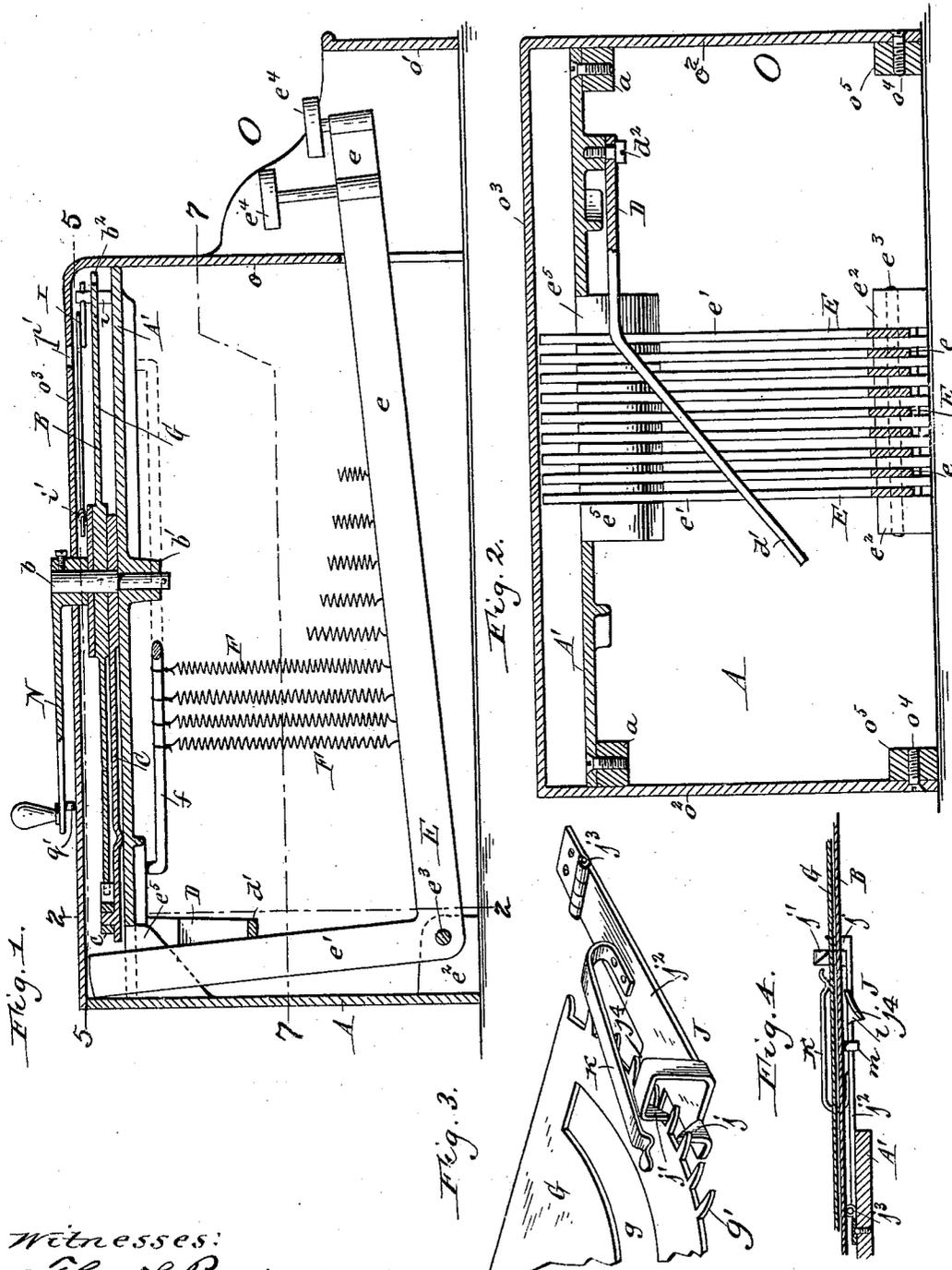


W. S. GUBELMANN.
ADDING MACHINE.

No. 507,810.

Patented Oct. 31, 1893.



