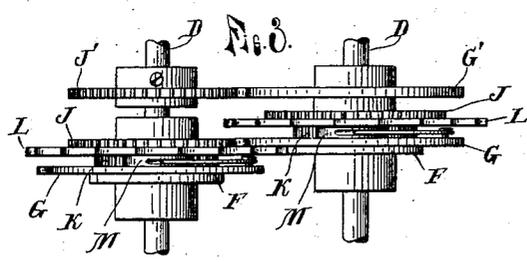
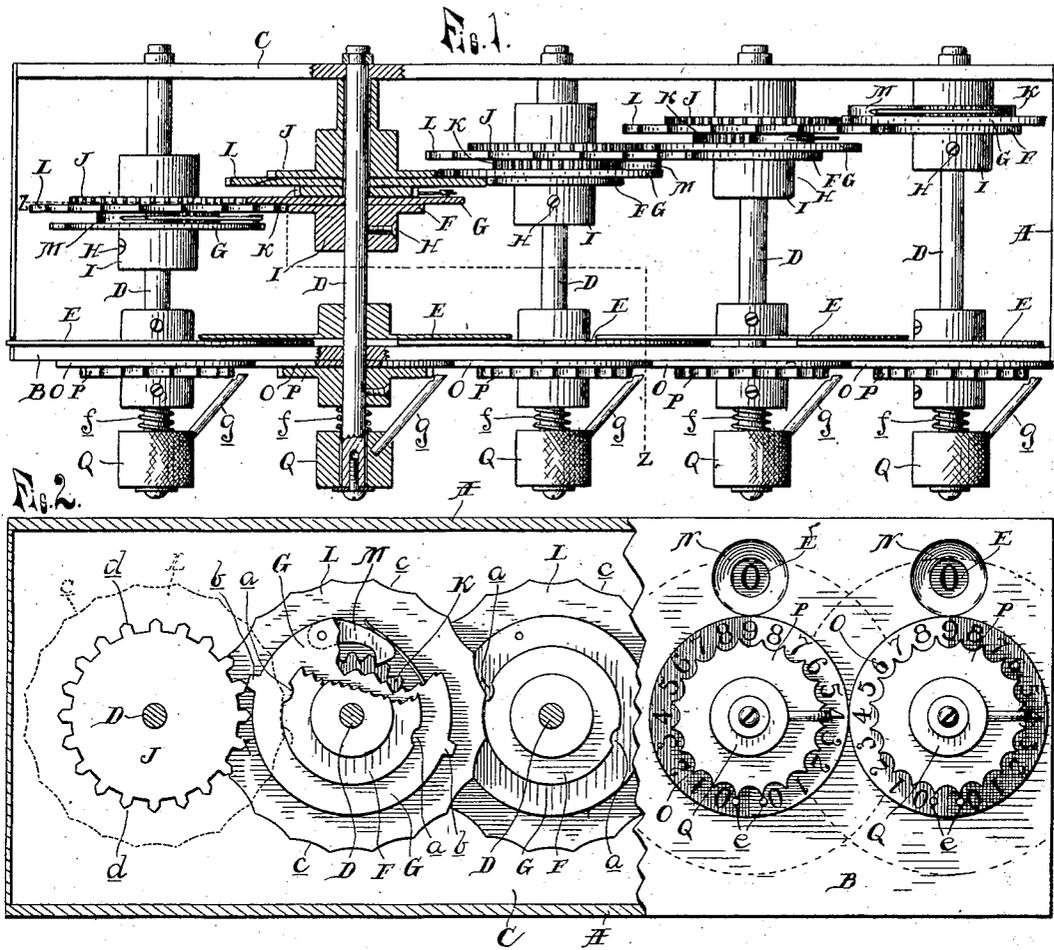


J. L. LEVIN.
ADDING MACHINE.

APPLICATION FILED MAY 26, 1902.

NO MODEL.



WITNESSES.

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JUDAH L. LEVIN, OF DETROIT, MICHIGAN.

ADDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 727,392, dated May 5, 1903.

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To all whom it may concern:

Be it known that I, JUDAH L. LEVIN, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Adding-Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to new and useful improvements in adding-machines, and has for its object to make a machine which shall be cheap, simple of operation, and capable of addition or subtraction, and in which the parts shall be locked at each and every step, so that there may be no error due to lost motion of the parts or the too-rapid manipulation of the machine, and in which the keys only of a higher denomination are capable of being affected by the key in operation, those of a lower denomination remaining unaffected.

To this end the invention consists of a series of shafts carrying wheels or gears arranged in pairs on the adjacent shafts, the wheels of both pairs being preferably fast on one shaft and sleeved upon the other shaft, the fast and loose wheels on the same shaft having a ratchet-and-pawl connection with each other, whereby upon each complete revolution of the shaft of lesser denomination a one-tenth revolution is imparted to the loose wheels on the next adjacent shaft of higher denomination and through the medium of said ratchet-and-pawl connection to the fast wheels thereon, which with each complete revolution imparts a one-tenth revolution to the next adjacent shaft of higher denomination, and so on throughout the machine, the notch and tooth on the fast wheels being so arranged in relation to each other and in relation to the scallops and teeth of the loose wheels respectively, that when the scalloped wheel is in engagement with the notch of the fast wheel, which is only at "9" and "0," the tooth of the fixed gear-wheel prevents the scalloped wheel from turning through the medium of a loose gear fixedly secured in relation to said scalloped wheel, and when the tooth of the fixed gear-wheel is not in engagement with the loose gear-wheel, which occurs always except at "9" and "0," the scallops of the scalloped wheel fit the periph-

ery of the fixed wheel and prevent the key under manipulation from affecting the next adjacent key to the right of lesser denomination, while the next adjacent key to the left of greater denomination is free to be affected with each complete revolution. Thus only the keys of higher numerical value are affected, while those of lesser value remain unaffected in the manipulation of the machine, whether in addition or subtraction.

The invention consists, further, in the peculiar construction, arrangement, and combination of parts, all as more fully hereinafter described, and shown in the accompanying drawings, in which—

Figure 1 is a plan view of my machine with the cover removed, showing one of the keys in horizontal section. Fig. 2 is a front elevation thereof, the casing being broken away to better show the interior parts along the line *z z*, Fig. 1; and Fig. 3, a plan view showing a modified form.

As shown in the drawings, A is the casing, provided with the front and rear walls B C, in which are journaled the series of parallelly-arranged horizontal shafts D, carrying the number-carrying wheels E and beginning with the right representing units, tens, hundreds, thousands, tens of thousands, &c.

F represents wheels fast upon the shafts by means of set-screws H passing through the hubs I, and G represents wheels of slightly-larger diameter secured to the sides of the wheels F or formed integral therewith. The wheels F are formed with notched or cut-out portions *a* on opposite sides, and the wheels G with a corresponding set of teeth *b* in diametrical line therewith.

JK are gear-wheels sleeved upon the shafts, each preferably formed with twenty teeth, and L represents wheels also sleeved on said shafts intermediate said gear-wheels, all of said wheels being secured together in any suitable manner.

c represents scallops, preferably twenty in number, formed in the edge of the wheel L and adapted to fit the periphery of the wheel F, so that the wheel L can only be turned by the operation of its own key when the notch *a* of the wheel F registers therewith and then only through the space of one tooth, the wheel F being free to rotate all the time. The teeth

of the gears J, with which the teeth on the wheel G are adapted to mesh, are preferably formed with oppositely-inclined ends *d*, so that when the notch *a* on the wheel F is in position for permitting the turning of the wheel L (which is only at "9" and "0") the inclined ends of the teeth will engage against the end of the tooth *b*, with the inclined end *d* parallel with the outer face of the tooth *b*, as shown in Fig. 2, and prevent the wheel from turning, so that in no position of the parts are the wheels capable of transmitting motion to the next adjacent shaft or key of lower denomination, but at the same time are always free to receive motion from said key or to permit the operation of either key.

