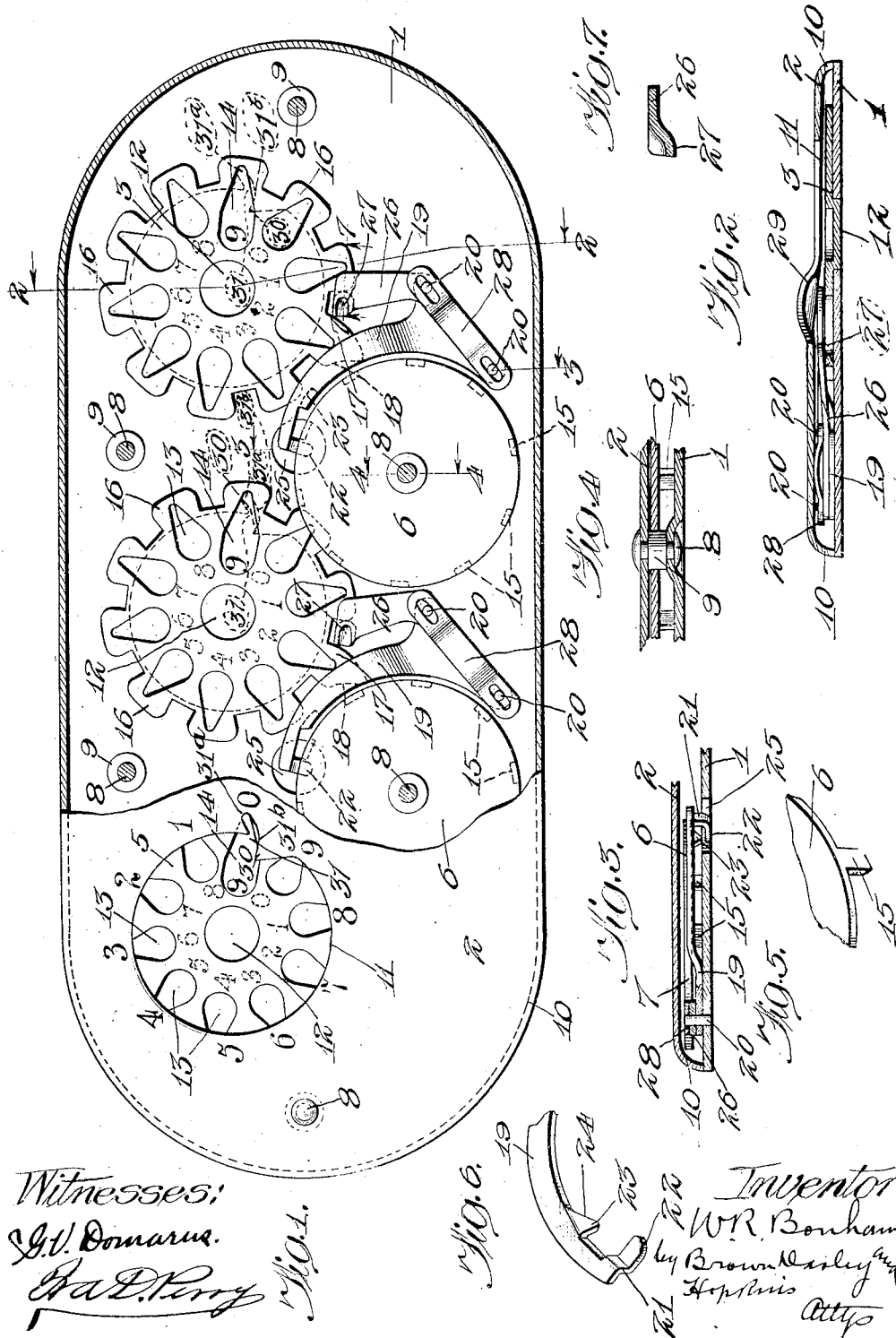


No. 845,747.

PATENTED MAR. 5, 1907.

W. R. BONHAM.
CALCULATING MACHINE.
APPLICATION FILED NOV. 20, 1905.



UNITED STATES PATENT OFFICE.

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CALCULATING-MACHINE.

No. 845,747.

Specification of Letters Patent.

Patented March 5, 1907.

Application filed November 20, 1905. Serial No. 288,113.

To all whom it may concern:

Be it known that I, WALTER RICHARD BONHAM, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Calculating-Machines, of which the following is a full, clear, and exact specification.

