M. BAUM & J. WIMMER.

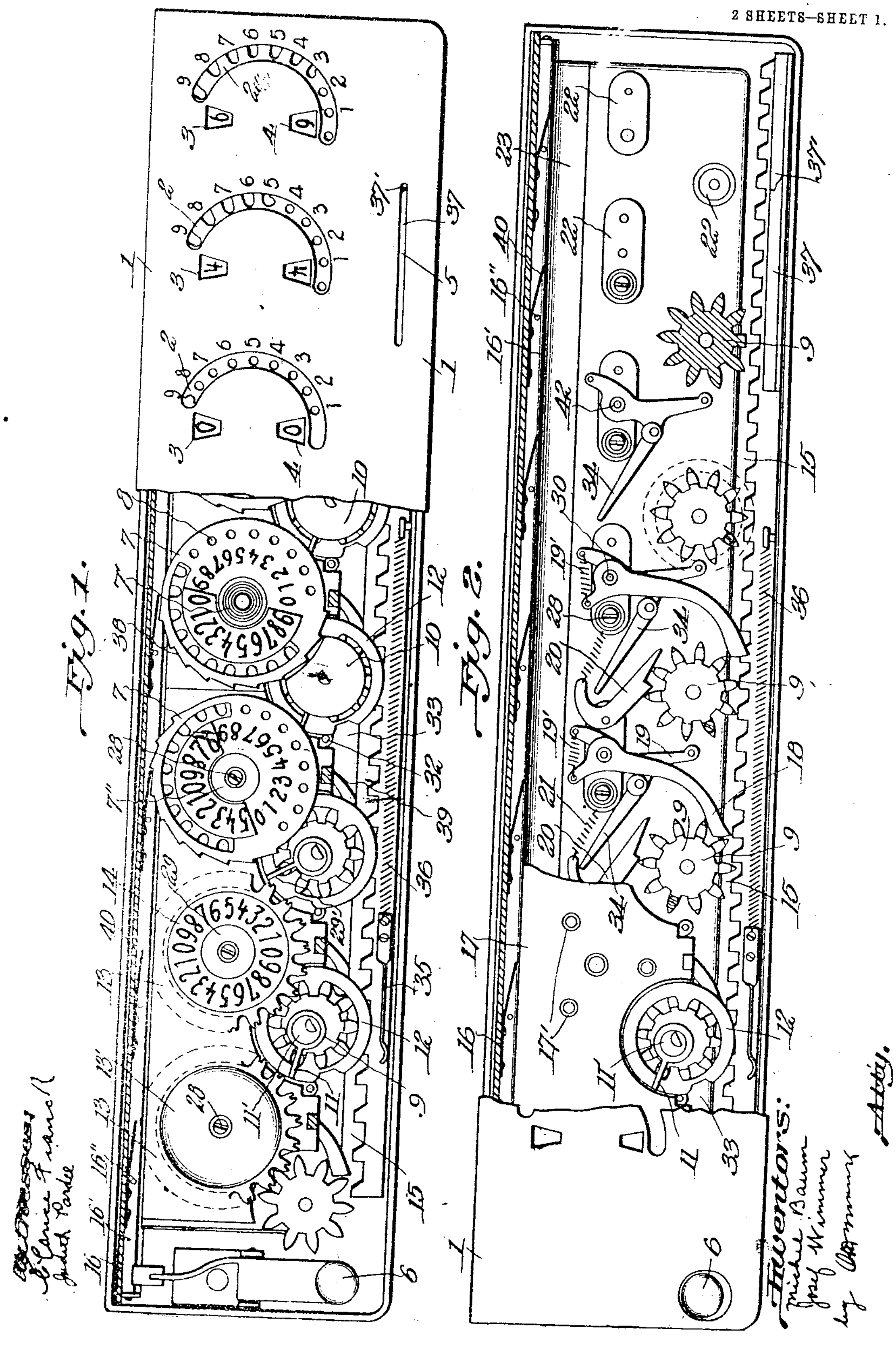
ADDING MACHINE.

APPLICATION FILED DEC. 7, 1911.

1,095,545.

Patented May 5, 1914.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 3.

