(No Model.)

C. W. FOWLER.

ADDING MACHINE.

No. 437,889. Patented Oct. 7, 1890.

Fig. 1.

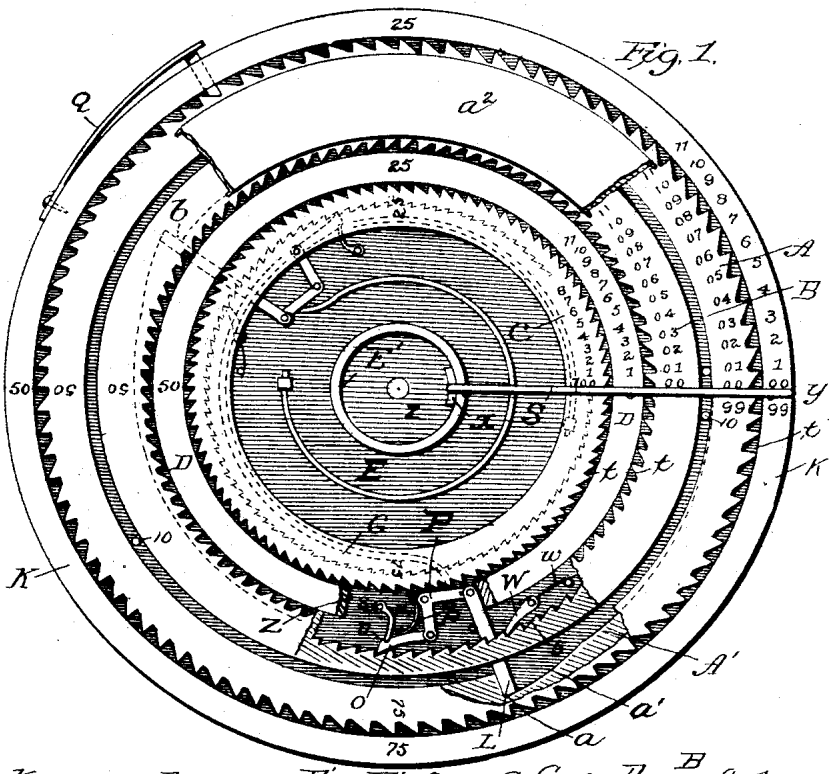
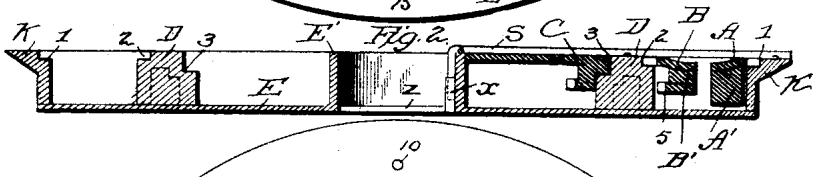


Fig. 2.



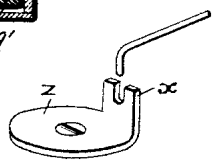
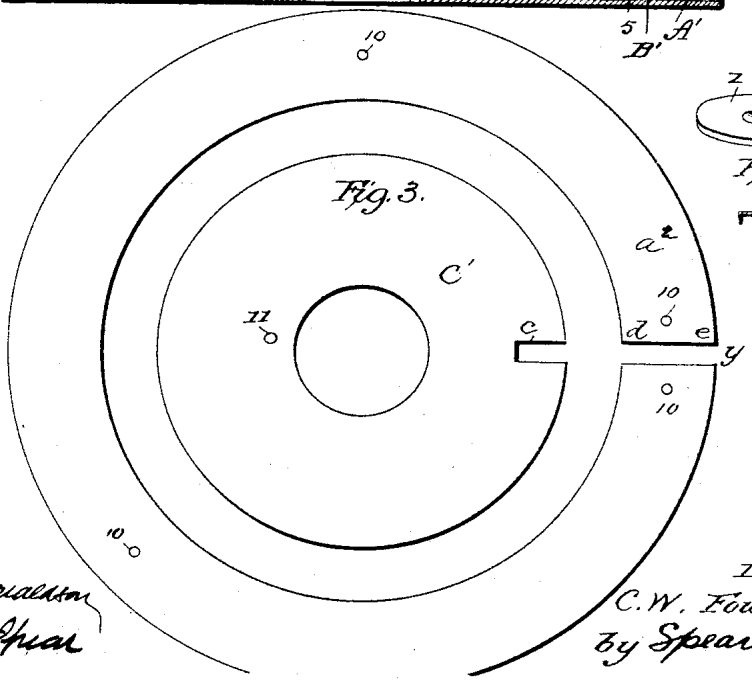


Fig. 4

Fig. 3.



