(No Model.) 2 Sheets—Sheet 1.

C. H. WEBB.

ADDING MACHINE.

No. 414,959. Patented Nov. 12, 1889.

Fig. 2.

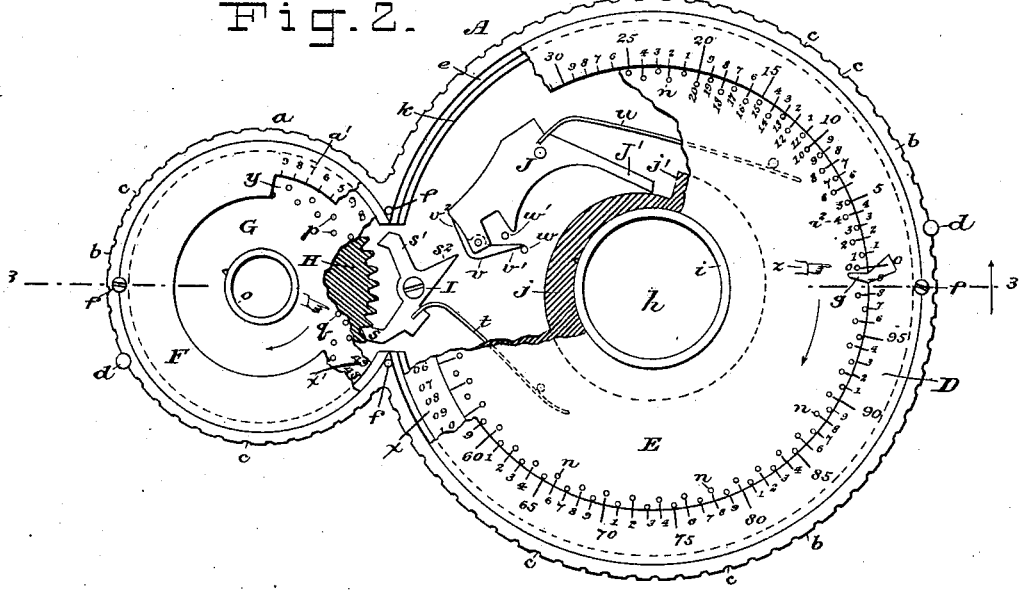

Fig. 1.

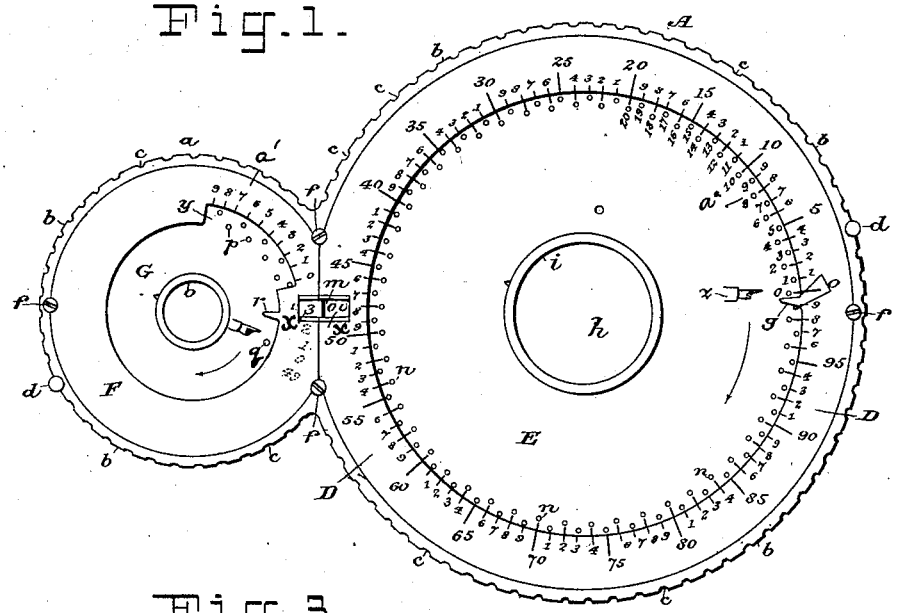

Fig. 3.

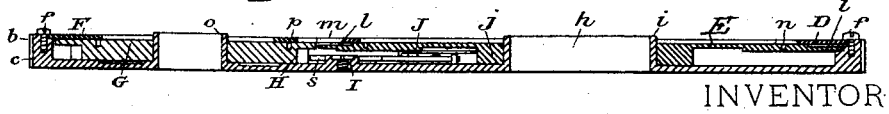

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Fig. 4.