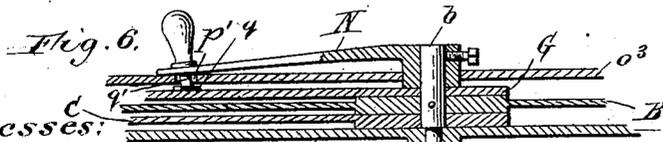
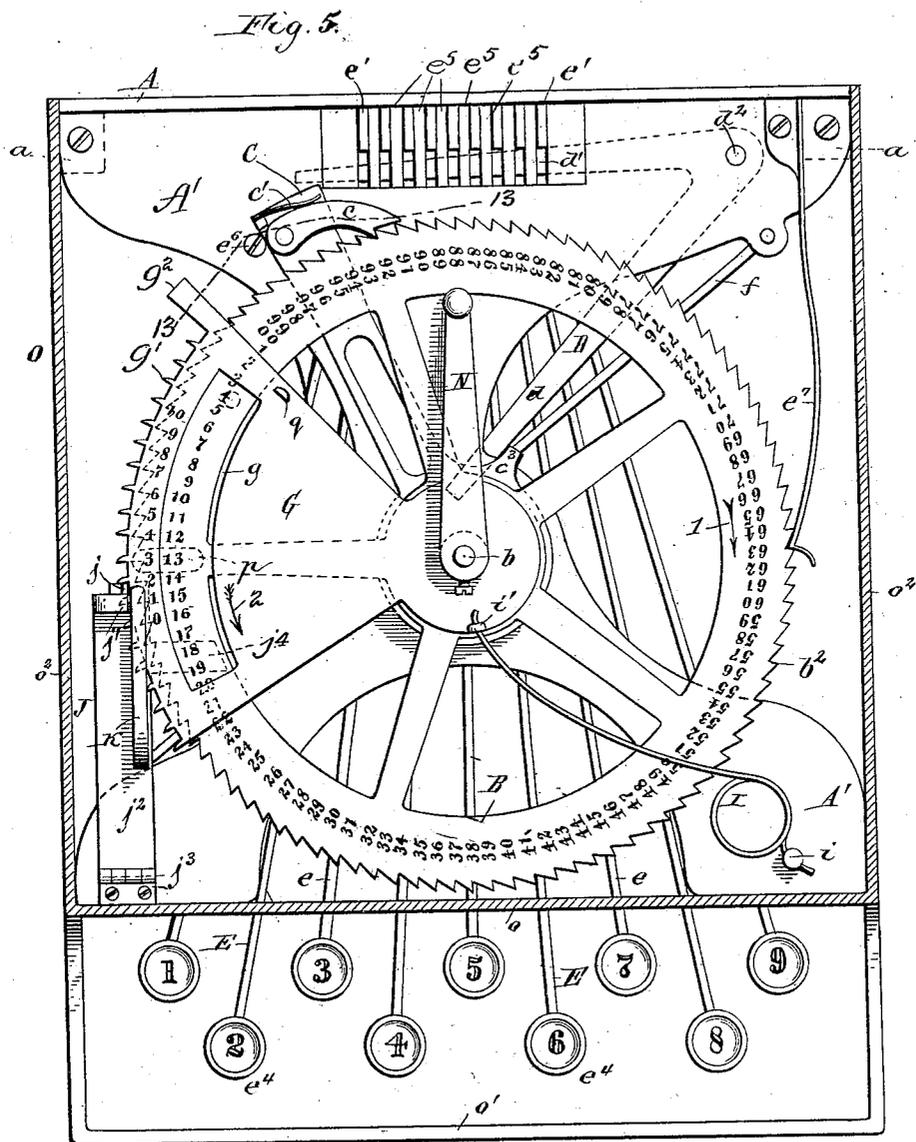
Witnesses:
Theo. L. Popp.
Friedrich, Gustav, Wilhelm

