

(No Model.)

3 Sheets—Sheet 1.

S. L. HUIZER.
ADDING MACHINE.

No. 515,228.

Patented Feb. 20, 1894.

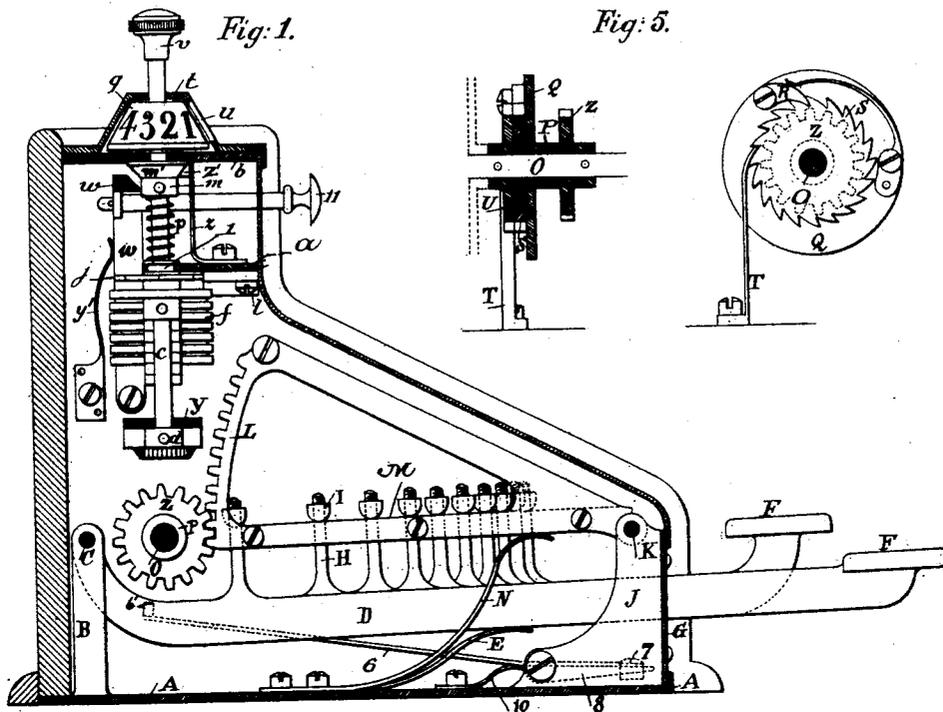


Fig. 1.

Fig. 5.

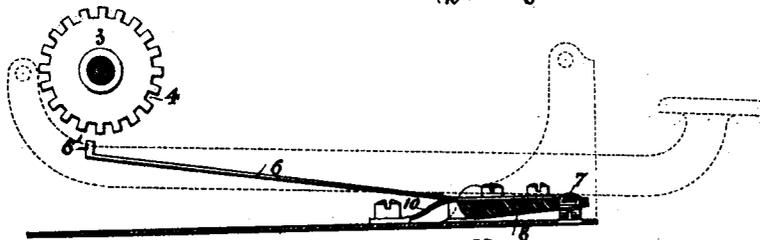
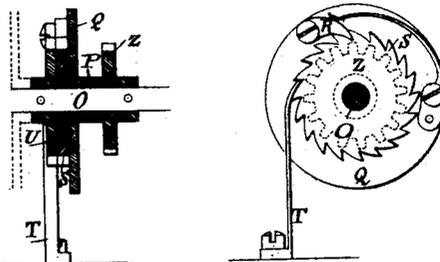
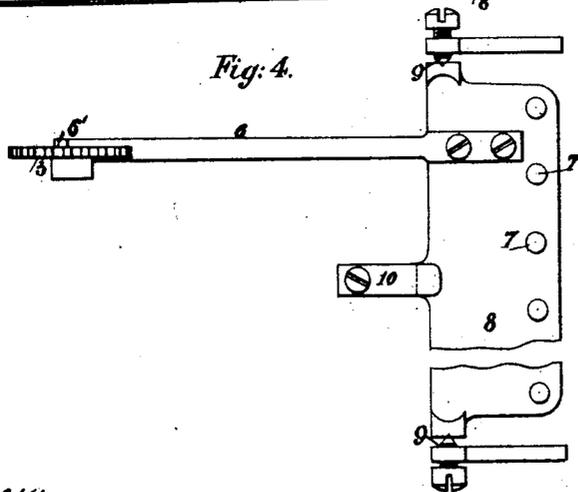


Fig. 4.