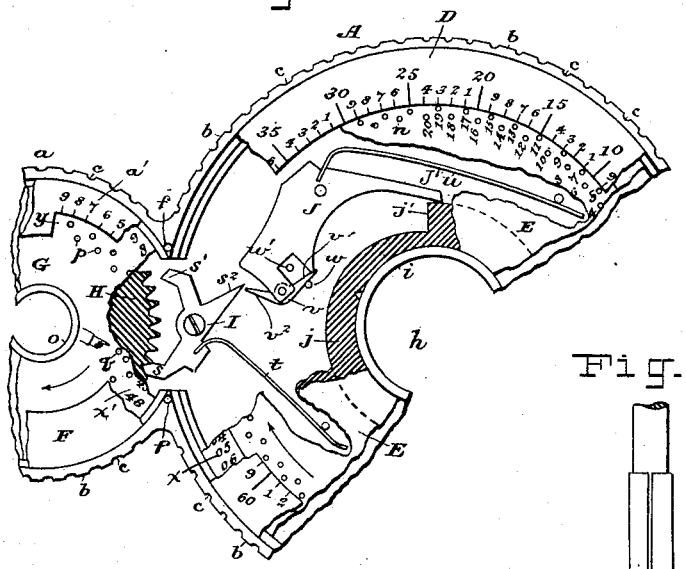


Fig. 6.

Fig. 3a.

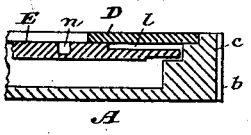
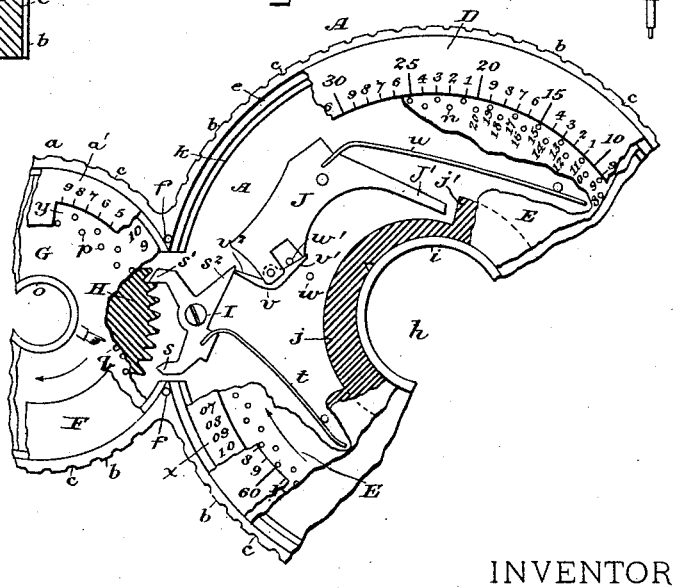


Fig. 5.



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UNITED STATES PATENT OFFICE.

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ADDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 414,959, dated November 12, 1889.

Application filed April 28, 1888. Serial No. 272,179. (No model.)

To all whom it may concern:

Be it known that I, CHARLES HENRY WEBB, a citizen of the United States, and a resident of the city, county, and State of New York, have invented certain Improvements in Adding-Machines, of which the following is a specification.

My invention relates, in the main, to adding-machines of the class employing two adding disks or wheels arranged tangentially and having internal mechanism whereby, at each revolution of one of said disks, it imparts an impulse or fraction of a revolution to the other disk; and one of the more important objects of my invention is to provide a machine of this general character with intermediate mechanism whereby continuous rotation of one adding-disk will impart regular intermittent rotary motion to precisely the proper extent of the other disk—that is to say, my mechanism not only enables the driver-disk to impart exactly the proper extent of movement to the driven disk, but it serves also as a stop to limit the movement imparted to the latter. At the same time the driven disk is free to be rotated independently of the other in setting the disks at starting.

Other objects of my invention relate to features of construction designed mainly to increase the durability of the machine and to facilitate the operation of adding therewith.

In the accompanying drawings, which serve to illustrate my invention, Figure 1 is a face view of the machine. Fig. 2 is a view similar to Fig. 1, but having parts of the machine broken away to expose the internal mechanism. Fig. 3 is a transverse section on line 3 3 in Fig. 2. Fig. 3ª is a fragmentary sectional view on a scale double that of Fig. 3. Figs. 4 and 5 are similar fragmentary views designed to illustrate the operation of the internal mechanism. Fig. 6 is a view representing a suitable stylus or point for operating the numerator or adding-disks.