W. S. Gubelmann
 Inventor.
By Wilhelm Popp, Attorneys.

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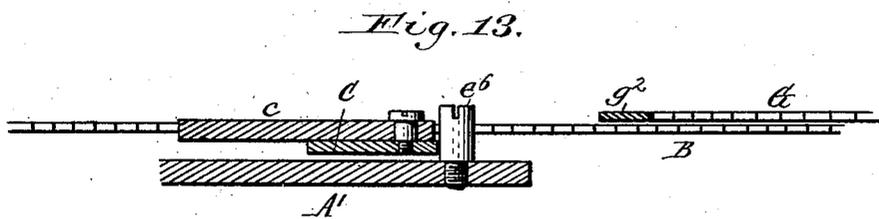
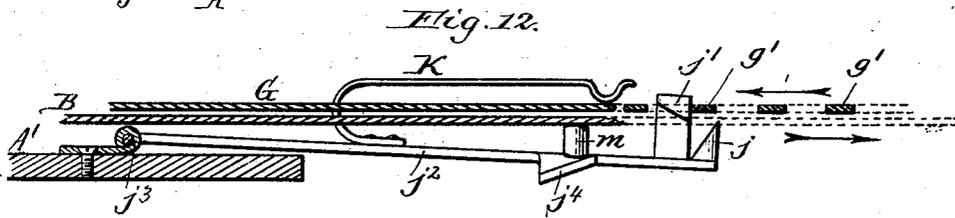
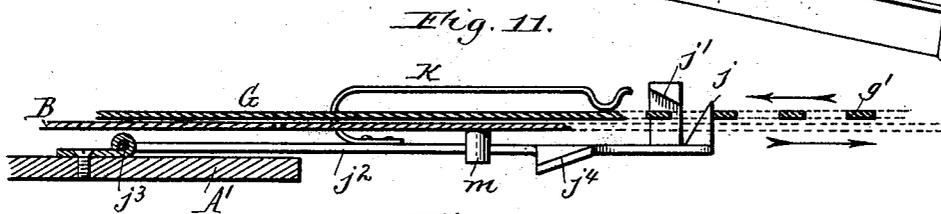
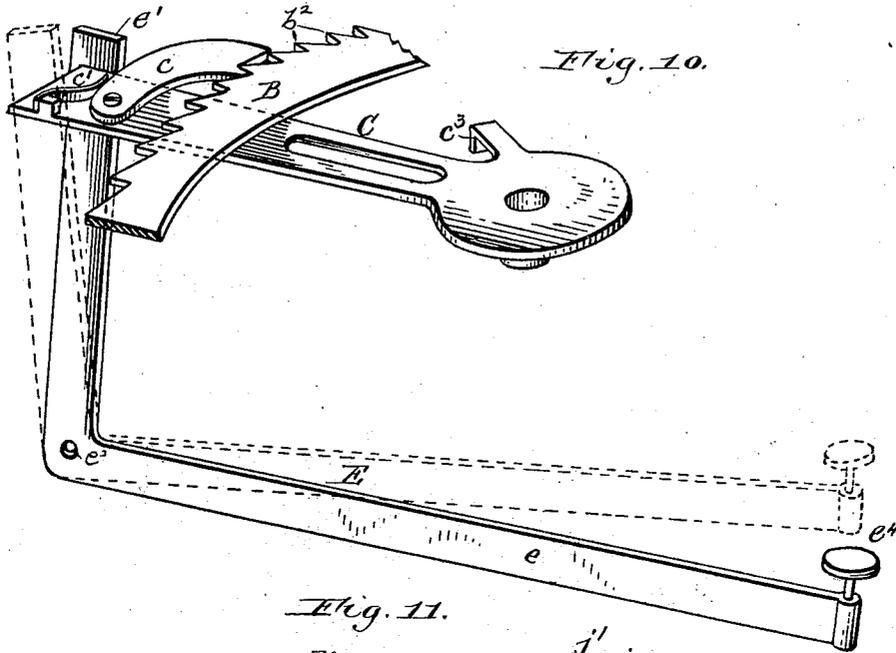
Witnesses:

Theo. L. Popp. W. S. Gubelmann Inventor.
 Friedrich, Gustav, Wilhelm By Wilhelm Hornum Attorneys.