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3 Sheets—Sheet 2.

S. L. HUIZER. ADDING MACHINE.

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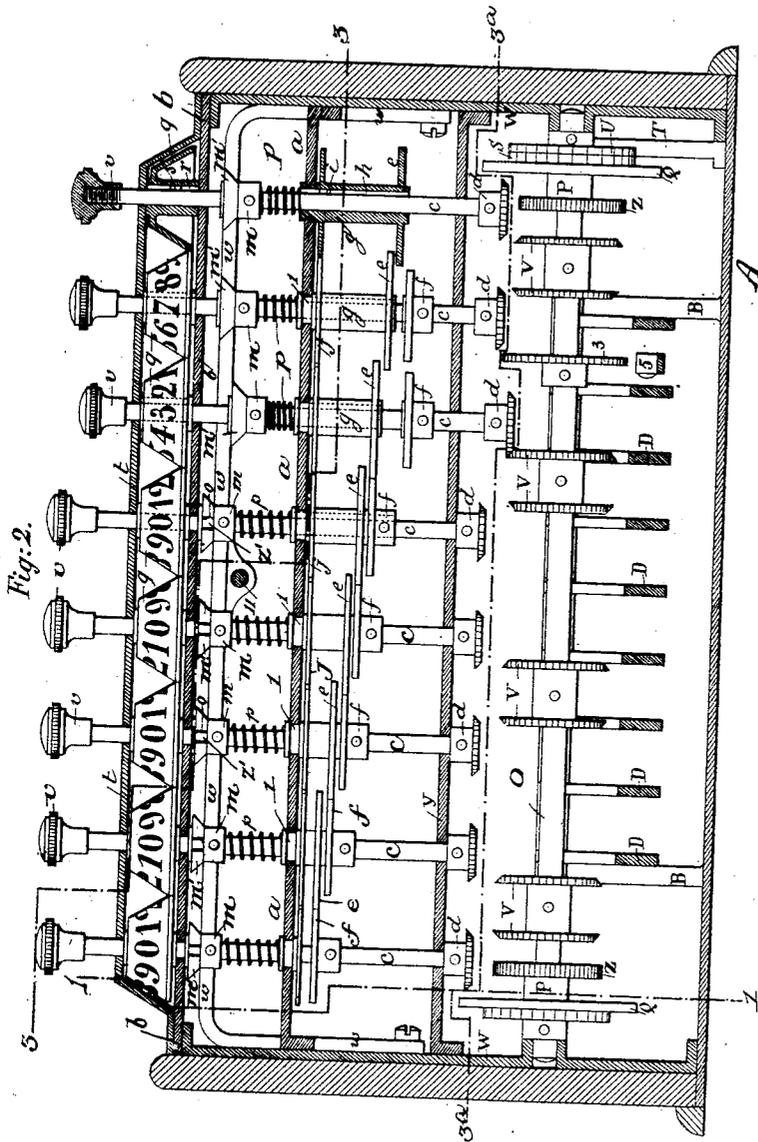


Fig. 2.