Attest

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UNITED STATES PATENT OFFICE.

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ADDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 437,889, dated October 7, 1890.

Application filed March 5, 1890. Serial No. 342,762. (No model.)

To all whom it may concern:

Be it known that I, CHARLES W. FOWLER, of Cloverport, in the county of Breckinridge and State of Kentucky, have invented a new and useful Improvement in Adding-Machines; and I do hereby declare that the following is a full, clear, and exact description of the same.

My objects are to provide a machine of compact form and of great capacity, having simple operating mechanism, to secure accuracy of operation, and to avoid confusion in selecting the proper figures on the several dial-rings.

My invention includes a pair or series of concentric rings with operating mechanism between, and the features of novelty lie in the construction and arrangement of said operating means, in means for preventing the momentum of the operated ring from destroying the accuracy of the result, and in various details of construction hereinafter particularly pointed out.

In the accompanying drawings, Figure 1 is a plan view of the device with the covering-plate removed and with parts broken away. Fig. 2 is a transverse sectional view. Fig. 3 is a view of the covering-plate. Fig. 4 represents details.

The shell supporting the operating parts consists of a circular plate E, to which is fixed at its periphery a ring K, having a shoulder 1 on its inner edge. Within the stationary flange or ring is a similar flange D, having a shoulder 2 on its outer edge and a shoulder 3 on its inner edge. In the present case I illustrate a machine having three calculating-rings; but it will be understood that two rings or more may be used without departing from the spirit of my invention. The first ring A, for the tens and units, rests upon the shoulder 1 of the flange K, and is numbered from 00 to 99, the said flange being similarly numbered from 00 to 99, beginning at point *y*, which designates the point at which the movement of the rings is stopped and at which the result of the calculation appears. Within the ring A and resting upon the outer shoulder 2 of the stationary flange D is the hundreds-ring B, and the third ring C is placed within the flange D, resting upon the inner shoulder 3. The ring C is numbered from 1 to 100 and the flange D from 1 to 99, the 00 mark being omitted. It will thus be understood that in solving examples the units and tens up to 99 are indicated on dial A, hundreds and thousands up to 9,999 on dials A and B, or 9,900 on dial B, and 990,000 on the dial C. Each ring is formed with ratchet-shaped teeth *t*, corresponding in number to the numbers on the ring. The teeth of the ring A are on the outer edge and form a series of pockets between said edge and the stationary flange K. The teeth of the other rings are formed on the edges adjacent to the flange D. The pockets formed by the teeth and the stationary parts are adapted to receive any suitable pointed instrument, and their size is such as to render the manipulation easy and to avoid all confusion and doubt as to which figure it is opposite.

The rings A B are covered by a shield a^2, which is wide enough to extend from the base of the teeth on one ring to the base of the teeth on the other ring, so that said teeth will be left exposed to receive the operating instrument, while the numbers are completely covered from view. The shield is supported on pins 10, passing from the plate E up between the rings A B. The shield is slotted at *d e*, Fig. 3, which slot comes over the indicating-line *y* to leave the result of the calculation clearly visible. The inner ring C is covered to the base of its teeth by a plate C′, and it is also slotted at *c*, being supported on and held in position by suitable pins 11.

The center of the casing is cut out for lightness and for convenience in handling the machine, and a circular rim E′ extends upwardly about said opening, the plate C′ being cut out to fit around said rim.

In order to operate the hundreds-ring B each time the tens and units ring A is given a complete revolution, the following mechanism is provided: The ring A has a depending cam-flange A′ on its under side, which is provided on its inner side with a cam-shoulder *a* either immediately beneath the 00 mark on the ring or so placed as to release bar L when 00 reaches the stop. The ring B is likewise formed with a depending flange, and the inner edge of this is provided with ratchet-teeth 5 and a cam-flange B′ and shoulder *b*, (shown in dotted lines, Fig. 1,) similar to that on A, but placed between

the plate that has figures on it and the one that has teeth 5 on it. The flange D, as shown at *z*, is undercut to admit the operating mechanism which transmits the movement to the hundreds-ring.