This invention relates to calculating-machines, and more particularly to the class designed for addition and subtraction; and it has for its primary object to provide an improved construction of calculating-machines of this character which shall be simple both in mechanism and operation and of inexpensive construction and especially adapted as a pocket-machine.

A further object is to provide an improved, simple, and efficient means for preventing the carrier from moving accidentally beyond the position to which it is positively moved by one of the indicator members.

A further object is to provide an improved means whereby the indicator members may be given a slight retrograde movement upon the completion of its forward rotation.

To these ends and the accomplishment of other new and useful objects, as will appear, the invention consists in certain features of novelty in the construction and arrangement of the several parts hereinafter more fully described and claimed, and illustrated in the accompanying drawings, illustrating an example of the invention, and in which—

Figure 1 is a plan view of this improved machine with a part of the top plate broken away. Fig. 2 is a sectional view on the line 2 2 of Fig. 1. Fig. 3 is an irregular section on line 3 3 of Fig. 1. Fig. 4 is a section on line 4 4 of Fig. 1. Fig. 5 is an enlarged perspective view of the edge of one of the carriers. Fig. 6 is an enlarged detail perspective view of the operating end of the retaining-pawl for the carriers, and Fig. 7 is an enlarged detail section on line 7 7 of Fig. 1.

The numeral 1 is a base-plate or back, and 2 is a face-plate, and between these two plates are arranged rotary indicating members or disks 3 4 5, any desired number of which being employed, according to the capacity of the machine desired, and which stand, respectively, for the units, tens, and hundreds columns, and located between these indicator members or disks are gears or carriers

6 7, which transmit a tenth of a rotation to each of the indicator-disks on the left from one complete rotation of the indicator-disks on the right, as is common in this art, and these gears or carriers 6 7 are also preferably arranged between the plates 1 2, and the two plates are secured together and the indicator members and carriers pivoted or journaled thereon by any suitable means, such as pins or bolts 8, passing through them. These bolts or pins 8 are provided with enlarged central portions 9 to form shoulders against which the plates 1 and 2 rest and serve as a means for holding said plates spaced apart. The periphery of the top plate 2 is preferably turned down against the face of the bottom plate 1, as at 10, to close the space between the plates and form a housing for the disks and carrying-wheels. Any number of these bolts or pins may be used as desired and are of such a size as to hold the plates 1 and 2 a sufficient distance apart to prevent them from bearing too severely against the gears and indicators.

The top plate 2 is provided with apertures 11, one opposite each of the indicator-disks 3, 4, and 5. These indicator members or disks are or may be duplicates of each other, and the description of one will apply equally as well to the others. They are pivoted to the back plate 1 by means of journals 12, preferably formed by a struck-up portion of the body thereof, and said struck-up portion engages a suitable aperture in the plate 1.

An important feature of my invention resides in the arrangement of the numbers or other characters of numerical value, and it consists in the employment of two sets of such numbers or characters arranged in arithmetical progression from one to zero and reversed with respect to each other, so that one series or set progresses in one direction and the other series or set in an opposite direction. These two sets of numbers or characters are provided for each of the indicators, whatever form the latter may have, and when such indicators have, as in the example of my invention shown in the drawings, a flat disk-like form the numbers are arranged in circular concentric series. The set of said numbers arranged in arithmetical progression from right to left is arranged upon the outer face of the plate around the aperture 11 therein, while the other set, or the set which

progresses in the opposite direction, is arranged upon the upper face of the base-plate 1 within and concentric with the first set and around the journal of each of the indicators 3, 4, and 5. These figures may be placed thereon either by stamping, printing, or in any other manner desired.

Each of the indicator-disks is provided with a plurality of tapering apertures 13, one of which is elongated, as indicated at 14, and extends inward toward the journal 12 a sufficient distance as to uncover and expose one of the numerals of the inner circle carried by the base-plate 1. The tapered portions of these apertures are arranged adjacent the peripheries of the disks. Carrier-disks 6 are arranged between each two of the indicator-disks 3, 4, and 5 and are provided with peripheral depending teeth or lugs 15, properly spaced for intermeshing with radial teeth 16, carried by the peripheries of the indicator-disks. One of the radial teeth 16 of each of these indicator-disks, excepting the last one of the series, is somewhat longer than the remaining teeth, as indicated at 17, and is provided with a beveled or inclined portion 18, and this tooth is adapted to engage with the depending lugs or teeth 15 on the carrier-disk adjacent thereto, and thereby impart a tenth of a rotation to the next one of the indicator-disks in the series by means of the engagement of the radial teeth 16 between the depending teeth 15. Thus it will be seen that for each complete rotation of the units-disk 3 the tens-disk 4 will receive one-tenth of a rotation, and the hundreds-disk 5 will receive a tenth of a revolution for each complete rotation of the tens-disk 4, and so on throughout the entire series.