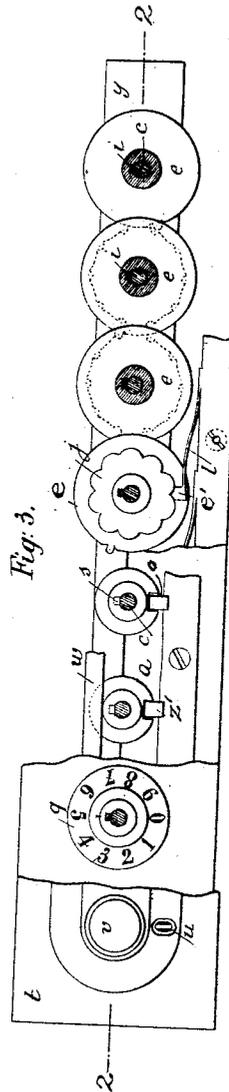


Fig. 3.

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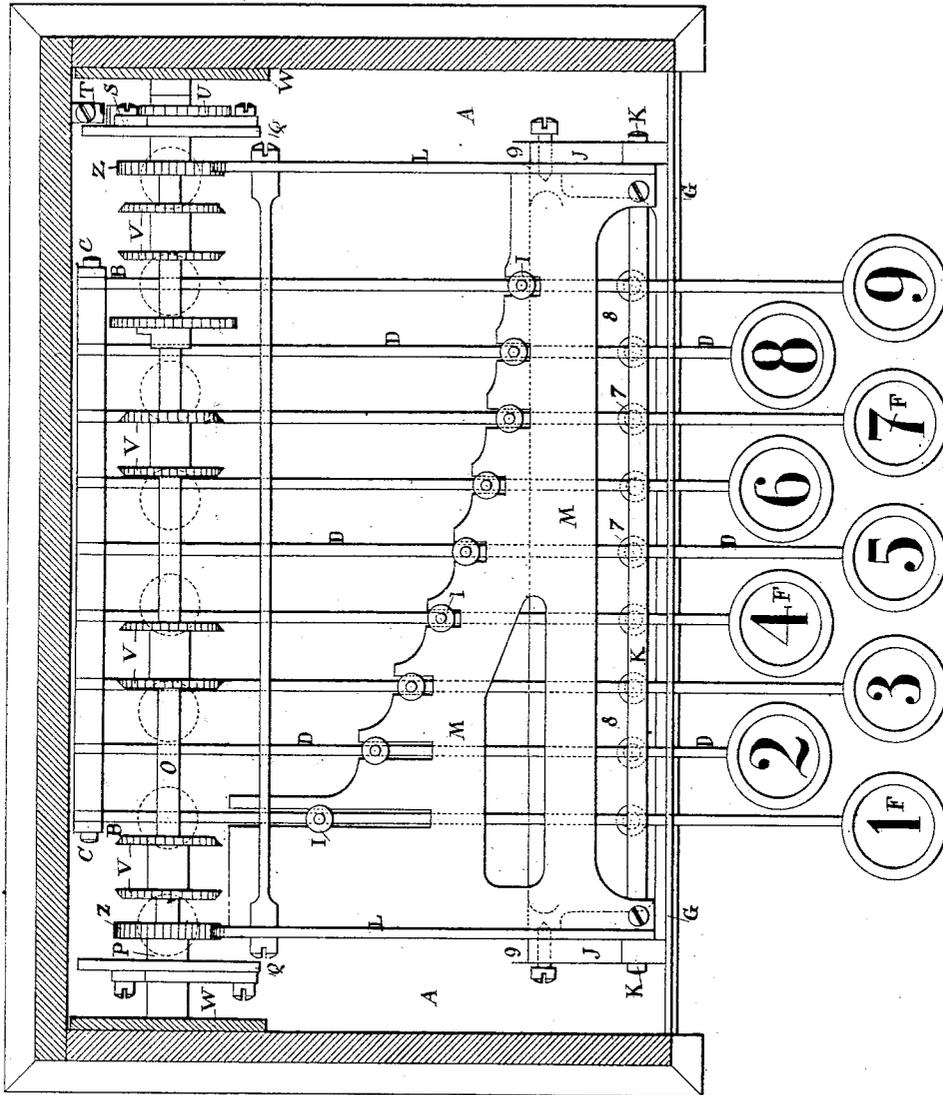
3 Sheets—Sheet 3.