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Witnesses:

Friedrich, Gustav, Wilhelm.
J. C. Geys.

W. S. Gubelmann Inventor.

By Wilhelm H. Pomeroy

Attorneys.

UNITED STATES PATENT OFFICE.

WILLIAM S. GUBELMANN, OF BUFFALO, NEW YORK.

ADDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 507,810, dated October 31, 1893.

Application filed June 30, 1891. Serial No. 398,002. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM S. GUBELMANN, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Adding-Machines, of which the following is a specification.

This invention relates to an adding machine in which a registering wheel or disk containing a row of numbers and inclosed in a suitable casing is rotated by a series of key levers, each key lever being provided with a number or figure. Upon depressing one of said key levers, the registering wheel or disk is rotated so as to expose, through an opening in the casing, a number corresponding with the number on the key lever, and upon depressing two or more of the key levers, successively, the number representing the numbers on all of the key levers depressed added together will be indicated on the registering wheel through the opening in the casing.

My invention has for its object to produce a machine of this class which will be simple and inexpensive in its construction and which will be positive and accurate in its operation.

In the accompanying drawings consisting of four sheets:—Figure 1 is a longitudinal sectional elevation of my improved adding machine. Fig. 2 is a vertical transverse section in line 2—2, Fig. 1. Fig. 3 is a fragmentary perspective view of the escapement whereby the movement of the registering segment is controlled. Fig. 4 is a fragmentary vertical section of the primary and secondary registers, showing an inside view of the escapement. Fig. 5 is a horizontal section in line 5—5, Fig. 1, looking down. Fig. 6 is a fragmentary vertical section, showing the manner of returning the registers to the place of beginning. Fig. 7 is a horizontal section in line 7—7, Fig. 1, looking up. Fig. 8 is a perspective view of the vertical wall and the horizontal frame attached thereto which supports the mechanism of the machine. Fig. 9 is a similar view of the casing inclosing the machine. Fig. 10 is a fragmentary perspective view, on an enlarged scale, showing the pawl arm and its pawl engaged with the ratchet wheel, and a key lever depressed with its upright arm bearing against the rear side

of the pawl. Figs. 11 and 12 are fragmentary vertical sections through the primary and secondary registers, on an enlarged scale, showing the two positions of the escapement whereby the secondary register is locked. Fig. 13 is a cross section, on an enlarged scale, taken in line 13—13, Fig. 5.

The same letters and numerals of reference refer to the same or like parts in the several figures.

A represents the vertical rear wall of the machine, and A' a horizontal supporting frame secured to lugs *aa* formed on the upper front side of the rear wall.

B represents a registering wheel arranged horizontally above the supporting frame and secured to a vertical shaft or arbor *b* journaled in a bearing *b'* formed centrally in the supporting frame A'. This registering wheel is provided on its upper face with a row of numbers running, preferably, from 0 to 99, and on its outer edge or periphery with an equal or corresponding number of ratchet teeth *b²*. This registering wheel is termed the primary register.

C represents a reciprocating pawl arm arranged horizontally between the supporting frame and the registering wheel with its inner end pivoted loosely on the arbor or shaft of the registering wheel.

c represents a pawl pivoted to the outer end of the pawl arm and engaging with the ratchet teeth of the register wheel. This pawl is held in contact with the teeth of the register wheel by a spring *c'* secured with one end to the outer end of the pawl arm and with its opposite end bearing against the pawl.

D represents an elbow lever whereby the pawl arm C is actuated to rotate the register wheel. This elbow lever is arranged underneath the supporting frame and composed of a horizontal front arm *d* and a downwardly inclined rear arm *d'*. The elbow lever is pivoted at its elbow to the rear portion of the supporting frame on one side of the same by a pivot bolt *d²*. The front arm of said elbow lever extends toward the center of the machine and bears against a depending lug *c³* as shown in Fig. 7 formed on the hub of the pawl arm and overhanging the edge of the supporting frame, as shown in Figs. 7 and 10.