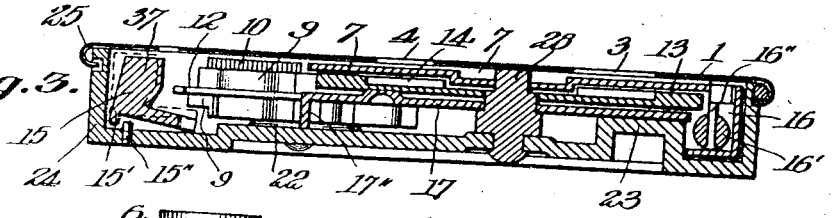

Fig. 4.

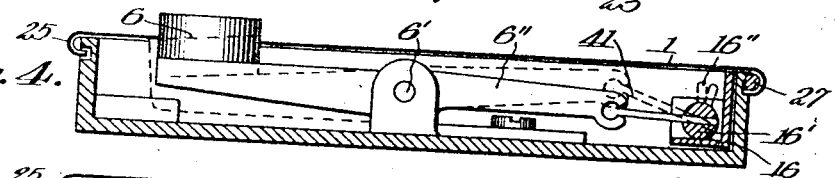

Fig. 5.

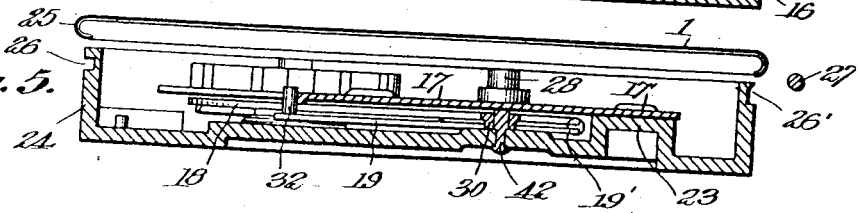

Fig. 9.

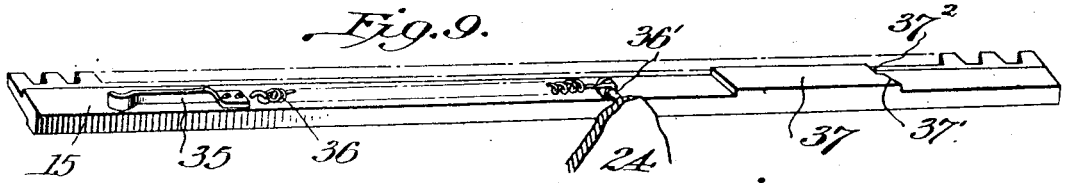

Fig. 6.

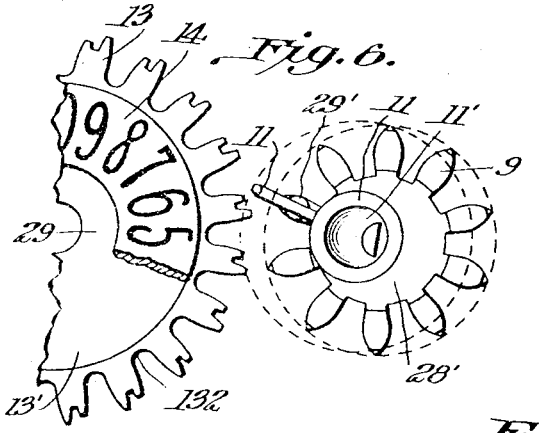

Fig. 7.

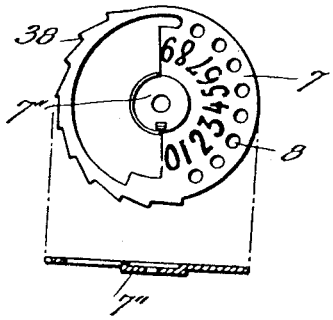

Fig. 8.

Witnesses:

C. Clarence Franck

Judith Pardee

Inventors:

Michael Baum

Josef Wimmer

by Attorneys

Atty.

UNITED STATES PATENT OFFICE.

MICHEL BAUM AND JOSEF WIMMER, OF MUNICH, GERMANY; SAID WIMMER ASSIGNOR TO SAID BAUM.

ADDING-MACHINE.

1,095,545. Specification of Letters Patent. Patented May 5, 1914.

Application filed December 7, 1911. Serial No. 664,365.

