

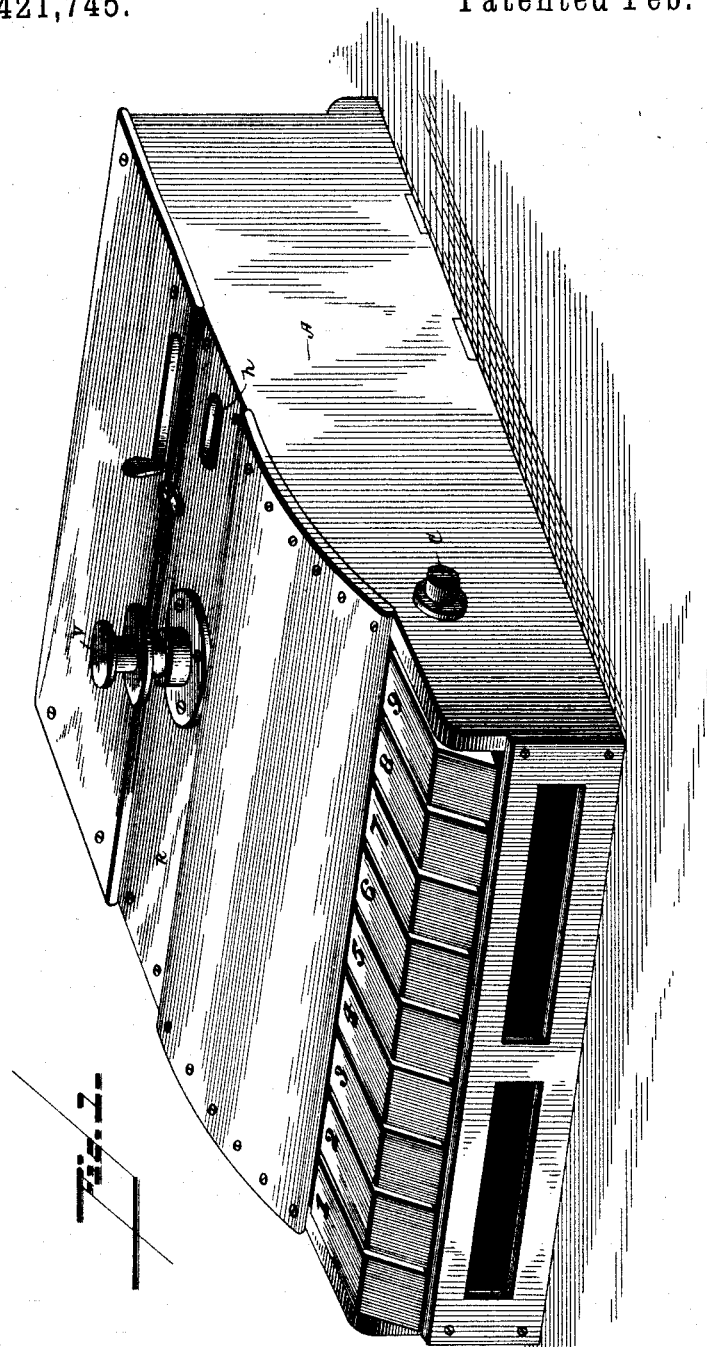
(No Model.)

4 Sheets—Sheet 1.

W. C. MILLS.
ADDING MACHINE.

No. 421,745.

Patented Feb. 18, 1890.



WITNESSES:

F. L. Ouraud.
C. F. Rhisholm.

INVENTOR:

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Attorneys.