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Fig. 3.^a



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UNITED STATES PATENT OFFICE.

SAMUEL LEENDERT HUIZER, OF THE HAGUE, NETHERLANDS.

ADDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 515,228, dated February 20, 1894.

Application filed June 15, 1893. Serial No. 477,697. (No model.) Patented in Belgium December 8, 1891, No. 97,493; in Germany March 9, 1892, No. 67,678; in France July 15, 1892, No. 222,997, and in Switzerland January 2, 1893, No. 5,743.

To all whom it may concern:

Be it known that I, SAMUEL LEENDERT HUIZER, engineer, a subject of the Queen of the Netherlands, residing at 180 Riouwstraat, The Hague, in the Kingdom of the Netherlands, have invented certain new and useful Improvements in and Relating to Adding-Machines, (for which I have obtained patents in Belgium, No. 97,493, dated December 8, 1891; in Germany, No. 67,678, dated March 9, 1892; in France, No. 222,997, dated July 15, 1892, and in Switzerland, No. 5,743, dated January 2, 1893,) of which the following is a specification, reference being had to the accompanying drawings.

The machine which forms the subject of this invention has for its object to effect the rapid and accurate addition of long columns of figures and it will be a useful auxiliary for all those whose occupation obliges them to effect similar operations.

In the accompanying drawings I have shown how my said invention may be conveniently and advantageously carried into practice.

Figure 1 is a transverse vertical section of the machine taken on the line 1—1 of Fig. 2. Fig. 2 is a vertical longitudinal section of the machine taken on the line 2—2 of Fig. 3. Fig. 3 is a horizontal section on the line 3—3 of Fig. 2. Fig. 3^a is an horizontal section on the line 3^a—3^a of Fig. 2; Fig. 4, detail views of the mechanism for arresting the rotation of the shaft O; Fig. 5, detail views of mechanism for rotating the shaft O in one direction only.

The same letters and numerals of reference indicate the same or corresponding parts in the several figures of the drawings.

Upon the bed plate A are arranged two uprights B formed on or fixed to the said bed plate and in which is mounted a shaft C serving as an axis for the levers D each held in its uppermost position by means of a spring E, the levers are each provided at their extremities with a key F marked 1, 2—9. The levers D are guided and limited in vertical grooves formed in the front plate G of the apparatus. On the levers D are arranged, at unequal distances from the common axis C screwed rods H each of which is provided with a small regulating nut I. J J represent

two other uprights or brackets formed on or fixed to the said bed plate A, and in which is mounted a shaft K serving as an axis upon which two toothed sectors L are pivoted see Figs. 1 and 3^a. These sectors are connected with each other by means of the plate M having the form shown in Fig. 3^a and retained in their upper position by means of springs N. The screwed rods H of the levers D pass into the grooves formed in the plate M, on the upper surface of which rest the regulating nuts I. When the levers D are depressed under the action of the keys F they communicate their movement to the sectors L, by means of the rods H, which pass through the plate M secured to the sectors and the nuts I screwed onto the ends of said rods and which bear upon the top of the plate M, the movement of the said sectors being greater the farther the rod H is situated from the axis C. The said sectors act upon two toothed wheels Z which turn loosely with their sleeves P upon the shaft O see Fig. 5. Upon the sleeves P are keyed the disks Q carrying the pawls R which act on the ratchet wheels S fixed to the shaft O as shown in Fig. 5. When therefore one of the levers D is depressed it causes the shaft O to turn, but when the key is released and the lever and sectors rise again under the action of their springs; the shaft is held in its place by the spring pawl T see Fig. 5 which engages with the ratchet wheel U which, like the ratchet wheel S, is fixed upon this shaft. On the shaft O are also mounted eight toothed wheels V see Fig. 2 which serve to transmit the movement of the shaft O to the rods *c* hereinafter referred to.