With this construction and arrangement of the disks it will be seen that should the indicator-disk be given a rapid rotation the momentum given to the carrier-disk would tend to carry the same forward to an improper position after the extended tooth or projection 17 passes out of engagement with the depending tooth 15. In order to overcome this tendency and to insure a proper movement of the carrier-disks, there is provided a stop or lock 19 in the shape of a spring-pawl, preferably of the form shown, on end of which is provided with apertures adapted to receive and be held in position against the base-plate 1 by means of the pins or lugs 20. The free end thereof preferably follows the contour of the carrier-disk, and its extremity is provided with a depending portion 21, having a radially-projecting lip or finger 22. Said radial lip or finger 22 extends under the periphery of the carrier-disk, normally below the extremity of the depending teeth 15, and is adapted to be raised between the teeth in the manner hereinafter set forth. The stop or lock 19 is also provided with a depending portion or pro-

jection 23, which is located behind the lip of finger 22. This projection 23 stands beyond the periphery of the carrier-disk and directly in the path of the movement of the extended finger 17 of the indicator-disk. One edge of the projection is inclined or beveled, as at 24, and the inclined portion 18 of the extended tooth 17 will contact therewith during its course of movement, causing the same to be raised to permit the tooth 17 to pass thereunder and at the same time raise the lip or projection between two of the depending teeth 15 and into the path of the movement of the advancing tooth, which contacts therewith and is held in this position until the projecting tooth passes from beneath the depending lip or portion 23, after which the stop or lock will spring down against the base-plate 1, carrying the radial projecting lip 22 with it and out of the path of the movement of the depending teeth 15, an aperture 25 being provided in the base-plate 1 to permit a proper movement of the lip 22.

In order to prevent the indicator-disks from being turned in the wrong direction, there is provided a retaining-pawl 26, having an arm engaging the pins 20, and said pawl is provided with a lip or depending portion 27, preferably struck from the metal thereof. The lip or portion 27 is adapted to stand between the radially-projecting teeth 16 of the indicator-disks and is adapted to be raised by said teeth when properly rotated and to spring between the teeth to prevent a backward movement. Suitable pressure may be given to this pawl by means of a spring 28, loosely engaging the pins 20.

The face-plate 2 is provided with suitable struck-up portions 29 adjacent the free end of the stop or lock 19 to permit the proper movement of the same.

The edges of the apertures 11 in the face-plate 2 are provided with stops 30, so arranged that if a pencil or other implement be inserted in any one of the series of apertures 13 in the indicator-disks and moved toward the right the motion will be arrested by the pencil coming against the top side of the stop 30, only one figure of the inner series being visible through the elongated aperture 14 of indicator-disks.

In order to impart a slight retrograde movement of the indicator-disks 3, 4, and 5 to insure the proper engagement of the lip or projection 27 of the retaining-pawl 26 between the two teeth 16, there is provided a slot 31 in the face-plate 2 adjacent the stop 30 and the edge of the apertures 11. This slot is provided with a rearward-inclined portion 31^a, the highest point of which is located at the correct stopping-point for the indicator-disks. The lowest point of the slot 31^b is so located that the disk may be moved slightly beyond its proper stopping-point, so

that upon its backward movement the lip or projection 27 of the retaining-pawl will positively spring into the space between two of the teeth 16 of the indicator-disks, so that the adjacent tooth will engage therewith. Thus it will be seen that if an implement is inserted in any one of the apertures 13 and the disk rotated the force will be exerted toward the periphery of the disks and the implement will travel around the edge of the apertures 11 in the face-plate 2, carrying with it the disk until the implement strikes the stop 30, when the outward strain will cause the implement to move into the slot 31 and travel to the lowest point 31^a therein, where it will be suddenly deflected into the inclined portion 31^b, thereby causing the disk to be turned slightly backward, so that the retaining-dog will properly engage the teeth 16, the tapering portion of the apertures 13 cooperating with the slot 31 to accomplish this movement. This arrangement is to facilitate the operation of the machine and dispenses with the necessity of the operator stopping to examine the same to see if the exposing slot or aperture 14 is correctly positioned and the indicator-disks properly locked.

