

UNITED STATES PATENT OFFICE.

KNUT EDWARD WIBERG, OF STOCKHOLM, SWEDEN, ASSIGNOR OF ONE-HALF TO GUSTAF FREDRIK BERNDES, OF SAME PLACE.

ADDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 517,319, dated March 27, 1894.

Application filed June 23, 1893. Serial No. 473,571. (No model.)

To all whom it may concern:

Be it known that I, KNUT EDWARD WIBERG, a subject of the King of Sweden and Norway, residing at Stockholm, Sweden, have invented an Improvement in Adding Apparatus, of which the following is a specification.

This invention is made for adding one set of numbers to another and indicating the total sum, and the invention relates to the combination of devices hereinafter described and claimed. I make use of a series of number rings and these are actuated by rocking number plates, and there are connections from the same acting through peculiarly constructed pawl mechanism to turn the number rings progressively the extent of the numbers that are added from time to time, and the total footings are visible through an opening in the case that contains the number rings.

In the drawings three sets of devices are made use of, for units, tens, and hundreds, but the number of sets of devices may be increased as desired.

Figure 1 is a general plan view with the case containing the number rings in section. Fig. 2 is a sectional elevation at the line 2—2 of Fig. 1. Fig. 3 is a sectional plan at the line 3—3 of Fig. 2. Fig. 4 represents the actuating gearing with the shafts in section. Figs. 5 and 6 represent the notched disk and pawl mechanism. Figs. 7 and 8 show the finger disk and its pawl. Figs. 9 and 10 represent the notched disks. Figs. 11, 12, and 13 show the finger plates and the devices therewith connected in different positions. Fig. 13^x is a side view and Fig. 14 an edge view showing the finger disks and pawl in a modified form. Fig. 15 shows the pawl and part of the notched disk and number ring. Fig. 16 is an edge view of the pawl-carrier. Fig. 17 is an edge view, and Fig. 18 is a side view of the parts shown in Figs. 13^x to 16, put together, and Fig. 19 is an inverted plan of the parts shown in Fig. 13^x.

A suitable box B is made for holding the number wheels and the extension B' at the front of said box contains the rack plates m' which are supported vertically and provided with extensions m in the form of racks that pass into the box B and act upon the mechanism that moves the number wheels or rings

C, and the rack plates m' are drawn forwardly by the actuating springs l, and above the upper edges of the rack plates m, the cover of the extension B' is slotted for a projection upon the top edge of each of the rack plates to pass up through the slot, and there is a pawl finger k upon each of these projections, which finger is above one of the rocking number plates d. The rack plates m' and the rocking number plates d are all alike; I have however shown only three of these devices but their number may be increased so that the apparatus is adapted to compute thousands, tens of thousands, hundreds of thousands, &c.

Each rocking number plate d is divided up into ten sections or divisions, and each rocking number plate is pivoted at the ends, but the pivots e are not central but are toward the right hand corners of the number plates as seen in Fig. 1, and there are springs i around the respective pivots that tend to lift the left hand edge of each rocking number plate beneath its projecting pawl k, and there are stops or teeth h in the surfaces of the rocking number plates d, which stops or teeth are adapted to engage the pawl k and hold such pawl and the rack plates m'. In actuating this part of the machine the attendant presses his finger upon the units, tens, and hundreds that are to be added up successively, and suppose the number 467 is to be added to the previous computation, the attendant puts his finger upon the rocking number plate d of the units column and upon the figure 7 and by pressing down the left side of the rocking number plate its stop or tooth h is liberated from its pawl k and the spring l of that plate m' draws the rack plate m' along until its pawl k stops against the finger, and as the finger is lifted the number plate rises and the stop or tooth h engages the pawl k, stopping the further movement of the rack plate m' allotted to units; then the finger is pressed upon 6 in the tens column and the pawl k of the rack plate m' of the tens column is liberated and its spring l draws the rack plate along until its pawl k stops against the finger, and as the finger is raised such pawl engages the rack plate to hold the same, and in like manner the finger is placed upon 4 in the hundreds column and the spring l of the rack

plate allotted to the hundreds column draws such plate along until the pawl k is stopped against the finger, and the lifting of the finger allows the rocking number plate to be raised by its spring and engage such pawl k , thereby the parts are held in their proper position and the 467 is added to the previous computation by the devices hereinafter described, and the parts are restored to their normal or zero position by actuating the return pusher n which is provided with plates engaging the front ends of the respective rack plates m' and they are pushed bodily along until the pawls k engage the stops or teeth upon the respective rocking number plates adjacent to the cipher or 0 of each of such rocking number plates, and in this manner a movement is given endwise to the rack plates m' in proportion to the number which is added to the previous enumeration.

There are two shafts across the box B, the shaft Z acting in connection with the direct enumeration and the shaft F, serving to give motion to the second or next higher number ring when the enumeration passes the tens and hundreds respectively. In effecting these objects I make use of a lever Q, pivoted at R, and having a handle Q', and two integral segmental racks S, and T, that act upon pinions U, and V, on the respective shafts Z, and F.