The shaft O turns in holes provided in the plates W which plates are arranged at the rear of the casing and at each end thereof, said plates being secured to the plate *b* and base A of the casing and to which are secured the horizontal plates *y*, *a*, and *b*. The said horizontal plates are provided with holes through which the vertical rods *c* pass, the said rods being adapted to turn easily in the said holes. The aforesaid rods carry at their lower extremities the toothed wheels *d* corresponding to the toothed wheels V upon the shaft O; while between the lower plate *y* and the intermediate plate *a* the said rods

are provided with wheels *e* and *f*. The wheels *e* are each provided with one tooth, see Fig. 3, while each of the wheels *f* has ten recesses so that when one of the wheels *e* has performed a complete rotation the rod *c* and its wheel *f* immediately to the left will be turned through one-tenth of rotation in order to carry the tens. The wheels *f* are fixed upon the rods *c*, while the wheels *e* are formed on or attached to the vertical sleeves *g* each provided with a groove *h* (see one sleeve in section, Fig. 2) in which a projection *i* on the rod *c* engages in such a manner that the rod may move up and down in the sleeve, but cannot rotate independently of the wheel *e*. The wheels *e* are held vertically in position by means of the grooves *h* in the sleeve *g* which engage into openings in the plate *a*. On the sleeves *g*, immediately below the plate *a*, are formed or fixed disks *j* each having ten notches in its periphery with which engages the nose *l'* of a spring *l* (see Fig. 3) in order that the rods will always be stopped exactly upon a division corresponding to one-tenth of a turn.

At the upper part of each of the rods *c*, below the plate *b*, is mounted a collar *m* terminating above in the form of a truncated cone *m'*. In the conical part of the said collar is formed a vertical groove *o*. Between the lower face of the collar *m* and the upper face of the sleeve *g* is arranged a helical spring *p* which surrounds the rod and which has for its object to retain the rod *c* in its uppermost position thereby bringing the upper face of the conical part of the collar *m* in contact with the plate *b*.

Above the plate *b*, upon each rod *c*, is mounted a conical drum *q* provided with numbers, the sleeve of the said drum has a vertical groove *r* (see one in section Fig. 2) with which engages a projection *s* on the rod in such a manner that the rod can move up or down in this drum but cannot turn without causing the said drum to rotate with it. The said drums are held in their place by the aid of the cover plate *t* of the machine having the form shown in Figs. 1 and 2 of the drawings and the front face of which has formed therein, for each drum, an aperture *u* at which a number on the said drum appears. The collars *m* are arranged in such a manner on the rods that the grooves *o* come exactly below the zero point *O* of the drums, as seen in Fig. 2. The upper extremity of each rod *c* is provided with a milled head *v* extending above the cover plate *t*.

To the lateral plates *W* is pivoted a bent bar *w* extending the entire length of the machine and adapted to turn upon the points of attachment to the said plates *W*. A spring *y'* keeps this bent bar to the front. At its upper face the said bar is cut obliquely so as to engage against the conical surfaces *m'* of the collars *m*, when the latter are depressed.

Upon the intermediate plate *a* are mounted spring strips *z* (one for each rod *c*), the projections *z'* on the ends of which engage into

the vertical grooves *o* formed in the conical part of the collars *m*. The projections are cut at their upper face obliquely in order that they may be applied exactly against the said conical edges.

When a rod *c* is depressed the spring *z* corresponding to it and also the bent rod *w* are pushed to the rear, and then return to their original position retaining the collar *m* and the rod connected therewith in the lowest position. In this position (as shown by the third rod from the right in Fig. 2) the wheel *d* engages with the corresponding wheel *V* arranged upon the axis *O* in such a manner that when a key is depressed and consequently the axis *O* set in rotation the depressed rod turns with it. By the depression of the rod, the wheel *f* is thrown out of gear with the wheel *e* of the rod immediately on the right, so that all the rods on the right remain immovable during the rotation of the axis *O* while the rod immediately on the left turns one-tenth of a rotation in each complete rotation of the depressed rod.