To all whom it may concern:

Be it known that we, MICHEL BAUM and JOSEF WIMMER, citizens of Germany, residing at Munich, Bavaria, Germany, have invented certain new and useful Improvements in Adding-Machines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of the present invention is an addjng machine with horizontally arranged number disks.

The structure of an adding machine made according to our invention is such as to enable the same to occupy a restricted space and to give the same the shape of a ruler-like body. The device thus constructed may be manufactured cheaply and may be manipulated with facility. By this adding machine all the calculating operations take place in a plane, as the adding disks also serve as driving wheels for the intermediate gears. The intermediate wheels are each provided with a slit in one of their teeth, in which a transmitting slide is arranged which is situated in the same plane with the driving adding disk. The transmitting slide may pass the driving gear when moved toward the axis of the intermediate wheel. This motion is effected by an eccentric, which is arranged at the surface of the intermediate wheel. The transmitting slide, when moved outward, engages the heads of the teeth of the adding wheel; these heads of the teeth are formed with notches in which enters the outer end of the transmitting slide. Therefore the latter acts as a prolongation of that tooth of the intermediate wheel in which it is arranged. The withdrawal of this prolongation is effected by the eccentric of the intermediate wheel.

A further feature of the invention involves a locking mechanism for the adding wheels with a compound locking device. Between the two levers constituting the locking device a spiral spring is arranged, the levers being pivoted in the manner of a pair of shears having a limited movement. To avoid the pressure of the locking device during the transmitting of the tens a special pivot is provided and the one part of the locking device bears against the circumference of a ring borne by the intermediate wheel. This ring has a recess, in which the end of the one part of the blocking lever enters whereby the device is released from the pressure of the spiral spring which serves to spread the levers.

Another object of the invention is to provide a limiting surface for the pin which serves to revolve the adding disks, so that the latter are released from any pressure and to prevent that the adding pin is driven too far in the disks. This is performed by an intermediate plate which simultaneously protects the transmitting gears and blocking levers lying under it.

This invention relates also to control-devices which make it possible to read the added number before a new addition is made. For this purpose controlling-disks are arranged coaxially over the adding disks. The controlling-disks are provided with a semi-circular aperture and with the figures 0 to 9. Beside the numbers are holes for inserting the adding pin between the gaps of the teeth of the adding disks to turn the latter together with the controlling disks. At the circumference of the controlling disks ratchet teeth are arranged in which plate springs enter to hold the controlling disks in each position. The release of the controlling disks is effected by a lever adapted to turn a spindle provided with pins, the latter drawing the spring plates out of engagement with the ratchet teeth and, thus to permit the controlling disks to turn back to their original position.

A further improvement consists in the device for bringing the adding disks to the zero position. For this purpose a rack-bar is used which may be tilted. This rack-bar is slidably arranged in a groove of the casing of the adding-machine and meshes with the adding wheels when tilted upward, so that the latter, when the rack-bar is longitudinally moved, are turned back into the original position.

Finally this invention relates to the construction of the casing and its cover-plate, whereby the manufacture of the whole machine is facilitated and cheapened. The bottom of the casing is pressed upward or embossed to form two steps and provided with ribs, by which not only the casing is tiffened but also supports for the adding m chanism are formed. The cover-plate is p ovided with semi-circular apertures; at the

head of these apertures are holes through which the added numbers of the adding disks are visible and at the foot of these apertures are holes through which the corresponding numbers of the controlling disks are made visible. The cover-plate is bent down at its short edges and at the long edges, the latter being bent in semi-circular form, and adapted to engage longitudinal notches of the casing, in which a fastening wire may be arranged.

In the accompanying drawing—Figures 1 and 2 are top plan views of a device embodying our invention, parts of the top and intermediate parts being broken away to show all of the operative parts; Fig. 3 represents a vertical transverse section on an enlarged scale, on a plane passing through the axis of one of the adding-wheels, the locking device being removed for the sake of clearness; Fig. 4 represents a similar section on a plane in front of the device for releasing the controlling disks; Fig. 5 represents a similar section on a plane passing through the fulcrum of one of the locking devices, the adding-wheels and controlling disks being omitted, and the cover plate lifted out of position. Fig. 6 represents a detail view of the device for transmitting tens on an enlarged scale; Fig. 7 represents a plan view and a diametrical section of a controlling disk in its actual size; Fig. 8 a side elevation of the adding pin employed in connection with the device, and Fig. 9 a detail perspective view of the rack-bar and accessory parts.