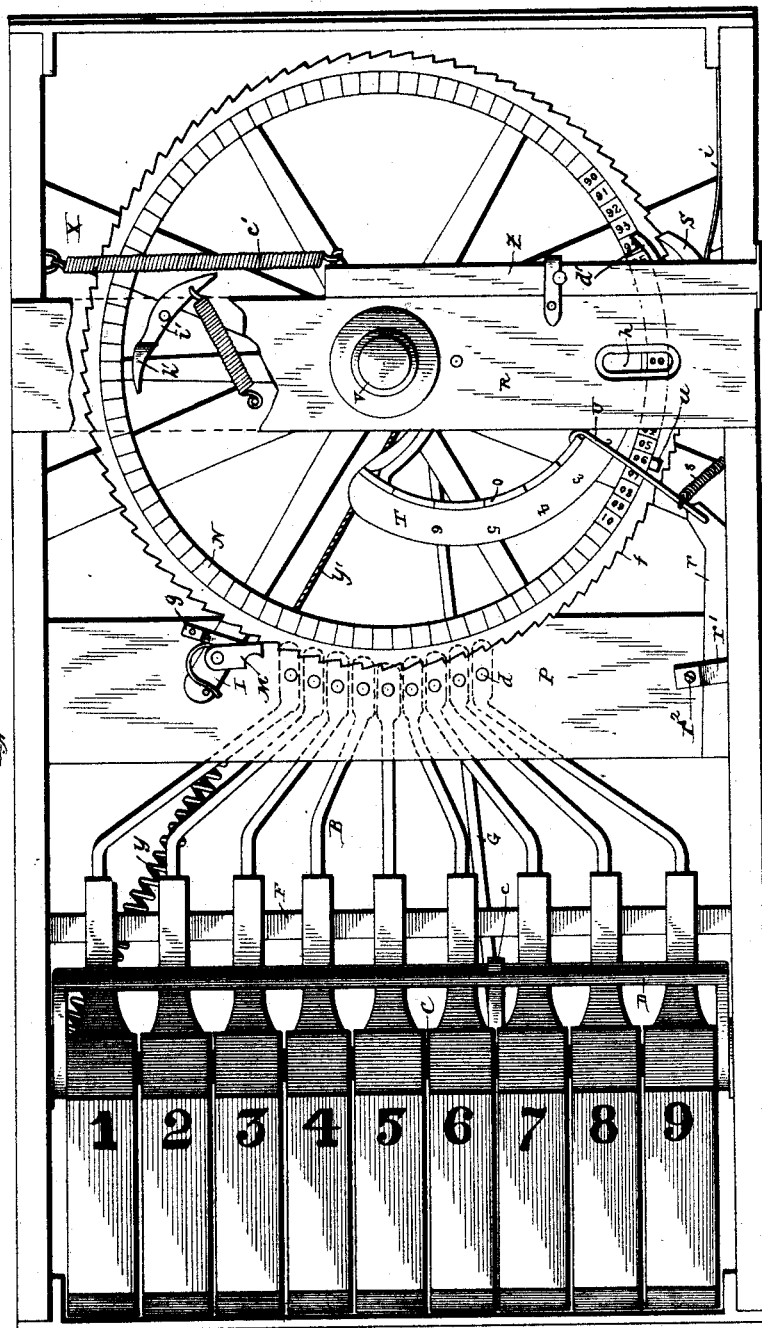
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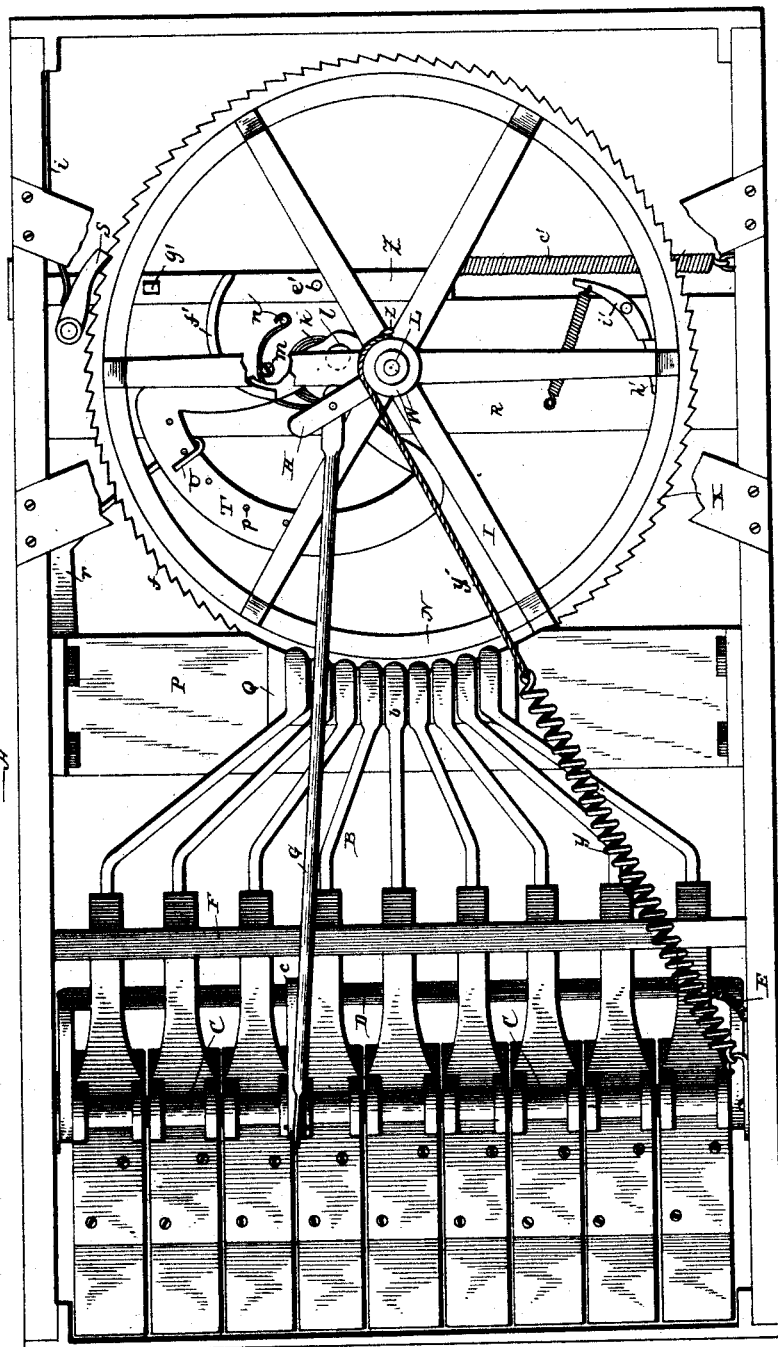
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Fig. 3.