These pinions are loose upon the shafts and are provided with disks or flanges that are integral or firmly attached to the pinions and pivoted on these disks are the pawls z , z' , respectively engaging the ratchet disks X, and Y, upon the respective shafts Z, and F, which ratchet disks have each one tooth and the disks are permanently fastened to the respective shafts, and the proportions of the racks S, and T, and the pinions U, and V, are such that the shaft Z, receives a complete rotation as the handle Q', is raised, and the shaft F, receives a complete rotation as the handle Q', is depressed for the objects hereinafter enumerated. The number rings C are loose upon the shaft Z, and adjacent to and forming a component part of each number ring is a disk y having ten notches in its periphery, as indicated in Figs. 9 and 10, and the pawl carrier s is made as a plate with an eye surrounding a hub that connects the gear wheel p and disk q on the shaft Z, and upon the pawl carrier s is a pawl t pivoted at u and having one end that passes into a notch r in the disk q and a hook t' at the other end that passes into one of the notches in the disk y as seen in Fig. 10 of the number ring and the spring v acts upon the pawl t to cause its end normally to engage the notch r .

As before mentioned, the disk q and the wheel p are united by a hub around the shaft Z and passing through the eye of the pawl carrier s , and this disk q has teeth around its periphery see Figs. 1 and 2 which engage the teeth on the rack m , hence when this rack m and the rack plate m' receive an end motion from the cipher or 0 to the number upon which the finger is placed on one of the rock-

ing number plates d , the disk q and gear wheel p are rotated in the direction of the arrow Fig. 6, and the notch r passes from beneath the pawl t and causes the hook t' to pass down into the adjacent notch in the disk y of the number ring, but the number rings are not moved by this operation, and upon the shaft Z is a finger disk x with a tooth a' adjacent to the end of the hook t' , as seen in Fig. 8, and this finger disk x being permanently fastened to the shaft Z the tooth a' acts against the hook t' when the shaft X receives its motion from the pawl z as the handle Q' is raised, and as before mentioned, the shaft Z receives a complete rotation and with it the finger disk x , therefore the tooth a' acting upon the hook t' carries the hook and the notched disk y and number ring around until the end of the pawl t drops into the notch r , thereby disconnecting the hook t' simultaneously from the notched disk y of the number ring and from the tooth a' , allowing the disk x to complete its rotation ready for the next operation, and after this movement has been given to the handle Q' the before mentioned backward movement is given endwise to the rack plates m' by the return pusher n , and in so doing the disk q and gear p are returned in the direction indicated by the arrow in Fig. 5 to their normal position indicated in said Fig. 5, so that the parts are ready to be acted upon in the next addition; and it is to be understood that if only units are added, the right hand number plate only is rocked, and that if tens and hundreds are simultaneously added all three number plates will be rocked and that the numbers added to the respective units, tens, and hundreds of the number rings C would be correctly computed by the devices that have been before described, but of course when the enumeration upon the units number ring passes the cipher or 0, the tens ring must be moved one space, and this is effected as hereinafter described by the rotation of the shaft F as the lever Q' is returned to the normal position, indicated in Fig. 4.

I remark that it is advantageous to cover up the number rings by the top of the box B and to provide a slot across the same with a glass at D through which the figures on the number rings are observed, and to prevent the number rings turning backwardly by any frictional action, each number ring is to be provided with a notched disk o' acted upon by a spring pawl A' see Fig. 2 having a convex edge so that such spring pawl is depressed as the number ring is rotated and springs up into the next or succeeding notches to hold such number ring in the position to which it may be turned.

Upon the shaft F are the finger plates I having at their ends projecting fingers I' see Figs. 2, 11, 12, and 13, and these finger plates are slotted to allow play upon the shaft F, and such finger plates are adjacent to disks E which are fastened upon the shaft F and slotted for the passage of pins I² that are fastened upon