M is a spring-backed pawl carried by the disk or wheel G and pivotally mounted thereon and cooperating with the teeth of the wheel K, so that as motion is imparted to the loose wheels J K L on the next shaft of higher denomination by the tooth *b* on the gear G to the right meshing with the teeth of the gear J it will in turn impart a corresponding motion to the key or shaft upon which said loose gears are mounted through the medium of said ratchet-and-pawl engagement with the fixed wheels, the power to turn the shaft not being sufficient to lift the pawl out of engagement with the ratchet-teeth. The pawl thus performs two functions—that is, it centers the parts at each twentieth of a revolution and forms the means for transmitting motion from the loose to the fixed wheels on the shaft. It will of course be understood that the position of the ratchet-teeth and pawl may be reversed without affecting the invention—that is, the pawl carried by the loose member and the gear by the fixed member—as also might the position of the loose and fixed wheels.

It will be noticed that I have twenty teeth or scallops upon all of the wheels J K L and two upon each of the wheels F G, two sets of numbers from "0" to "9" being provided on all of the number-carrying wheels, so that for each half-revolution of the shaft the next adjacent shaft will be turned through the space of one number, which numbers are displayed through openings N in the front of the casing.

O represents circular plates carrying like sets of numbers secured to the front of the machine and provided with central apertures through which the key-shaft passes and with stops *e*, the numbers on one half of the plate being preferably colored different from the other half or set, so that for addition the key is turned one way and for subtraction the other way, although if a person wishes he may make more than a half-revolution of the machine without affecting the accuracy of the machine.

P represents disks fast upon the shafts and provided with scallops corresponding in number to those of the numbers, and Q is a knurled knob sleeved on the end of the shaft, a suitable coil-spring *f* being sleeved on the

shaft intermediate said knob and disk to hold said knob away, and *g* is an arm carried by said knob adapted to engage the scallops of said disk when the knob is depressed, said arm at the same time forming a shoulder to engage the stops *e* and prevent the parts from turning too far, so that in the operation of the machine should it be desired to indicate "40" on the machine the operator takes the second key from the right (see Fig. 2) and engages it with the scallops at the numeral "4" and turns it toward the bottom until it engages the stop *e*, when the numeral will appear in the opening.

My machine in its simplest form will of course have but ten instead of twenty numbers on each dial and a corresponding number of teeth on each gear, necessitating the turning of a complete revolution of one shaft before a one-tenth revolution is imparted to the next, and it will be noticed that none of the wheels are fastened to the casing in any way, but are held from rotation by each other.

As there are times in which all of the keys must turn through the medium of the spring-ratchets at once, the springs in the machines having a large number of keys must be made rather heavy, which prevents an easy working of the machine, and in order to overcome this objection I have devised a modified construction (shown in Fig. 3) in which the shafts are positively actuated by the gears J' G', fast and loose upon their respective shafts and provided with teeth similar to the gears J G, which gears could be dispensed with, as the ratchet-and-pawl connection would only act to center the parts at each tooth.

Having thus fully described my invention, what I claim is—

1. In an adding-machine the combination with the shafts and actuating means therefor, of two pairs of wheels on each of said shafts, one pair cooperating to receive motion from the next adjacent shaft to the right and to prevent a retrograde movement and the other pair cooperating to impart movement to the next adjacent shaft to the left at predetermined intervals and to prevent a retrograde movement and a ratchet-and-pawl connection between said pairs of wheels on the same shaft, for actuating the one through the other.

2. In an adding-machine the combination of a series of shafts and actuating means therefor, each shaft provided with a pair of loose and fast wheels, the fast wheels on one shaft cooperating with the loose wheels on the next adjacent shaft and a ratchet-and-pawl connection between the two sets of wheels and actuating the one through the other.