My machine comprises, in a general way, a neat casing recessed to receive the two adding-disks and provide bearings therefor, in which casing below the disks is an escapement device or mechanism whereby the larger adding-disk, which adds sums up to one hundred, is made to impart at each revolution one impulse or fraction of a revolution to the lesser or hundreds disk, thus adding one hundred to the sum.

I will now describe the mechanism more minutely.

Referring to the drawings, A *a* represent a casing, usually made from cast metal. This casing has the form, by preference, shown in Figs. 1 and 2—that is to say, it consists of two circular parts A and *a*, formed in one piece, and each having a raised rim or margin *b*, provided with indentations, notches, or recesses *c* in its outer edge or face, whereby the machine may be conveniently secured in place on a table or desk by pins or screws *d*, as represented in Fig. 1. These indentations *c* also facilitate the handling of the machine, as they enable the fingers to obtain a firm grasp thereon.

D is a ring-dial, which fits in a rabbet *e*, formed in the rim of the portion A of the casing, and is, or may be, secured to the said rim by screws *f*. The ring-dial D is graduated or provided with one hundred graduation-marks equally spaced and numbered from 0 to 99 to form an index, as shown in Fig. 1. At or adjacent to the number 0 the ring-dial is provided with an inwardly-projecting stop-piece *g*, the purpose of which will be hereinafter explained.

In the center of the part A of the casing is an aperture *h*, surrounded by a circular flange *i*, which forms a large and firm journal for the units and tens adding disk E, which turns thereon. The boss of this disk is a snail-cam *j*, which has a bearing on the bottom of the casing (see Fig. 3) adjacent to the journal *i*. At its outer edge the disk E takes under the dial D, as seen in Fig. 3, and rests in a rabbet *k*, formed in the rim of the portion A of the casing. This disk is designed to turn smoothly and steadily on its journal and marginal bearings and not too freely or loosely. Around its margin, on its upper face, the disk is cut away so as to form a slight band-like recess or rabbet *l*, (see Fig. 3ª,) and on this depressed surface the disk is graduated or provided with one hundred equally-spaced divisions, which are numbered 00, 01, 02, consecutively, up to 99. This series of numbers *x* is covered by the dial D; but said numbers may be made to appear in succes-

sion at an aperture m in said dial by rotating the disk E.

Just within the inner margin of the ring-dial D and opposite to each number on the disk is a socket n in the disk, to receive a point for rotating the disk.

In a marginal rabbet in the rim of the lesser part a of the casing is fitted a ring-plate F, which has a flattened side that fits up to a similar flattened side on the ring-dial D, and it may be secured to the casing in the same manner as the dial. In this part a of the casing is rotatively mounted on a hollow journal o, similar to journal i, the hundreds-adding disk G, the margin of which takes under the plate F and stands in peripheral contact, or nearly so, with disk E. This tangential arrangement of the disks may be seen at the aperture m in Fig. 1. This disk G is divided around its margin into fifty equally-spaced divisions, and is provided with a series x' of numbers from 0 to 49, consecutively arranged. Opposite to each of the numbers in this series is a socket p, similar to the sockets n in disk E. The plate F extends out over these sockets p except at some point y, where it is cut away to an extent sufficient to uncover ten of said sockets, and it has graduation-marks a' opposite said sockets numbered from 0 to 9, forming an index, as seen in Fig. 1. The disk G has a socket q, that is not covered by the plate F. This socket is arranged opposite the zero-mark on said disk.

On the plate F is an inwardly-projecting stop-piece r, similar to the stop-piece g on dial D.

On the lower face of the disk G is fixed a toothed wheel H, having fifty equally-spaced teeth with beveled faces, or as many teeth as there are divisions on the disk G. This wheel may be in one piece with the disk if preferred.

The wheel H and disk G are adapted to be rotated intermittingly, one tooth at a time, by a vibrating pallet-lever I, provided with two pallets s and s', the former of which is normally held in mesh with the teeth of wheel H by a spring t. The beveled end of pallet s holds the wheel steady, but does not prevent the disk G and said wheel from being rotated by the insertion of a pin or stylus in the sockets p or q. Every revolution of disk E causes the snail-cam j thereon to draw back a lever J by pushing outward the tail J' of same, and when the cam passes the tail of the lever the spring u returns said lever to its normal position. In returning, said lever acts on and vibrates the pallet-lever and thus imparts an impulse to disk G.