The cover plate 1 of the machine is provided with semicircular apertures 2 through which the adding pin, shown in Fig. 8, may be inserted into the holes of the controlling disks 7 and adding wheels 13. The added numbers are visible through the apertures 3 of the cover plate and the control numbers through the apertures 4. In Fig. 1 the number 46 is to be seen through the two first apertures 3 and 4; the upper numbers are the result of the addition, the under numbers are for controlling. The aperture 5 of the cover plate 1 serves to obtain the zero position of the adding wheels 13 in which position the zeros appear through the apertures. For obtaining the zero position of the controlling disk 7 the button lever 6 is used. The adding disks 13 are provided with number rings 14 which are marked with a double series of figures from 0 to 9. The controlling disks 7 bear the figures 0 to 9 and cover one half of the adding wheels. At the side of every figure 0 to 9 of the controlling disk is a hole 8 which corresponds with each gap between the teeth of the adding disk. These holes permit the insertion of the adding pin between the gaps of the teeth of the adding disks, to turn the latter together with the controlling disks. The intermediate wheels 9 carry on their surface transmitting slides 11 arranged in suitable recesses which are covered by plates 10. The further details of these transmitting slides will be described later on. The adding wheels 13 are placed on the intermediate plate 17 and the intermediate wheels 9 and blocking levers 18, 19 beneath it. The intermediate wheels 9 are provided with rings 12 with apertures 33. The lever 18 of the locking device lies over the lever 19; besides these levers a stop lever 20 is arranged which may be actuated by the lever part 19 so that it does not engage the wheel 9. Fig. 2 shows the manner in which the stop lever 20 under the influence of the spring 21 engages the intermediate wheel 9 and prevents the latter from turning more than the amount of one tooth. The intermediate wheels 9 have, as will be seen in Fig. 2, at the right one shortened tooth at the lower portion which serves to obtain the zero position of these wheels and of the adding wheels 13.

The bottom of the casing 24 is provided with ribs 22 and 23 which latter support the intermediate plate 17. The ribs 22 serve for bearing the wheels 9 and levers 18 and 19. The cover plate 1 is provided with flanges 25 bent over semi-circularly which engage grooves 26 of the casing 24. One of these grooves has a circular part 26′ which serves for the reception of a fastening wire 27 (Figs. 3–5). The two other flanges of the cover plate are straight, thus rendering it possible to readily lift and remove the cover plate.

The adding wheels 13 which possess 20 teeth each form the driving gear for the intermediate wheels 9 which possess 10 teeth each, the gaps between which are rounded at their bases as shown at 132, Fig. 6, and serve for putting in the adding pin in order to turn the adding disks and controlling disks. The number rings 14 which carry two series of the figures from 0 to 9 are of suitable material and are provided with an inner aperture which is larger in diameter than the arbor 28 so that a sunken annular chamber 29 (Figs. 1, 3 and 6) is formed which takes up a corresponding hub of the controlling disk 7. The adding wheels 13 drive, as already mentioned, the intermediate wheels gearing therewith and are on the other hand driven by these intermediate wheels by means of the transmitting slides 11. The intermediate wheels are driven by the teeth proper of the adding wheels 13 while the transmitting slide does not gear directly into these teeth, but in the notches in the same. For an adding machine these head portions of the teeth have the form shown in Fig. 6; the rear portion of the teeth is somewhat shorter than the front portion. If the machine is destined to serve for adding and subtracting, both portions must be