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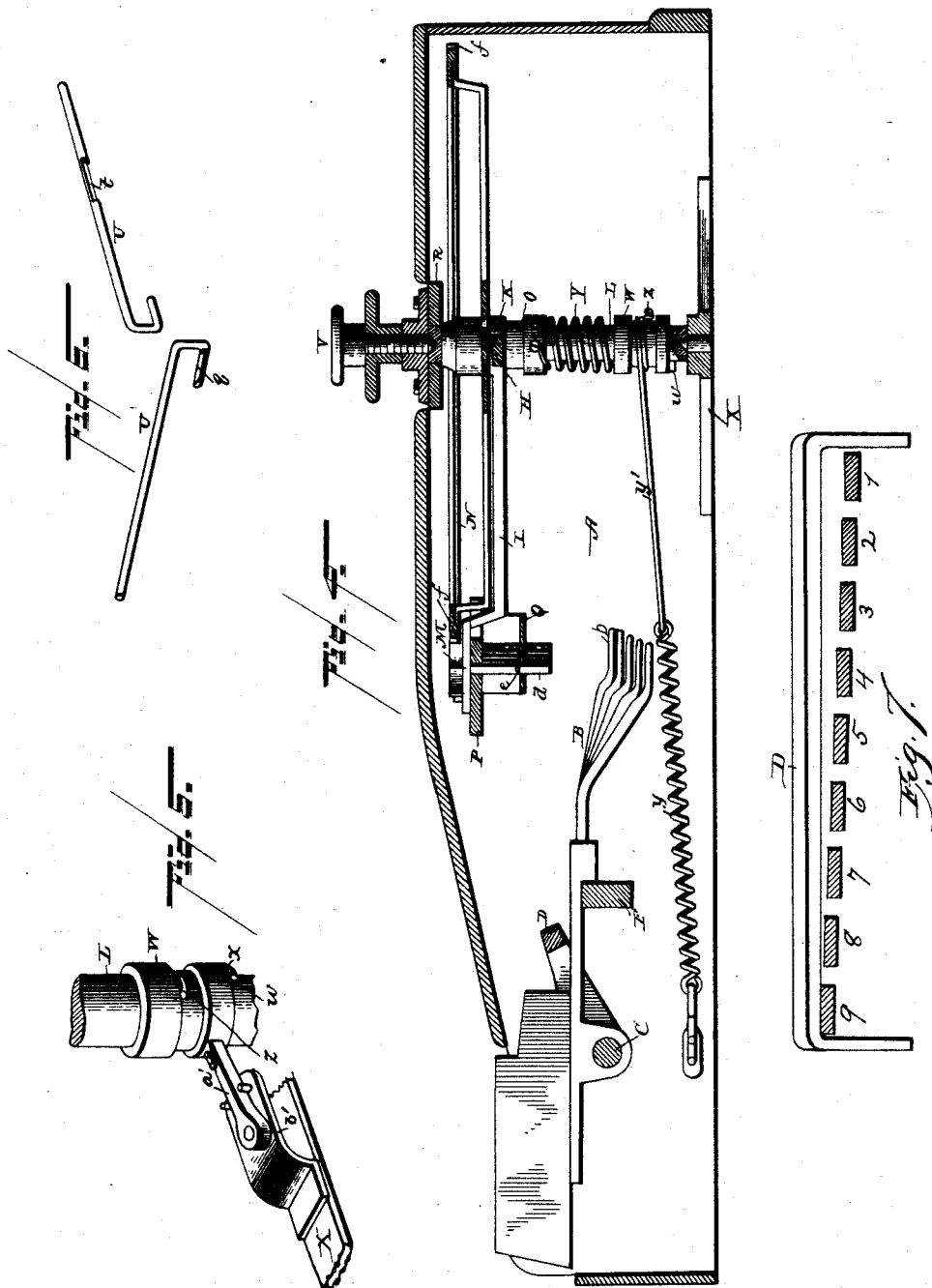
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UNITED STATES PATENT OFFICE.