Having described the construction of the machine, I will now describe the operation of adding with it. The user inserts a pin or stylus of any kind in the socket n opposite the hand or index-mark z on the adding-disk E and turns the disk to the right until the point is stopped by the stop-piece g. This will bring the double-zero mark 00 on the disk E opposite the reading-aperture m, where it may be seen. He then inserts the stylus in the socket q in disk G and turns said disk to the right until it is stopped by the stop-piece r. This will bring the zero-mark 0 on disk G opposite that portion or extension of the aperture m which is formed in plate F. This is the preliminary step, and he will now see at aperture m the three zero-marks 000 at the point where the disks are tangent to each other. Now suppose he wishes to add up the sums or amounts two hundred and thirty-six, one hundred and twenty-seven, and fifty-four. He inserts the stylus in the socket n opposite the number 54 on dial D and turns disk E to the right until the stylus strikes the stop g. The number 054 now appears at aperture m. He then inserts the stylus in the socket opposite 27 on the dial and again turns the disk until the stylus is stopped by the piece g. The number now appearing at aperture m will be 081, (054 + 27.) He next inserts the stylus in the socket n opposite 36 on the dial and turns the disk as before. The number appearing at aperture m will now be 117, (081 + 36.) This sum being more than one hundred, the disk E will have made more than one revolution, and consequently will have acted through the pallet-lever I on disk G, to move the latter one-fiftieth of a revolution, and thus bring the hundred-numeral 1 thereon to the reading-aperture in place of 0. He now adds the hundreds (in the present case of the amounts two hundred and thirty-six and one hundred and twenty-seven) by inserting the stylus in the socket p in disk G that stands opposite the number 1 in the series of index-numerals a' along the margin of recess y in plate F and turns disk G to the right as far as the end margin of said recess y will allow. The sum at aperture m will now be 217. He then inserts the stylus in the socket p opposite number 2 of the series a' and repeats the operation, when the sum at aperture m will be 417, which is correct. Any series of sums or amounts not exceeding hundreds in each may be thus added up. If there are four or more figures in the amounts of the column, he adds up the units and tens in the column, sets down with a pencil the units and tens in the sum, and carries the hundreds to the hundreds column, which he then adds independently.

To facilitate the carrying of the hundreds, I provide the disk E with a series of numerals a^2, which may extend to 20 or more, as desired. The numerals of this series are so arranged that they stand when the disk is at zero opposite the corresponding index-numerals on the dial D. For example, after the units and tens have been added up, suppose there are five hundreds to carry. The operator sets the disks at first by inserting his stylus, not in the socket n opposite index z, but in the socket at 5 of the series a^2, and

turns disk E until the stylus stops against the piece *g*. Thus he adds up the "carries" simultaneously with the setting of the disks.

One of the more important features of my machine is the internal mechanism for imparting intermittent impulses to the disk G. In order to enable said disk to be conveniently rotated independently of disk E, I construct the pallets of the lever I with rather flat bevels, so that they will not positively lock the wheel H.

It has been a desideratum in this class of machines to obtain a device capable of imparting a quick movement to the driven disk and one that would at the same time move said disk positively to the proper extent and no more. It was necessary, also, that the device should allow the driven disk to be independently rotated. My lever-escapement effects these objects perfectly. The object in employing a snail-cam, as *j*, to actuate the operating-lever J is to draw back the pallet-actuating end of said lever gradually, and also to provide the disk E with a friction-brake to steady it in its rotation and prevent it from revolving too easily.

The lever J is provided at its end with a peculiarly-constructed L-shaped trip *v*, pivoted at its internal angle to the end of lever J. The tail *v'* of this trip stands between two guide-pins *w* and *w'*, fixed in the bottom plate of casing A, which serve to give the proper movements to the operating point or arm v^2 of the trip.