of equal length. The transmitting slide 11 consists of a bolt with annular hub and is guided by a plate 11' eccentrically fixed on the fixed axis of the intermediate wheel 9 (Fig. 6) in such a manner that it is moved forward beyond the teeth of the intermediate wheel 9 to engage the teeth of the adding wheel 13 which is to be driven, while at other times it is drawn back so that the intermediate wheel 9 may be driven by the preceding adding wheel 13 without interference. In order to arrange the adding wheels, the intermediate wheels and the transmitting slides in one plane, the transmitting slides are ar ·ged within the intermediate wheels in recesses 28' so that the adding wheels, intermediate wheels and the transmitting slides are at equal heights. The tooth of the intermediate wheel 9 which is provided with the transmitting slide 11 must be slotted in a radial direction. As the axis of the hub of the transmitting slide is eccentrical, the slot of the tooth must be of corresponding width or wedge-shaped. It is preferable, however, to substitute for the upper part of this tooth a slotted steel pin 29' (Fig. 6) which is swiveled on the lower part of this tooth. Under this arrangement, if an adding wheel is turned for the amount corresponding to the figures 0 to 9, that is to say, rotated 180°, the intermediate wheel 9 meshing therewith makes a complete rotation, turning 360° and the transmitting slide advanced during this time engages the head of a tooth of the following adding wheel 13 and turns the latter a tooth forward. The transmitting slide 11 therefore effects the well known transmitting of the tens.

The blocking levers 18, 19 are, as already mentioned, arranged in such a manner that the intermediate wheels 9 remain free from pressure during the transmission which is effected by the action of the spring 19' and the lever 18. To obtain this release the levers 18 and 19 (Figs. 2 and 5) are arranged on the same fulcrum 42; the lever 18 which lies over the lever 19 does not turn directly around the fulcrum 42 but around the hub 30 of the lever 19 (Figs. 2 and 5). The spiral spring 19' arranged between the rear arms of the levers 18 and 19 holds the other ends of the levers separated like the two arms of a pair of scissors. In order to limit the distance between these ends, the lever 19 carries a stop in form of a small eccentric plate 31, which permits the adjustment of the opening between these arms. The spiral spring 19' can only exercise a pressure on the hub 30 and the eccentric plate 31, but not on the arbor 28 or on the casing of the adding machine. The levers 18 and 19 turn readily on the fulcrum 42 and may be removed or lifted out together. To bring the lever 18 into action, the end of the lever 19 must receive a support. For this purpose the ring 12 of the intermediate wheel 9 is provided. Against this ring rests the steel pin 32, fixed at the end of the lever 19 (Figs. 1, 2 and 5). To press together the front ends of the levers 18 and 19, the lever 19 must be turned aside, and the full resistance of the spiral spring 19' must be overcome. This pressing together of the two levers takes place, when the intermediate wheel 9 is turned by the adding wheel 13. The lever 18 always insures the same relative position of the engaging teeth of the intermediate wheel and the corresponding adding wheel. If, at the same time, several transmissions must be made, the corresponding number of levers 18 must be put under tension, for which purpose considerable power is necessary. If the levers 18 have not the necessary support, their tension is not possible and the transmission can be made without considerable pressure. For this purpose each ring 12 is provided with a recess 33 (Figs. 1 and 2) at that portion which would contact with the pin 32 of lever 19 during the transmission. By this arrangement the lever 19 may be moved aside without resistance from the intermediate wheel 9 (Fig. 2, 4th intermediate wheel) and the transmission, released from the pressure of the lever 19, may easily be made. The inclined edge of the ring 12 at the one end of the notch 33 brings back the lever 19 in its original position. To avoid that the easily movable adding wheels and intermediate wheels turn more than for the amount of one tooth during the transmission, which would cause mistakes in calculating, the stop lever 20, under the influence of the spiral spring 21, engages the teeth of the corresponding intermediate wheel 9. The arm 34 of the lever 19 however prevents the stop lever 20 from gearing with wheel 9, if a transmission does not take place. In the case of a transmission the levers 18 and 19 move together toward the right hand and the arm 34 comes down for a corresponding amount, and releases the stop lever 20. The spiral spring 21 brings the latter into engagement with the teeth of the turning intermediate wheel 9 and stops it till the lever 19 goes back into its original position and removes with its arm 34 the stop lever 20 from the intermediate wheel 9. This removal takes place only at the last moment, when the transmitting slide 11 has left the teeth of the adding wheel 13 and the lever 18 has nearly completed its return movement.

The arrangement of the intermediate plate 17 renders it possible to set the adding disks 13 loosely on the fixed arbors 28. To diminish the friction between the adding disks 13 and the intermediate plate 17, the latter is provided with three small ribs for each wheel which serve as supporting points.

