth, and thus registers 10. The remaining 7 is added to the 9 at the top of the column, which gives 16, of which 10 is registered, as before, by depressing the lever S, and thereby moving the wheel L^1 to the extent of another tooth, while the remaining 6 is registered on the first wheel, L, by moving the index F to the graduation 6 and back again to zero, the total result of the addition of the units column, amounting to 26, being thus obtained and registered much more expeditiously than in the manner first described.

The casing H is next moved on the plate A, and the addition of the tens column is proceeded with in precisely the same way, the results of the partial additions being registered by the lever S and its pawl on the hundreds-wheel L^2, and when the casing is again moved in order to add the hundreds column, the partial results are in like manner registered on the thousands-wheel L^3 by the said lever and pawl.

The numbers which appear through the lower row of perforations *p'* of the casing are intended to give the results in subtracting one number from another, which, being merely the reverse of addition, can be readily accomplished by the machine.

In carrying out my invention the operating-arm *b* may, if desired, be continued out to the graduated segment *y*, so as to form a pointer, in which case the index F can be dispensed with.

I claim as my invention—

1. A calculating-machine in which are combined a plate, A, with graduated segment *y*, a cog-wheel, D, and lever and pawl for operating the same, and a train of pinions contained within a casing, H, by the longitudinal adjustment of which on the plate any one of said pinions may be brought into gear with the cog-wheel, all substantially as and for the purpose set forth.

2. The supplemental lever S and its pawl *t*, combined with the pinions J, and arranged to operate on the latter in conjunction with the cog-wheel D, substantially as and for the purpose described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRANK S. BALDWIN.

Witnesses:

WM. A. STEEL,

HUBERT HOWSON.