Figs. 2, 4, and 5 show the trip in its several positions and illustrate its action on the rearwardly-projecting part or spur s^2 of the pallet-lever I. Fig. 2 shows the parts in their positions of rest after an impulse has been given to disk G and the elements of the actuating mechanism have resumed their normal positions. Starting from this, if the disk E, and with it the cam *j*, be rotated to the right in adding, the snail-cam will gradually draw back the end of the lever J, which bears trip *v*, by the action of said cam on the tail J' of said lever. As the trip *v* moves back the inner guide-pin *w* will act on or arrest the tail *v'* of the trip and throw out the point v^2 of the latter until the tail of the lever J rests on the highest point of cam *j*. This position of the parts is seen in Fig. 4. Now, when the shoulder *j'* of the cam passes the tail of lever J, spring *u* instantly throws the other end of the lever outward, the point v^2 of trip *v* strikes or engages the spur s^2 on the pallet-lever I and oscillates the latter in such a manner as to cause the pallet *s'* thereon to engage the teeth of wheel H and impart to it a movement to the extent of one half-tooth. This position of the parts is seen in Fig. 5, wherein the tail *v'* of the trip *v* is found in contact with guide-pin *w'*. The final act of the spring *u* in its action on lever J is to draw in the point v^2 of the trip out of engagement with the spur of lever I through the action of pin *w'* on the tail of the trip. This permits the spring *t* to retract the lever I to the position seen in Fig. 2, whereby the pallet *s* on same engages the tooth next succeeding that it engaged before and imparts a movement to the wheel H equal in extent to another half-tooth. Thus one vibration of the pallet-lever advances wheel H one tooth. It is not possible with this escapement for the disk G to be moved more or less than the proper distance at each impulse.

I employ sockets *n p*, &c., which do not extend through the disk, instead of holes or perforations, in order that the pin or point may be conveniently used for rotating the adding-disks without danger of its projecting into the casing in a manner to interfere with the internal mechanism. It is convenient, however, to employ a stylus such as that illustrated in Fig. 6, which consists of a slitted socket-tube of the proper size to embrace the end of an ordinary lead-pencil provided with a point adapted to enter the said sockets *n p*.

By recessing or rabbeting the margin of the disk E at *l* the series of numerals stamped thereon are protected against erasure or obliteration by constant chafing against the lower face of the dial.

The apertures *h* and *o* in the casing serve to lighten it, and also to assist in grasping and holding the machine. They are also convenient for hanging the machine up on a nail or hook and for securing it in place on a table. The large journal-bearings provided for the adding-disks and the absence of all screws for journals impart great durability to the apparatus, which is designed especially for resisting hard and constant usage for a long time.

To increase the durability of the machine, I make the stop-piece *g* of steel and let it into the ring-dial D, which will be made of softer metal—as brass, for example—so that the numerals and graduation-marks may be the better stamped thereon. The stop-piece may be secured in place by solder or the like.

The series of "carry" numerals a^2 is not an essential feature, and it may be omitted. The series *a'* on plate F over the disk G may be extended, if desired, beyond nine digits. The size of disk G relatively to disk E and the number of divisions on its margin are not important. I have shown it half as large as disk E. It is necessary, however, that the numbers in the hundreds series on the margin of disk G shall be equal to the number of teeth in wheel H as the apparatus is here represented.

In assembling the parts of my machine the escapement or internal mechanism is first placed in the cavity of the casing. The adding-disks are then slipped onto the journals, and, finally, the ring-dial D and ring-plate F are placed and secured. The dial and ring-plate F serve to hold the disks

down in place. The disk E is supported at its margin on the rabbeted face or shoulder *k* of the casing.

Having thus described my invention, I claim—

1. The combination of the rotatively-mounted units and tens disk, the rotatively-mounted hundreds-disk, the toothed wheel fixed to the latter disk, the vibrating pallet-lever having one of its pallets held in engagement with the teeth of said wheel by a spring, and the said spring whereby said wheel may be rotated continuously and independently by the yielding of said spring, as set forth.

2. The combination of the units and tens disk, the hundreds-disk, the toothed wheel fixed to the hundreds-disk, the pallet-lever, one of the pallets of which is held normally in engagement with the teeth of said wheel by a spring, the said spring, the intermediate lever for actuating said pallet-lever, its spring, and means, substantially as described, carried by the units and tens disk, for actuating said intermediate lever once in each revolution of said disk, substantially as described.

3. The combination of the units and tens disk provided with a snail-cam, the hundreds-disk, the toothed wheel fixed to and carried by said hundreds-disk, the vibrating pallet-lever and its spring, and the intermeate lever and its spring, the tail of the latter lever bearing on said snail-cam, substantially as described.

4. The combination of the units and tens disk provided with a cam, the hundreds-disk, the toothed wheel fixed to and carried by said hundreds-disk, the vibrating pallet-lever and its spring, arranged as shown, the intermediate lever and its spring, the L-shaped trip carried by said intermediate lever on its operating end, and the two guide-pins for the tail of said trip, all arranged to operate substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

CHAS. HENRY WEBB.

Witnesses:
HENRY CONNETT,
J. D. CAPLINGER.