The number and dimensions of the teeth of the wheels *V*, *d*, and *Z* and of the sectors *L* are such, and the place of each rod *H* upon its lever *D* is such, that by the depression of a key the rod *c* turns as many tenths of a complete rotation as corresponds to the value of the number marked on the said key.

To prevent the axis *O* from turning more than is required, the said axis has mounted thereon a ratchet wheel 3 (see Fig. 4) the number of intermediate spaces 4 between the teeth of which is in such proportion to the number of teeth of the wheels *V* and *d* that when the rod *c* by the rotation of the axis *O* has turned one or more tenths of a rotation an intermediate space 4 presents itself opposite the projection 6' of the spring strip 6. The said spring strip 6 is fixed to the oscillating plate 8 which can turn upon pivots 9 and in which are mounted the buttons or screws 7. When a lever by the depression of its key has nearly reached the lower end of its movement it will bear upon the button or screw 7 which corresponds to it, and will cause the oscillation of the plate 8 which raises the strip 6, the projection 6' of which engages with the corresponding intermediate space 4 of the wheel 3, thereby preventing the axis *O* from turning more than is needed. The spring 10 keeps the oscillating plate depressed at its rear edge at ordinary times.

The numbers indicated upon the first drum *q* on the right represent the units, those on the next drum the tens, and so on. Each of the drums is provided with the numbers 0 to 9 either from left to right or from right to left according to the direction of rotation to which the rod corresponding to the drum under consideration is subjected. In a machine built as shown in Fig. 2 the numbers on the drums alternate.

In order to effect an addition I operate the apparatus in the following manner: I depress

the first rod on the right, which brings the two corresponding wheels d and V in contact. Pressing now successively upon the keys corresponding to the numbers to be added in the column of the units I cause the turning of the depressed rod c through as many tenths of a complete rotation as indicated by the successively lowered keys. In each ten tenths of a turn, that is to say, in each complete rotation of the rod the following rod is rotated one-tenth of a rotation, in each hundred-tenths of a rotation of the first rod that is to say in each ten-tenths of a rotation, or complete rotation of the second rod or rod for the tens the rod for the hundreds turns one-tenth of a rotation and so forth until the last number of the column for the units is added and at the end of the calculation the sum of the numbers of this column is read off by the succession of the figures which appear at the apertures u in the cover plate t . When the column of units has been added I depress the rod for the tens which first pushes back, by the conical part m' of the collar m , the bent rod w , which has the effect of releasing the rod for the units. The latter is then retained by its collar m in an intermediate position below the projection z' of the spring z . In this state the wheel f of the rod for the tens is disengaged from the wheel e of the rod for the units so that in the rotation of the rod for the tens the rod for the units will not be rotated and that consequently the number of the units of the sum to be obtained remains fixed at the aperture u corresponding to the drum for the units. I now proceed in the same manner for the addition of the tens as I have proceeded for that of the units. For the hundreds I depress the third rod, which has the effect of liberating the rod for the tens, and putting the apparatus in the position shown in Fig. 2. The third rod is from this moment also uncoupled from the second which remains in the same position as the first, showing at the corresponding aperture u the number of the tens of the sum to be obtained. When I have proceeded in this manner for the several columns in the addition I read at the successive apertures u of the cover plate, commencing with the left, the total to be found. Before proceeding with another addition it is necessary to return the parts to their original position, with the drums indicating zero. After the former addition had been performed the last rod c employed in the operation remained depressed and held down by the bar w resting over and engaging the top of the cone portion m' of the collar m , and in order to release said rod I employ a push rod 11 which at its rear end is connected to the bar w (as seen in Fig. 1). By pushing in said rod the bar w is caused to disengage the collar m . Nothing remains to be done now but to turn the rods by acting upon the milled heads v beginning with the rod on the left until each drum q presents at the corresponding aperture u the cipher 0. The rotations

of the rods must of course take place in the opposite direction to that which had been imparted to them by the axis O . The rod having been moved back to zero the projections z' on the spring z can pass through the groove o of the collar, which under the action of the helical spring p moves this rod up to its highest position and couples it to the neighboring rod on the right through the medium of the wheels e and f .