The depending lug c^3 of the pawl arm is held against the front arm of the elbow lever by a coil spring d^4 which is connected with its ends to the supporting frame and the lug c^3 of the pawl arm.

E represents the key levers whereby the elbow lever is moved forward to operate the pawl arm C and rotate the registering wheel B. These key levers are preferably nine in number and are each provided with a number representing one of the digits. The lowest key lever, No. 1, is arranged at the left, while the remainder follow progressively in their order toward the right. Each of these key levers consists of a horizontal arm e pivoted at its rear end to the rear wall of the machine, and an upright arm e' formed integrally with the rear end of the horizontal arm. The rear ends of the key levers are pivoted between forwardly projecting ears or plates e^2 formed on the lower front portion of the rear wall by a transverse pin e^3 . The outer free ends of the key levers are provided with finger pieces e^4 whereby the key levers are depressed. The upright arms e' of the key levers extend above the supporting frame with their upper ends projecting through a slot in the supporting frame and are guided between forwardly projecting ears or plates e^5 formed on the upper front side of the rear wall of the machine.

The rear arm d' of the elbow lever is arranged in front of the upright arms of the key levers, so that by depressing any one of the latter, the elbow lever will be moved forward to actuate the pawl arm and the register wheel. The rear arm of the elbow lever is preferably arranged diagonally across the upright arms of the key levers and inclines from the upper portion of the key lever No. 9, downwardly toward the key lever No. 1, as shown in Fig. 2, thus producing a different leverage between the elbow lever and each of the key levers, whereby the throw or movement of the elbow lever is varied and gradually decreased from key lever No. 9 to key lever No. 1, although the key levers are all depressed the same distance. The distance between the fulcrum of key lever No. 1, and its point of contact with the inclined rear arm of the elbow lever is such that the leverage of the key lever will move the register wheel one tooth in the direction of the arrow 1, Fig. 5, which corresponds to one numerical space on the face of the register. This distance between the fulcrum of the several key levers and the inclined rear arm of the elbow lever increases in proportion from the left hand side toward the right, so that each succeeding key lever throws the elbow lever one space farther than the preceding one, the last key lever moving the elbow lever and the register wheel forward nine spaces.

The pawl arm C when in its normal position rests against a stop e^6 projecting upwardly from the supporting frame A', as shown in Fig. 5. The upper projecting ends of the vertical arms e' of the key-levers are arranged

outside of the path of the pawl arm and pawl and in advance thereof when the pawl arm is in its normal position against the stop e^6 , as shown in Fig. 5. When one of the key levers is depressed, its upright arm engaging against the arm d' of the elbow lever swings the latter on its pivot and its inner arm d engaging with the depending lug c^3 as shown in Fig. 7 of the pawl arm moves the latter and the ratchet wheel forwardly. The upper end of the upright arm e' of the key lever which projects above the ratchet wheel, moves inwardly into the path of the pawl arm and pawl when the key lever is depressed, and intercepts the forward movement of the pawl and ratchet wheel by striking against the rear side of the pawl, as shown in Fig. 10. The position of the upright arms of the key levers with reference to the pawl arm and pawl is such that the register wheel is allowed to be moved only the number of teeth corresponding to the key depressed, when its further movement is arrested by the upright arm of the key lever engaging against the pawl. The register wheel is thus positively locked against movement in either direction by the pawl which is held in engagement with the teeth of the ratchet wheel by the upright arm of the key lever. Upon releasing the depressed key lever, its upright arm becomes disengaged from the rear side of the pawl and the pawl arm and elbow lever are returned to their normal positions by the spring d^4 .

e^7 represents a detent pawl secured with one end to the supporting frame and its opposite end engaging with the ratchet teeth b^2 of the register wheel B, whereby the latter is held against backward movement.

F represents tension springs whereby the key levers are yieldingly held in an elevated position. These springs are secured at their lower ends to the key levers and with their upper ends to a supporting rod f secured to the under side of the supporting frame A'.