W. COLUMBUS MILLS, OF OXFORD, INDIANA.

ADDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 421,745, dated February 18, 1890.

Application filed September 4, 1889. Serial No. 322,922. (No model.)

To all whom it may concern:

Be it known that I, W. COLUMBUS MILLS, a citizen of the United States, and a resident of Oxford, in the county of Benton and State of Indiana, have invented certain new and useful Improvements in Adding-Machines; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to adding-machines, and I aim to provide a machine of this class which shall be simple in construction and practical in operation. I attain these objects by the improved construction and novel adaptation and combination of parts of the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of the machine. Fig. 2 is a plan view of the same with a portion of the top removed. Fig. 3 is a plan of the bottom of the machine. Fig. 4 is a vertical longitudinal sectional view, and Figs. 5 and 6 are detail views. Fig. 7 is a detail sectional view of the key-levers.

Like letters of reference denote corresponding parts in all the figures.

The letter A designates the frame of the machine, which furnishes support and bearings for the working mechanism. At the front of the frame is a set of keys numbered consecutively from 1 to 9, inclusive, and fixed on a corresponding set of levers B, which are fulcrumed on a horizontal shaft C, having its ends fixed to the side pieces of the frame A. The shaft C also serves as a fulcrum for the pivoted action-bar D, which has two points of support—one near each end of said shaft. The action-bar is placed above the key-levers B and rests on the last of said levers, or the one to which is fixed the key numbered 9. Each of the other key-levers has a certain vertical play before it strikes the action-bar D, the amount of play being constant with the same lever, but varying with each successive lever, so that the key numbered 8 has slight vertical play before its lever strikes the bar D, the key numbered 7 a greater play than the key numbered 8, and each successive key in a descending scale more than the one to the right of it, as seen in Fig. 7.