The intermediate plate may consist of one or several pieces and is supported by the rib 23 of the casing 24, by the stops 28 of the adding wheels and by supporting feet 17″ (Fig. 3) at an exact distance from the bottom of the casing 24.

The rack bar 15 which serves to obtain the zero position of the adding mechanism is placed removably in a notch at the bottom of the casing and may be longitudinally moved beyond the intermediate wheels without engaging them. The longitudinal rib 15′ on the under side of the rack bar 15 is guided by several pins 15″ and may be tilted up in the position shown in Fig. 3 by broken lines. In this position the rack bar 15 meshes with the intermediate wheels 9 and brings the latter back in the zero position, if it is longitudinally moved. The zero position is reached if all the shortened teeth of the intermediate wheels 9 are opposite to the rack bar, as it is apparent from Fig. 2, where one intermediate wheel 9 is shown in section. The longitudinal movement of the rack bar must be made twice, because the slit 5 in the cover plate 1 is only of half the length of the longitudinal movement of the rack bar. The movement of the rack bar is caused by means of the adding pin which is inserted into the slot 5 and pressed against the rack bar. If the rack bar is released, it tilts down on account of its own weight and under the influence of the spring 35, while the spiral spring 36 which, as best shown in Figs. 2 and 9, is attached at one end to the rack-bar 15, and at the other end to a pin 36′ extending inward from the casing 24 brings it back into its horizontal original position. The rib 37 with the inclined face 37′ on the upper side of the rack bar 15 (Figs. 2 and 3) serves to tilt up the rack bar by means of the adding pin, which is pressed toward the face 37′, which lies at the right end of the slit 5. The adding pin being inserted in the slot 5 for this purpose first impinges against the inclined face 37′ of the rib 37, thereby tilting the rack-bar 15 backward toward the wall of the casing 24, thereby putting spring 35 under torsional strain, and then it encounters the shoulder 37² of the rib 37, whereafter its further movement to the left serves to push the rack-bar 15 longitudinally to the left, thereby stretching the spring 36.

To obtain a sure control of the calculating manipulations a controlling device is provided. This device consists, as already mentioned, of number disks 7 with holes 8 which are arranged over the adding wheels 13. The operation of the control disks is effected together with that of the adding wheels 13 by means of the adding pin so that the control disks are turned together with the adding wheels for the same amounts. To bring the control disks 7 back to the zero position, each control disk is provided with a watch spring 7′ housed in a recess. This spring is tensioned when the control disk is mounted on the adding wheel, and may be located as well on the under side of the adding disk as on the upper side. On the circumference of the control disks ratchet teeth 38 (Figs. 1 and 7) are provided. The first tooth 38 corresponds to the figure 0 and, in the zero position of the control disk strikes against a stop 39 (Fig. 1) of the intermediate plate. The ratchet teeth 38 coöperate with spring plates or pawls 40 which are fixed on an angle plate 16 (Figs. 1 to 4) and tend to engage the ratchet teeth 38. When the control disks 7 are turned for any amount, the spring plates 40 gear into the teeth 38 and hold the control disks in this position. To bring the controlling disks back to their original position, a device is provided which consists of a spindle 16′ revolubly arranged on the angle plate 16. On the spindle 16′ as many pins 16″ (Figs. 1–4) are fixed as there are plate springs 40. These pins 16″ are in the path of the springs 40. If therefore the button lever 6 is pressed down it turns on the fulcrum 6′; the arm 6″ is thereby raised and turns by means of the arm 41 the spindle 16′. The pins 16″ are thus pressed against the spring plates 40 and the latter are disengaged from the ratchet teeth 38. The controlling disks 7 now turn back to their original position under the influence of the watch springs 7′ and the first ratchet tooth strikes against the stop 39 of the intermediate plate 17.

By this new adding machine a quick and easily controllable calculating is insured. All parts of the machine may, if necessary, easily be replaced; the management is simple and sure.

What we claim is:

1. An adding machine, embodying a series of numbering wheels, a series of transfer wheels intermediate said numbering wheels and in substantially the same plane therewith, an eccentric projection on each of said transfer wheels, and a slide having a part encircling said eccentric projection and a second part movable into and out of engagement with an adjacent numbering wheel through coöperation of said eccentric projection and said first mentioned part of the slide.