In moving the register wheel one space, it requires less pressure than when moving the same nine spaces. In order to equalize the pressure upon the key levers, the tension springs F are attached to the key levers at points located at different distances from their fulcrum. The spring supporting rod f is preferably arranged diagonally under the supporting frame to accommodate the various positions of the tension springs.

G represents a secondary register whereby the number of rotations of the primary register wheel are registered. The secondary register consists preferably of a segment arranged horizontally above the primary register wheel and pivoted loosely on the shaft b . The secondary register is provided with a concentric slot g whereby the numbers on the primary register wheel B below the segment are visible through said slot. The secondary register is provided with a row of numbers arranged along the outer side of the slot g concentric with the numbers on the primary

register wheel. These numbers run from 0 upward and are adapted to register with the left-hand side of the numbers on the primary register, thereby representing the hundreds and thousands of the total number formed by associating the numbers of the primary and secondary registers. The outer edge of the segment extends beyond the primary register wheel and is provided with teeth g' . The teeth g' are arranged in line with or opposite the numbers on the segment. The segment is provided with an outwardly projecting nose g^2 which is adapted to engage against the stop e^6 .

I represents a spring (Fig. 5) which is secured with one end to a post i on the supporting frame and with its opposite end to a lug i' on the segment. The object of the spring I is to move the segment in the direction of the arrow No. 2 in Fig. 5.

J represents an escapement whereby the segment is locked against movement by its spring I and is released and permitted to move one numerical space after each rotation of the register wheel. This escapement is provided with a front escapement stop j and a rear escapement stop j' supported on the rear end of a plate j^2 which latter is arranged lengthwise of the machine and pivotally secured with its front end upon the supporting frame by a hinge j^3 . The rear end of the hinged plate j^2 is arranged underneath the register wheel and segment. The front escapement stop j extends upwardly from the hinged plate across the path of the teeth of the segment and holds the latter from movement by the spring I. The rear escapement stop overhangs the segment and engages with the teeth of the latter from above when the segment is released by the front stop. By depressing the hinged plate j^2 the front escapement stop j releases the segment tooth impinging against it and the segment G moves forwardly by the spring I until its tooth strikes the rear stop j' which has entered between the teeth and arrests the further movement of the segment. Upon releasing the hinged plate, its upward movement causes the front stop to engage between the teeth, and the rear stop to clear the teeth. The stops j, j' are arranged one in rear of the other and at the proper distance apart to permit the tooth released by the front stop to strike the rear stop, whereby the segment is prevented from moving a greater distance than the space between two teeth at a single movement of the escapement. Both escapement stops are provided with rearwardly inclined faces which facilitate the passage of the segment teeth. The hinged plate j^2 is provided with an inclined cam arm j^4 which extends inwardly from the inner side of the hinged plate underneath the register wheel, as shown in Figs. 7, 11 and 12 and in dotted lines in Fig. 5.

m represents a stop projecting downwardly from the under side of the register wheel, as shown in Figs. 4, 11, and 12, and adapted to

engage with the cam arm of the hinged plate at each rotation of the register wheel, so as to depress the hinged plate j^2 of the escapement and permit the segment to move the distance of one tooth at each rotation of the register wheel.

K represents a spring whereby the escapement is yieldingly retained in an elevated position with the front escapement stop j in the path of the segment teeth when the machine is at rest. This spring is attached to the upper side of the hinged plate j^2 and bears with its free end against the upper side of the segment and retains the front stop of the escapement in engagement with the segment teeth.

N represents a crank or hand lever secured to the upper end of the arbor or shaft b of the primary register wheel, whereby the latter is rotated independently of the key levers, for the purpose of returning the register wheel to the starting point after the register wheel has been moved by the key levers.

O represents the case inclosing the front, top, and sides of the machine. The casing consists essentially of a front wall o provided with a guard rail o' for the keys, side walls o^2 extending rearwardly from opposite ends of the front wall and a top plate or cover o^3 connecting the sides and front wall.