The ring B is operated through its ratchet 5 by means of a push-pawl *o*, held in engagement therewith by means of a spring. The push-pawl is pivotally connected to a bell-crank lever P, to which also is pivoted the bar L, adapted to operate longitudinally through the rib D and to bear upon the depending cam-flange A′. The parts are under constant tension of spring G, which, as shown in dotted lines, bears upon the bell-crank and tends to press the bar L outward and to move forward the push-pawl *o* through the connecting bell-crank lever. When the parts are in normal position, the bar L presses against the low part of the cam; but when the ring A is given a full revolution in calculating the bar L rides up to the high part of the cam, thus retracting the push-pawl *o* to engage with a new tooth, and the final part of the movement of ring A carries the high part entirely past the bar L, allowing the spring G to exert its force and move forward the hundreds-ring one step. The ring B is held in its moved position by a catch-pawl W, pressed into contact therewith by the spring *w*. The momentum of the operated ring B might carry it more than one tooth-space were special provision not made to avoid this, and in order to prevent any such action I provide a stiff "brake-spring" *u*, supported at *s*, with the other end *v* fitting in a notch in the pawl *o*. This spring is so placed that it will be strongly compressed when the pawl moves forward, the end *v* being moved toward a perpendicular or radial line drawn from the point *s* to the ratchet-teeth of ring B. The increased power of the spring, caused by the forward movement of the pawl, operates to make the frictional connection between the pawl and the ratchet-teeth rigid, thus causing said pawl to hold the ring in the exact position to which it has been moved. The action of this spring, so far as its holding qualities are concerned, is like that of a rigid wedging-lever, which normally is inclined and is moved to the perpendicular by the forward movement of the pawl; but as it is essential that each ring should be movable independent of the rings lower in the scale it is desirable to use the stiff spring mentioned instead of the rigid lever, and in order to remove the extra pressure caused by this spring as quickly as possible the first part *a′* of the cam A′ is made steep, so that the pressure on the pawl will be relieved by the backward movement of said pawl as soon as the ring is moved a slight distance. After this first rapid movement the rise of the cam is gradual.

The operating mechanism between B and C is exactly similar to that just described.

A spring-catch Q is provided on the outside of the case to engage with the teeth of the ring A to insure the accurate position of said ring. The stop against which the operating-stylus abuts in turning the rings consists of a bar or wire S, extending over the rings at the indicating-point *y* and into the circular rim E′. It is secured to the flanges K D and rim E′. The inner end of said stop-wire projects downwardly within the rim E′ and is adapted to be engaged by a slotted lip *x* on a plate Z. This plate is adapted to be secured to the table or desk, and when the wire is in engagement with the slotted projection the device will thus be held against movement on the surface of the desk, and may be operated readily, or it may readily be disengaged from the holding-plate and held in the hand.

The machine might be made smaller than shown by doing away with the scale K and placing the flange D between the parts A and B and making the scale for the inner ring on a disk within. In this case it would not be essential for the third ring C to have one hundred teeth, but it could have any number, thus increasing or decreasing the ultimate capacity of the machine.

To operate the machine, first, as an adder; second, as a multiplier:

The machine may be used to add from one to six columns at a time; but in practice it is found more convenient to add even numbers of columns, because it is easier to hold in the memory pairs of numbers than any other groups. To illustrate with an example: Suppose it is required to add 3,426, 12,735, and 253,218. If the dials are not already at zero, set them so by inserting the operating-stylus into the pocket opposite 00, which is indicated by coloring the tooth that forms that particular pocket some striking color, as black, and moving the dial in a positive direction until the stylus meets the stop S. Do this with each dial, always beginning with the units-dial A. To solve the above example at one operation insert the stylus into pocket 25 on dial C and move to the stop, then into pocket 32 on dial B and move to the stop, and then into pocket 18 on dial A and move to the stop, when the number 253,218 will show in the slot in the shields or cover, Fig. 4. Then insert the stylus into pocket 1, dial C, 27, dial B, and 35, dial A, and move to the stop, when the sum of the last two numbers will be shown. Then insert the stylus into pocket 34 in dial B and pocket 26 in dial A and move to the stop as before, when the total sum will be shown, 269,379. The 26 will show on dial C, 93 on dial B, and 79 on dial A, all the carrying being done automatically. Reset the machine at zero.