A coiled spring E, fixed to the action-bar D

and to the frame A, tends to hold said bar down to the key-9 lever and to bring it back to that position when raised by the manipulation of any of the keys. Each key and key-lever returns to its normal position after manipulation by its own weight and by the pressure of the bar D, and in such position each lever rests upon a fixed horizontal bar F, which extends from side to side of the frame A. Fixed to the bar D is a downwardly and forwardly projecting arm c, the bifurcated end of which is pivoted to one end of the angularly-bent connecting-rod G. The rear end of this rod is pivoted in the bifurcated arm H of an elbow-lever. The arms H and I of this lever project from a collar K, which turns freely on a vertical shaft L. When the action-bar D is operated by the manipulation of the keys, its projecting arm c pushes the connecting-rod backward and turns the collar K, and consequently the long arm I, on the end of which is pivoted a spring-actuated click M. The click engages the horizontally-projecting teeth f of the units-dial wheel N, turns said wheel and the vertical shaft L, to which the hub of said wheel is fixed just above the collar K. Said collar K is confined between said hub and a set-collar O.

It has already been shown that the keys bearing the figures 1 to 8, inclusive, and the corresponding key-levers have a certain amount of loose play before the said levers strike and act on the bar D, and that the amount of such play increases from right to left. The total amount of play is also different for different keys, but increases from left to right, or in an opposite direction to that of the loose play. In order to effect this difference in the total amount of play, the fingers b of the key-levers are bent down more and more from left to right.

Each of the fingers b is adapted to strike against a corresponding pin d, a series of which are arranged to move vertically in a series of perforations through the lateral brace P and through a bar or plate Q, the upwardly and laterally extending flanges of which are fixed to the under side of said brace. These perforations are arranged in the form of an arc whose center is the center of the shaft L. In their normal position the top of the pins d

is flush with the upper surface of the brace P and depend about half their length below the plate Q. The vertical play of each of the pins *d* is limited by pegs *e*, inserted through said pins. When the top of the pins *d* is flush with the surface of the brace P, these pegs rest on the plate Q, and the pins can be raised by the fingers *b* till these pegs strike the under side of the brace P. Inasmuch as the pins *d* are all the same length and each has the same amount of vertical play, it is evident that the fingers *b* will rise to the same height with the action of the key-levers, and since each successive finger *d* from left to right is bent downward more than the one before it, and since the loose play of the successive key-levers increases from right to left, it becomes evident that the total play of successive keys and key-levers will increase from left to right; that they will successively raise the bar D to a greater height, and consequently turn the units-wheel N through a correspondingly greater arc by the action of the elbow-lever and click M.

The motion of the arm I is limited by the pins *d*, so that when the key bearing the figure 1 is pressed it raises the corresponding pin and arrests the movement of the arm I and click M when said click has turned the units-wheels through the arc represented by one of the teeth *f*. In like manner when any other key is pressed its finger *b* raises the corresponding pin *d* and arrests the motion of the elbow-lever and click when they have turned the wheel N through the arc occupied by the number of teeth represented by the figure on the key pressed.

When a key is released, the elbow-lever is brought back to its normal position by the action of the spring E, bar D, arm *c*, and connecting-rod G, and the arm I rests against a lug *g*, fixed on the brace P. The click also strikes this lug and is pressed out of contact with the teeth *f*; but as soon as the arm I moves away from the lug the spring-actuated click immediately engages the teeth *f*. There are a hundred of these teeth projecting at equal radial distances on the vertical periphery of the units-dial wheel. The horizontal surface of the periphery is divided into one hundred equal radial spaces corresponding to the hundred teeth. Ninety-nine of these spaces are numbered from 1 to 99, consecutively, and the last space is designated by two ciphers. As the units-wheel is turned these characters are visible through a slot *h* in the cross-bar R, which forms a part of the frame A. Underneath the cross-bar R and near the right side of the frame is placed a pawl S, upon a pivot depending from the cross-bar R. This pawl is actuated by a spring *i*, fixed to the frame A, which spring tends to keep the pawl in contact with the teeth *f*, and the wheel N is thereby held at any point to which it is turned by the click M and allowed to turn in only one direction.