The casing O is secured to the rear wall A by screws o^4 passing through the lower rear corners of the side walls o^2 and engaging with lugs o^5 formed on the lower front side of the rear wall A. The top plate o^3 is provided with a central opening through which projects the upper end of the arbor or shaft b of the register wheel B, and the crank or hand lever N is secured to the upwardly projecting end of the shaft above the top plate of the casing, as shown in Fig. 1.

p represents an elongated opening formed in the top plate or cover of the casing near the outer edges of the register wheel and the segment and through which a single number of each of the registers is visible.

p' is a segmental slot formed in the top plate or cover o^3 and curved concentric with the center or pivot of the register wheel.

q represents a lug formed on the upper side of the segment opposite or in line with the segmental slot p' in the casing. The outer end of the crank or hand lever N extends over the segmental slot p' and is provided on its under side with a depending lug q' which is adapted to engage in the segmental slot in the top of the casing by slightly depressing the outer end of the crank or hand lever, as shown in Fig. 6. The latter is made elastic or yielding to permit its depression and so allow the depending lug to enter the slot p' and when in its normal position its depending lug q' is arranged above the slot so as not to engage therein as the lever is moved over the slot.

The operation of my improved adding machine is as follows:—When the parts are in their normal position, the numbers on both

the primary register wheel and the segment opposite the opening or slot p in the casing indicate zero or nothing. By depressing one of the key levers, the vertical arm e' of the key lever engaging against the rear arm d' of the elbow lever D swings or rocks the latter on its pivot and its front arm d engaging against the depending lug c^3 of the pawl arm C, turns the pawl arm on the central shaft or arbor. The outer end of the pawl arm being engaged with the teeth of the primary register wheel B by the pawl c , causes the primary register to turn with the pawl arm. The upper end of the vertical arm of the key lever moving forwardly against the pawl on the pawl arm, locks the same in engagement with the teeth of the register wheel and prevents the latter from moving farther than the movement of the pawl arm. Upon releasing the key lever, the register wheel is released from the pawl arm and the latter is returned to its former position against the stop e^6 , and the elbow lever D to its former position by the spring d^4 . The number on the register wheel, exposed through the slot p , will now indicate the number of the key lever depressed. By depressing two or more of the key levers successively, the register wheel B will be rotated in the same manner and register through the slot p the total number representing the numbers added together on all the key levers depressed. When the primary register wheel B has made a complete rotation, so that its highest number is exposed through the slot p , the vertical pin or lug m on the under side of the register wheel will engage against the cam arm j^4 of the escapement J and depress the hinged plate j^2 which releases the segment G and permits the latter to move one notch and indicate through the slot p the first or lowest number on the segment. The segment G will remain in this position while the primary register wheel B is rotated by depressing the key levers until it has completed another rotation, when the pin m will have again arrived opposite the cam arm j^4 and the segment will be again released and moved one notch to indicate its second or next lowest number through the slot in the casing.

The primary register wheel B can be readily turned on its arbor or shaft to bring its cipher or zero mark opposite the opening p in the casing by means of the crank or hand lever N. The segment G is also returned to its normal position in which its cipher or zero mark is opposite the opening p in the casing, by slightly depressing the hand lever as the latter is rotated, so that its depending lug q' will enter the segmental slot p' in the casing and engage against the projecting lug q on the upper side of the segment. By holding the hand lever in this depressed position and continuing its rotary movement, the segment will move with the lever until its outwardly projecting nose g^2 strikes the stop e^6 when its further movement is arrested.

I claim as my invention—

1. The combination with a register wheel having ratchet teeth, of a pawl arm carrying a pawl engaging with the toothed register wheel, whereby the register wheel is rotated with the pawl arm, and a key lever adapted to engage directly against the back of the pawl and lock the latter against the register wheel when the register wheel is turned the proper distance, substantially as set forth.

2. The combination with a register wheel having ratchet teeth, of a pawl arm carrying a pawl engaging with the toothed register wheel, whereby the register wheel is rotated with the pawl arm, and a series of pivoted key levers, arranged outside of the path of the pawl arm and pawl and adapted to be moved into the path of the pawl arm and pawl, and bear directly against the back of the pawl and lock the pawl against the wheel upon depressing the key lever, substantially as set forth.