The number of rods c may be augmented or diminished according as the machine is to be used for the addition of greater or smaller totals. In like manner the machine may be arranged for another system of numeration, than such as the decimal system, use being made for that purpose of wheels having corresponding numbers of teeth and a number of keys proportionate with the system employed. Thus for example for English money there must be eleven levers with keys and the first drum must bear the numbers 0 to 11, while the number of teeth of the wheels d and V must be in the proportion of ten to twelve. On the other hand the third drum for marking the tens of shillings must invariably bear 0, 1, 0, 1.

What I claim is—

1. In an adding machine, the combination with the pivoted key levers D normally held elevated by springs E , and each provided with a rod H having a nut I , of a plate M having graduated slots for the passage of the rods H and a toothed sector L secured to each side of said plate, springs for raising said plate and sectors, a rotatable shaft provided with gear wheels engaging said sectors, a clutch for permitting said shaft to revolve in but one direction, drums each provided with a series of numerals and mechanism for communicating the movement of said shaft to said drums, substantially as described.

2. In an adding machine, the combination with the pivoted key levers D normally held elevated by springs E , and each provided with a rod H having a nut, said rods being arranged at different points on the respective levers, of a plate M having graduated slots for the passage of the rods H and having secured to either side a toothed sector L , springs for raising said plate and sector, a rotatable shaft provided with gear wheels Z engaging said sectors, a clutch for permitting said shaft to revolve in but one direction, drums each provided with a series of numerals, gearing for successively communicating the movement of said shaft to said drums, and means for throwing the gearing of said drums successively out of gear with said shaft, substantially as described.

3. In an adding machine, the combination of the shaft O and toothed wheels V fixed upon said shaft, the vertically movable rods c having projections s , the slotted drums q engaging said projections, the wheels f fixed to said rods, the wheels e, j , mounted on and rotating with said rods but held against ver-

- tical movement, the springs *l* carrying projections *l'* engaging notches on the wheels *j*, collars *m* mounted on the rods *c* and having conical portions *m'* and grooves *o*, springs *z* having beveled ends *z'* adapted to engage said grooves, and toothed wheels *d* carried by said rods and adapted to engage the wheels *V* when the rods are depressed, substantially as shown and described.
- 10 4. In an adding machine, the combination with the rotatable shaft *O*, carrying toothed wheels *V*, of the vertically movable rods *c* carrying toothed wheels *d* adapted to engage the wheels *V* when the rods are depressed,
- 15 the collars *m* mounted on said rods and having conical portions *m'* and grooves *o*, springs *p* for holding said rods in a raised position, springs *z* having projections *z'* adapted to engage the grooves *o* an oscillating bar *w*,
- 20 and its spring *y'*, for engaging the rods *c* to

hold them when depressed, a push bar *11* for releasing said bar, drums *q* mounted on said rods, and gearing for successively imparting at regular intervals the rotation of one rod *c* to the rod next adjoining, substantially as shown and described and for the purpose specified.

5. In an adding machine the combination of levers *D* with the plate *8* provided with the buttons or screws *7*, the pawl *6* and the oscillating piece held by the spring *10*, the plate *8* adapted to turn upon the points *9*, and the wheel *3* fixed upon the axis *O*, as herein described and shown in the drawings.

In witness whereof I have hereunto set my hand this 20th day of May, 1893.

SAMUEL LEENDERT HUIZER.

Witnesses:

A. H. VOORWINDEN,
M. D. GARDNER.