Upon another pivot depending from the

cross-bar R turns a sector-shaped dial T, the figures on which are also visible through the slot *h*, and which registers the hundreds. It is actuated by a coiled spring *k*, one end of which is fixed to the collar or hub *l* of the sector-shaped dial. It then encircles the hub *l* like a watch-spring, and the outer end passes around a peg *m*, depending from the bar R, and is fastened to a second depending peg *n*. The upper side of the sector T is provided with a series of notches or ratchet-teeth *o*, and opposite these ratchet-teeth on the under side are a series of depending pegs *p*. Both the ratchet-teeth and the pegs are adapted to engage the rectangularly-bent hook U, which incloses the inner edge of the sector-shaped dial. The end of the hook U, which rests below the rim of the dial, is slightly bent or twisted forward, and is beveled on the rear side, as shown at *q*, so that when the hook is raised from a ratchet-tooth it will slip past the peg opposite said tooth and will catch against the next peg before the upper side of the hook has reached the next tooth. This will arrest the motion of said dial, which, by the action of the spring *k*, tends to fly around, so that the hook U will have time to drop and catch the next succeeding tooth in the upper face of the sector-shaped dial. The figures on this dial are arranged consecutively from 1 upward, are equidistant from one another, and correspond to the number of teeth *o*.

The hook U is hinged in the bifurcated end of a tapering arm *r*, held adjustable to the brace P by a button *r'* and set-screw *r''*, and a coiled spring *s*, fastened to said hook and to the frame A, tends to keep the hook in contact with the ratchet-teeth of the hundreds-dial.

At starting, to use the machine the units-dial wheel is in such a position that the two ciphers are visible through the slot *h*, and the hundreds-dial in such a position that a blank space on its face is visible through the slot. Then when the operation of adding is carried on by the manipulation of the keys, as heretofore shown, the sum, if less than one hundred, is read from the units-dial alone through the slot *h*. When the sum is more than ninety-nine, a lug *u* on the face of the units-dial strikes a bevel *t* of the hook U, raises said hook and allows the hundreds-dial to turn, so that the figure 1 is visible through the slot *h*. In like manner when at one operation the sum exceeds one hundred and ninety-nine, the lug *u* again raises the hook U, the hundreds-dial turns a second space, and the figure 2 is read on its face through the slot *h*; and so whenever the lug *t* raises the hook U, as it must every time the figures 99 pass beyond the slot *h*, the succeeding number on the hundreds-dial will be made to appear at the slot *h*.

The shaft L turns in suitable bearings between the cross-bar R and cross-brace X at the bottom of the frame. A thumb-screw V works through the bar R and bears with its

lower end against the upper end of the shaft, and by turning this thumb-screw the shaft and wheel are temporarily fixed when desired.

5 Near the bottom of the shaft L is a sleeve W, and a coiled spring Y, encircling said shaft between the set-collar O and the sleeve, tends to hold the sleeve down against a pin *w* in the shaft. The pin *w* strikes against a
10 lug *x* at the base of the sleeve and normally causes the sleeve to rotate with the shaft. A spring *y*, terminating in a cord *y'*, extends from the frame A to a hook *z* on the periphery of said sleeve and tends to hold the lug
15 *x* against the pin *w*. It is evident that the cord must wind around the sleeve W as the units-dial and shaft are turned, and that should the pawl S be thrown out of contact with the teeth *f* the spring *y* would cause
20 said dial and shaft to turn in an opposite direction.

In order that the cord *y'* may not be wound again and again about the sleeve W when the sum of an addition reaches several hundred a horizontally-projecting lug is so fixed
25 on the periphery of the sleeve that it will strike a beveled lug *a'* just at the time that the lug *t* strikes the hook U. The lug *a'* is placed on a knee *b'*, fixed to the cross-brace X, and operates to raise the sleeve against the
30 action of the spring Y, so that the lug *x* is raised over the pin *w* and the action of the spring *y* turns the sleeve once around; hence the spring *y* and the sleeve assume the same
35 relative position each time the 00 of the units-dial pass the slot *h*.