3. The combination with a series of shafts of two sets of wheels on each shaft, one set being loose upon the shaft and adapted to receive motion from the next lower shaft and the other set being fast upon the shaft and

adapted to transmit motion to the next higher shaft, and a ratchet-and-pawl connection between the two sets whereby the loose set is adapted to transmit motion in one direction to the fast set and means for preventing the fixed set from receiving any motion back.

4. In an adding-machine the combination with a series of shafts, each shaft provided with a pair of loose and a pair of fast wheels, the loose wheels adapted to mesh or cooperate with a set of fixed wheels on the next shaft of lower denomination and the fixed wheels to cooperate with the loose wheels on the next adjacent shaft of higher denomination, whereby each complete revolution of the lower shaft imparts a one-tenth revolution to the loose gear on the next higher shaft and a ratchet-and-pawl connection between the two sets of wheels whereby the loose gears actuate the fast gears upon said shaft.

5. In an adding-machine the combination with the casing, of a series of shafts, provided with wheels arranged in pairs one of each pair having scallops to fit the periphery of the adjacent wheels and the other provided with diametrically oppositely disposed cut-out portions to permit the other wheel to rotate through the space of one tooth and a second pair of gears or wheels on said shafts cooperating with said first-mentioned wheels to prevent the latter of the first-mentioned wheels from turning when said cut-out portion is in position to permit the turning of the first-mentioned wheel.

6. In an adding-machine the combination with the supporting frame or casing of a series of shafts provided with wheels arranged in pairs one of each pair having diametrically oppositely disposed cut-out portions and the other having scallops to fit the periphery of said wheel and prevent the scalloped wheel from turning except when in engagement with said cut-out portions and a second set of wheels cooperating with said first-mentioned wheels to prevent the same from turning when in their operative position except through the medium of the shaft of lower denomination.

7. The combination with a series of shafts carrying the number-wheels and means for operating the shafts, of two pairs of wheels on said shafts, one pair fixed and adapted to transmit motion to the higher shaft and the other pair loose and adapted to receive motion from the lower shaft and means for actuating the one through the other.

8. In an adding-machine, a series of shafts and a corresponding series of fixed and loose

wheels arranged in pairs on said shafts, the loose wheels cooperating with the fixed wheels on the next adjacent shaft of lower denomination and the fixed wheels cooperating with the loose wheels on the next adjacent shaft of higher denomination and a ratchet-and-pawl connection between said fixed and loose wheels on the same shaft.

9. In an adding-machine, the combination with a series of shafts; of a pair of fixed and a pair of loose wheels on each shaft, the loose wheels on one shaft in alinement respectively with the fixed wheels on the next adjacent shaft to the right and adapted to cooperate therewith and the fixed wheels on said shaft in alinement respectively with the loose wheels on the next adjacent shaft to the left and adapted to cooperate therewith and means for transmitting motion from the loose to the fixed wheels on the same shaft and to the next adjacent shaft.

10. The combination with a series of shafts, and operating means therefor, of a pair of loose and a pair of fast wheels on each shaft, the loose wheels adapted to mesh or cooperate with a set of fixed wheels on the next shaft to the right and the fixed wheels to cooperate with the loose wheels on the next adjacent shaft to the left whereby each complete revolution of the lower shaft imparts a one-tenth revolution to the loose gear on the next higher shaft and a ratchet-and-pawl connection between the two sets of wheels whereby the loose gears actuate the fast gears upon said shaft in one direction only and transmit motion to the next adjacent shaft of higher denomination at predetermined intervals.

11. The combination with the casing of a series of shafts, each shaft carrying a number-wheel having a duplicate set of numbers from "0" to "9" adapted to be displayed through openings in the casing a corresponding set of fixed numbers on the casing, a disk fast on each shaft and having a corresponding number of scallops, a knob sleeved on the shaft and having a finger adapted to engage said scallops, a spring sleeved on the shaft, adapted to normally hold said finger out of engagement with the scallops and a stop to limit the combined movement of said finger and disk.

In testimony whereof I affix my signature in presence of two witnesses.

JUDAH L. LEVIN.

Witnesses:

JACOB LEVIN,
OTTO F. BARTHEL.