Second. With the machine as described—*i. e.*, with three dials, each having one hundred figures (from 1 to 100)—any two numbers under one thousand and all numbers whose product is less than one million may be multiplied together. To multiply three hundred

and twenty-five by four hundred and sixty-eight—

325
468

40
160 } Product of three hundred and twenty-five by eight.
2,400

300
1,200 } Product of three hundred and twenty-five by sixty.
18,000

2,000
8,000 } Product of three hundred and twenty-five by four hundred.
120,000

Beginning as usual in multiplication, eight times five units is forty units; insert stylus in pocket 40 in dial A and move to stop; then eight times two tens, or twenty, is one hundred and sixty; move up the 60 on dial A and the 1 on dial B; then eight times three hundreds, or three hundred, is two thousand four hundred; move up the 24 on dial B, and the products of three hundred and twenty-five multiplied by eight will have been added together and will show in the slot in the shield. Now the six in the multiplier, being in the second place, is really sixty, so that sixty times five units is three hundred units. Move up the 3 on dial B; sixty multiplied by twenty is twelve hundred; move up the 12 on dial B; sixty multiplied by three hundred is eighteen thousand; move up 80 on dial B and the 1 on dial C and three hundred and twenty-five has been multiplied by sixty-eight. Now by the 4—*i. e.*, four hundred—four hundred multiplied by five is two thousand; move up the 20 on dial B; four hundred multiplied by twenty is eight thousand; move up the 80 on dial B; four hundred multiplied by three hundred is one hundred and twenty thousand; move up the 12 on dial C, and the product of three hundred and twenty-five multiplied by four hundred and sixty-eight will show in the slots.

A "rule" for the multiplication would be: Multiply any two digits of the numbers together and annex as many ciphers to the product as there are places to the right of the digits in the original numbers. Thus, in the above example, four hundred multiplied by three hundred, you say four multiplied by three is twelve, and then annex (mentally) four ciphers 12 (0000.) In practice nothing is done but move up the 12 on dial C, and likewise for all the other partial products.

I claim as my invention—

1. In combination, the ring A, provided with a cam A′, having a shoulder *a*, the ring B within the ring A and concentric therewith, having ratchet-teeth on its inner side, a pawl *o* within the second ring B, a movable support therefor independent of the rings, and means for operating said movable support, said means being acted upon by the cam A′ and its shoulder *a*, substantially as described.

2. In combination, the ring A, provided with cam A′, the ring B, provided with ratchet-teeth, the pawl *o*, engaging with the ratchet-teeth, the radially-movable bar L, bearing upon the cam, and the means for applying a tension to the parts, substantially as described.

3. In combination, the ring A, with its cam, the ring B, with its ratchet-teeth, the pawl *o*, engaging the ratchet-teeth, the bar L, bearing upon the cam, the bell-crank between the bar L and the pawl *o*, and the spring G, substantially as described.

4. In combination, the ring A, the ring B, with its ratchet, the pawl *o*, engaging said ratchet, means for operating the pawl, and the leaf-spring arranged to bear upon its forward portion and to be compressed as the pawl moves forward, substantially as described.

5. In combination, the ring A, with its cam, the ring B, with its ratchet, the pawl, the means for operating said pawl from the cam of ring A, and means for applying an increasing tension to the pawl as it moves forward, the said cam A′ having a rapid rise to relieve said tension at the beginning of the movement of ring A, substantially as described.

6. In combination, a series of concentric rings with operating mechanism, the casing having the central rim E′ and the outer flange K, and a stop consisting of the bar *x y*, extending radially from the center rim to the outer flange K and held by both, substantially as described.

7. In combination, the casing having the central opening and the rim E′, the rings, the stop *x y*, having its end projecting down within said rim, and the plate adapted to said central opening and having a notch to receive the stop-wire, substantially as described.

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

CHARLES W. FOWLER.

Witnesses:
THOS. C. TOUSUP,
C. P. SANGER.