When one operation of adding is completed, it will usually be desired to have the parts of the mechanism assume their relative position
40 at starting. This is accomplished by the movement of a rod Z, which slides in suitable ways formed by projections of the bar R and a mortise in the frame A. This rod is actuated by hand, being provided with a button on its
45 free end, which extends outside of the frame of the apparatus. In sliding this rod to the right a depending pin *e'* catches a curved finger *f'* of the hundreds-dial, turns it so that its blank space appears at the slot *h*, and winds up
50 the spring *k*. At the same time a depending lug *g'* throws the pawl S out of contact with the teeth *f*, and the action of the spring *y* turns the units-dial wheel back, so that the two ciphers appear at the slot *h*, where the
55 backward revolution of said wheel is arrested by a beveled lug *h'*, fixed to one of the spokes of said wheel. This lug is so placed that it strikes against a spring-actuated pawl *z'* on the lower side of the bar R at the
60 instant the two ciphers appear at the slot *h* in a backward motion of the units-wheel. A spring *c'* extends from this rod *z* to the farther side of the frame A, and tends to draw the rod to the left. The head of the rod
65 strikes the outside of the frame A and prevents the rod from sliding too far to the left,

and a projecting pin *d'* is adapted to strike the inside of the frame A and prevent it being slipped too far to the right.

Having thus described my invention, I 70 claim and desire to secure by Letters Patent of the United States—

1. The combination, in an adding-machine, of a frame, a shaft journaled in suitable bearings of said frame, a toothed dial-wheel, 75 an elbow-lever, one arm of said lever having a spring-actuated click, a brace-bar having a lug adapted to limit the motion of said arm and throw the click out of contact with the teeth of the dial-wheel, a series of stops slid- 80 ing vertically in perforations of said brace-bar and of a plate fixed to said bar, a spring-controlled action-bar, a rod connecting an arm of said action-bar to the other arm of the elbow-lever, pivoted key-levers having une- 85 qually-bent fingers, a spring-actuated sleeve having a basal lug, a pin fixed to the shaft and adapted to engage said lug, a lug projecting horizontally from said sleeve, a lug attached to the frame and adapted to en- 90 gage said horizontally-projecting lug at each rotation of the dial-wheel, all arranged to operate substantially as described.

2. The combination, in an adding-machine, of a shaft having a rotary dial-wheel, a sleeve, 95 a vertical and a horizontal spring by which said sleeve is actuated, a pin adapted to turn said sleeve, a pawl adapted to hold said dial-wheel, a sliding rod adapted to disengage said pawl and allow said dial to turn backward, a 100 pawl adapted to arrest the backward rotation of said dial-wheel, and means for operating said mechanism, substantially as described.

3. The combination, in an adding-machine, of a rotary shaft having a toothed units-dial 105 wheel fixed thereto, a sleeve, a pin adapted to turn said sleeve, a lug adapted to engage a horizontally-projecting lug of said sleeve at each rotation of the dial-wheel, a hundreds-dial sector having ratchet-teeth and a 110 curved finger, a coiled spring fixed to the hub of said sector, a spring-actuated hook adapted to engage said ratchet-teeth, a lug on the units-dial wheel adapted to engage said hook at each rotation of the dial-wheel, a 115 pawl adapted to engage the teeth of said dial-wheel, a sliding rod having a depending pin adapted to engage the curved finger of the sector, and a lug adapted to engage a lug on said pawl, key-levers, and means, substan- 120 tially as described, for operating said dials with said key-levers, all constructed and combined to operate substantially as and for the purpose described.

In testimony that I claim the foregoing as 125 my own I have hereunto affixed my signature in the presence of two witnesses.

W. COLUMBUS MILLS.

Witnesses:

E. R. AUDLEY,
JOHN HEBER.