3. The combination with a toothed register wheel, and a pawl arm carrying a pawl engaging with the toothed register wheel, whereby the register wheel is rotated with the pawl arm, of a key lever adapted to engage against said pawl and lock the latter in engagement with the ratchet wheel and an independent shifting lever actuated by the key lever and engaging with the pawl arm, substantially as set forth.

4. The combination with a toothed register wheel and a pivoted pawl arm provided with a pawl engaging with the teeth of the register wheel, of a key lever adapted to engage against said pawl and hold the same in engagement with the toothed register wheel, and an independent two-armed lever interposed between the pawl arm and the key lever, one of the arms of said lever being arranged in the path of the key lever and its other arm engaging against the pawl arm, substantially as set forth.

5. The combination with a register wheel provided with ratchet teeth and a reciprocating pawl arm provided with a pawl engaging with said teeth, of key levers provided with upright arms adapted to move across the path of the pawl arm and lock the pawl from disengagement with the ratchet wheel, and an elbow lever having one of its arms engaging with the pawl arm and its other arm extending diagonally across the upright arms of the key levers, substantially as set forth.

6. The combination with a register wheel, of a segment pivoted to the arbor of the register wheel, a spring whereby the segment is swung on its pivot, an escapement stop engaging with said segment, and a pin secured to the register wheel and adapted to release the segment from its escapement stop by the movement of the register wheel, substantially as set forth.

7. The combination with the register wheel and a segment pivoted on the arbor of the register wheel and provided with escapement

teeth, of a spring whereby said segment is rotated, and a plate provided with a stop adapted to engage with the teeth of the segment and arrest its movement, substantially as set forth.

8. The combination with the register wheel and a segment arranged concentrically with said wheel and provided with escapement teeth, of a spring whereby the segment is rotated, and a plate provided with front and rear stops adapted to engage alternately with the teeth of the segment, substantially as set forth.

9. The combination with the primary register and a secondary register provided with escapement teeth, of a hinged plate provided with front and rear stops which engage with the teeth of the secondary register, and a spring secured to the hinged plate and bearing against the secondary register, whereby the hinged plate and its stops are yieldingly held in contact with the teeth of the secondary register, substantially as set forth.

10. The combination with the primary and secondary registers and the escapement teeth formed on the latter, of a yielding plate provided with a cam arm, front and rear stops formed on the yielding plate and engaging with said teeth, a spring whereby said stops are retained in an elevated position, and a pin formed on the primary register and adapted to engage with the cam arm of the yielding plate whereby the stops are depressed, substantially as set forth.

11. In an adding machine, the combination with the register wheel and its pivot support or arbor, of a segment pivoted to said support or arbor and adapted to be moved forwardly and backwardly over the register wheel, a yielding escapement stop for arresting the forward movement of the segment, and a

spring whereby the segment is moved against said escapement stop, substantially as set forth.

12. In an adding machine, the combination with the register wheel and its pivot-support or arbor, of a secondary register pivoted to said support or arbor, and provided with a ratchet escapement actuated by the register wheel, and with a lug or projection on its upper face, of a flexible hand lever secured to the arbor of the register wheel, whereby the register wheel is rotated, and provided with a projection or stop on its underside adapted to engage with the projection on the secondary register by depressing the hand lever, substantially as set forth.

13. In an adding machine, the combination with the vertical rear wall, and a horizontal supporting plate secured to said rear wall, of a register wheel provided with ratchet teeth and having a shaft or arbor journaled in said supporting plate, a pawl arm pivoted to the arbor of the register wheel and provided with a pawl engaging with the ratchet teeth, a series of key levers pivoted at their rear ends to the rear wall and provided with vertical arms adapted to engage against the pawl on the pawl arm, an elbow lever pivoted to the supporting plate and having a front arm engaging with the pawl arm and a rear arm inclined downwardly and arranged across the vertical arms of the key levers, substantially as set forth.

Witness my hand this 25th day of May, 1891.

WILLIAM S. GUBELMANN.

Witnesses:

JNO. J. BONNER,
FRED. C. GEYER.