2. In an adding machine, a numbering wheel and an intermediate transmitting wheel arranged in the plane of the numbering wheel, provided with a recess, and a slot extending radially through one of its teeth, in combination with a reciprocating slide arranged loosely in the recess and extending into the slot, and a pin swiveled in said tooth and having a groove in line with the slot and arranged to receive the slide.

3. In an adding machine, a numbering wheel and an intermediate transmitting

wheel arranged in the plane of the numbering wheel, provided with a recess and a slot extending radially through one of its teeth, in combination with a slide having an annular enlargement loosely arranged in the recess and extending into and through the slot, and an eccentric hub mounted on the transmitting wheel and engaging the annular enlargement.

4. An adding machine, embodying a series of numbering wheels each having teeth notched at their crowns, a series of transfer wheels intermediate said numbering wheels, a hub on each of said transfer wheels, and a slide comprising an annular member in cooperative relation with said hub and an elongated member adapted to be protracted into and retracted out of the notches in the teeth of said numbering wheels through coöperation of said annular member and said hub.

5. In an adding machine, a series of intermediate transmitting wheels each provided with a circular ring having a recess, in combination with a locking device comprising two levers pivotally connected and a spring to yieldingly spread the outer arms thereof, the outer arm of one lever arranged to engage the recesses between the teeth of the transmitting wheel at one side and outer arm of the other lever to bear against the notched circular ring, of the transmitting wheel on the other side, and means carried by one lever for limiting the extent of spread of said levers.

6. In an adding machine, a series of intermediate transmitting wheels each provided with circular ring having a recess, in combination with a locking device comprising two levers pivotally connected and a spring to yieldingly spread the outer arms thereof, the outer arm of one lever arranged to engage the recesses between the teeth of the transmitting wheel at one side and outer arm of the other lever to bear against the notched circular ring, and an eccentric stop mounted in one lever and bearing against the other to vary the amount of spread of the levers.

7. In an adding machine, a series of intermediate transmitting wheels each provided with circular ring having a recess, in combination with a locking device comprising two levers pivotally connected and a spring to yieldingly spread the outer arms thereof, the outer arm of one lever arranged to engage the recesses between the teeth of the transmitting wheel at one side and outer arm of the other lever to bear against the notched circular ring, and an eccentric stop mounted on one lever and bearing against the other to vary the amount of spread of the levers, and a spring-actuated stop-lever provided with a rearwardly extending tail and an arm connected to the eccentric stop and arranged to raise the tail of the stop lever and disengage the stop lever from the transmitting wheel, when in the upper position.

8. In an adding machine, a series of toothed numbering wheels each having a double series of numbers in annular form on one face of the wheel, in combination with controlling disks superimposed on said wheels, each controlling disk having a single series of numbers thereon, and each of said controlling disks covering approximately one half of its adjacent numbering wheel and having apertures therein positioned in line with the gaps between adjacent teeth of the numbering wheel.

9. In an adding machine, a train of numbering wheels, a portion of said wheels being provided with peripheral teeth, in combination with a pivoted rack-bar adapted to mesh with the peripheral teeth in its operative position and arranged to normally drop out of said operative position.

10. In an adding machine, a train of numbering wheels, a portion of said wheels being provided with peripheral teeth, in combination with a pivoted rack-bar adapted to mesh with the peripheral teeth in its operative position and arranged to normally drop out of said operative position, the bottom of the casing of the machine being provided with a groove into which the forward edge of the rack-bar may drop when out of engagement with the teeth.

11. In an adding machine, a train of numbering wheels, a portion of said wheels being provided with peripheral teeth, in combination with a pivoted rack-bar adapted to mesh with the peripheral teeth in its operative position and arranged to normally drop out of said operative position, the said rack-bar being provided with an upper rib, adapted to be pressed by the numbering pin to raise the bar into operative position, and a lower guiding rib.

In testimony whereof we hereunto affix our signatures in the presence of two witnesses.

MICHEL BAUM.
JOSEF WIMMER.

Witnesses:
ARTHUR V. W. COTTER,
MATHILDE R. HELD.