the rear portions of the finger plates I and project through the slots in the disks E, and there are sliding rings L that are loose upon the shaft F and they are grooved around their hubs and acted upon by the levers M that are pivoted upon the cross bar N and forked at the ends adjacent to the rings L and provided with fingers at the other ends adjacent to the pins O² that are upon the notched disks o', there being one pin upon each notched disk o' and in a position to act against the lever M at the time the particular number ring C is turned from 0 to 1, hence when the movements that have been before described are given to the number rings C the turning of such number rings and notched rings o' from 0 to 1 causes the pin O² to act upon the lever M and slide the loose ring L endwise of the shaft F and move the edge of the ring L from beneath the pin I², so that the spring K see Fig. 2 acting upon such pin I² will project the finger plate I into the position indicated in Fig. 12, and this finger I' is in the path of the next notched disk o' of a higher order so that when the units number ring is moved from 9 to 0 the finger plate I, and the finger thereof I' are brought into the position indicated in Fig. 2 to act upon the notched disk o' of the tens number wheel, and the rotation of the shaft F as before mentioned causes the finger I' to turn the tens number disk one figure, thereby maintaining a correct enumeration, and the same result is effected by the finger plate I between the tens and the hundreds number disks, and in order to bring back whichever of the finger plates has been projected, the stationary cam plates P see Figs. 2 and 3 are made use of against which the projected finger I' presses and is by the said cam plate P pressed toward the shaft F, and a spring O Fig. 1 acting upon the lever M moves it and the loose ring L with which it engages up toward the disk E and into a position for the periphery of such loose ring L to receive against its edge the pin I² and hold the finger I in its retracted position and against the action of its spring K until again liberated by the movement given to the lever M, as before described. There may be slots in the finger plates I receiving pins, as illustrated in Figs. 11 and 12, to guide such finger plates in their movements. It is to be understood that the rotation of the shaft F upon each movement of the handle Q' effects no movement of the number rings C except when either one of the finger plates I is unlatched by the action of the lever M and projected by its spring.

In the modifications represented in Figs. 13^x to 19 inclusive, the pawl is made in two parts, the pawl *t* being similar to that before described and pivoted upon the stud or screw *u* upon the plate *s*, and adjacent to the pawl *t* is a secondary pawl *t*² pivoted also upon the pin or screw *u* and having a hook end or finger *t*³ to pass into the notches in the numbering disk *y*. The spring *v* is provided to act upon the pawl *t* as before described, and there

is a tail 3 upon the back end of the pawl *t*² that passes over the pawl *t* see Fig. 17 so that when the disk *q* is turned as before mentioned, its notch *r* acts upon the pawl *t* and also upon the pawl *t*² through the tail 3, throwing the end *t'* of the pawl *t* into line with the tooth *a'* upon the disk *x'* and throwing the finger *t*³ into the notch in the disk of the number ring, and upon the pawl carrier *s* there is a pin 4 against the end of which the spring 5 that projects from the pawl *t*² presses, but the spring 5 is free to rub across the surface at the end of the pin 4, the friction holding the spring 5 and the pawl *t*² in whatever position it may be moved; in consequence of this construction the pawl *t* is free to return into the normal position shown in Fig. 5 when the end of the pawl drops into the notch *r*, but the pawl *t*² continues to hold the notched disk *y* of the number ring until the inclined projection 5 upon the finger disk *x'* runs under the hooked end *t*³ of the pawl *t*², pressing it out from the notch in the disk *y*. This prevents the parts being carried beyond the proper position by the momentum that the respective parts may receive; and it is to be understood that the projection *a'* upon the toothed disk *x'* occupies but one-half of the thickness of said disk so as to act against the end of the pawl *t* in moving the same and the pawl carrier *s*, and that the incline 5 upon the toothed disk *x'* acts to push out the hook *t*³ of the pawl *t*² from the notch in the disk *y* after the other parts have stopped their movement and the toothed disk *x'* is completing its rotation. This prevents the number wheels being carried beyond the proper position by the momentum of the parts.

I claim as my invention—

1. The combination in an adding machine, of rack plates and their pawl, rocking number plates pivoted at their ends and having teeth to engage the pawls of the rack plates, means for giving endwise motion to the rack plates, number rings, and gearing acted upon by the rack plates and pawls for giving motion to the number rings, substantially as set forth.

2. The combination in an adding machine, of rack plates, rocking number plates for holding the rack plates when they have been moved, number rings, gearing and pawls intervening between the rack plates and the number rings, a shaft, a lever and gearing for turning the same by hand to give motion to the number rings in proportion to the distance that the rack plates have been allowed to move, substantially as set forth.

3. The combination in an adding machine with the rack plates and their pawls and rocking number plates pivoted at their ends, of number rings, a shaft for the same, gearing and pawls receiving a motion in proportion to the number added, a lever, a rack, a pinion and a pawl for rotating the shaft of the number rings, and means for disconnecting the shaft from the number ring when the

proper movement has been given to the latter, substantially as set forth.

4. The combination in an adding machine, of rack plates, rocking number plates and pawls intervening between the rack plates and the number plates, springs for giving end motion to the rack plates and a pusher for returning the rack plates to their normal positions, number rings and gearing intervening between the rack plates and number rings, a shaft carrying the number rings, mechanism for rotating the same and turning the number rings, and means for disconnecting the number rings from the shaft when such number rings have been turned the proper distance, substantially as set forth.

5. The combination with the number rings and their notched disks and means for actu-

ating the same, of the holding pawls for the notched disks, finger plates, springs for projecting the same, stationary cams for returning the finger plates to their normal positions, loose rings and pins for holding the finger plates in their retracted positions, levers, and pins upon the number disks for moving the loose rings and allowing the springs to project the finger plates for turning the next number ring and its notched disk, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

KNUT EDWARD WIBERG.

Witnesses:

RUDOLPH BJORKLUND,
CARL AUGUST DEHN.