In the operation of this machine it is to be understood that the inner series of numbers are used for addition and the outer series for subtraction, and the machine is operated in the following manner: All of the disks or indicators are so set that the cipher of each of the inner series will be exposed through the aperture 14. A number may be added by placing the point of a pencil in that one of the apertures 13 which is directly opposite the number in the outer series which is desired and the disk rotated to the right until arrested by the stop 30, whereupon the desired number will be exposed through the aperture 14. For example, starting with the disks arranged as just mentioned and it is desired to add nine, the pencil is inserted in the aperture opposite the number "9" of the outer series and the disk rotated until its movement is arrested by the stop 30, whereupon "9" will appear in the aperture 14. Should it be desired to add nine to this result, the same operation is repeated; but inasmuch as the projecting tooth 17 at the beginning of the second operation would be just back of one of the teeth 15 of the carrier-disk the first-tenth of the revolution of the second operation would cause the tooth 17 to rotate the carrier 6 a tenth of a revolution, and thereby impart a tenth of a revolution to the disk 4, bringing the aperture 14 therein opposite the number "1" in the inner series of numbers, while the disk 3 would continue to rotate until arrested by the stop 30, whereupon the number "8" would appear in the aperture 14 in the disk 3, and by reading the number "1" in the aperture 14

in the disk 4 in connection therewith the sum "18" appears. Thus each time the unit-disk 3 makes a complete rotation the tens-disk 4 makes a partial or tenth revolution, and each time the tens-disk 4 makes a complete revolution a partial or tenth revolution is imparted to the hundreds-disk 5 through the intermediate carrier-disk 7 and finger 17. During each movement of the indicator-disks the carriers are locked and released by the locking member 19 and the disks 3, 4, and 5 properly positioned in the manner already set forth. Should it be desired to subtract a given number from the sum thus added up or from any other amount, the disks 3 and 4, in which the sum appears in the aperture 14, and also the disk 5, if the sum be large enough to extend to this disk, are shifted until the apertures 14 stand opposite the numbers in the outer series. Thus if the sum appearing in the apertures 14 be the number just added, "18," the disk 3 would be turned until the aperture 14 is opposite the number "8" in the outer series, and the disk 4 should be turned until the aperture 14 therein stands opposite the number "1" in the outer series. The pencil is then placed in the aperture opposite the number in the outside series which is to be subtracted. Should the number be nine, for example, the pencil would be placed in the aperture opposite "9" and the disk rotated toward the right, as before, until arrested by the stop 30, whereupon the aperture 14 would be opposite the number "9" of the outside series, and the corresponding aperture 14 of the disk 4 would come opposite the cipher in the outside series, it being understood that when subtracting the outer series are read and the number taken is always the one opposite to which the aperture 14 stands. After thus subtracting, if it should be desired to again add to the remainder it would be necessary to again shift the disks until the remainder appears in the aperture 14, whereupon the addition may be performed, as just described, by placing the pencil in the aperture opposite the number in the outer series to be added and then rotating the disk until arrested by the projection 30.

The operation has been described in relation to only two of the disks; but it is to be understood that any number of disks constituting the machine may be operated in the same manner.

With a machine thus constructed it will be seen that the mechanism is simple in construction and operation and may be made in a thin flat form suitable for carrying in the pocket, and the disks and also the carriers are facsimiles in size and shape, and hence may be produced from two disks, one for the disks and one for the carriers, it being unnecessary to increase their diameter or the length of the teeth 15 as the values of the disks progress.

Having thus fully described the construction and operation of the machine, what is claimed as new, and desired to secure by Letters Patent, is—

1. In a calculating-machine, the combination of two sets of digits or characters of different numerical values bearing a fixed relation to each other and being reversely arranged, and means whereby the numbers in both sets are indicated and all the numbers in one set are simultaneously visible and those of the other set are only progressively visible.

2. In a calculating-machine, the combination of two sets of characters of different numerical values progressing arithmetically reversely of each other, one set being fixed with relation to the other and permanently visible, and a movable indicator whereby the characters of the other set are only progressively visible, and the characters in either set may be indicated.

3. In a calculating-machine, the combination of two sets of characters of different numerical values progressing arithmetically reversely of each other, and an indicator having apertures corresponding in number to the characters of one set, one of said apertures being elongated and through which the characters of the other set are progressively visible.

4. In a calculating-machine, the combination of two sets of characters of different numerical values progressing arithmetically reversely of each other, and a movable indicator having apertures corresponding in number to the characters of one set, one of said apertures being arranged to progressively expose the characters of the other set.

5. In a calculating-machine, the combination of two sets of characters of different numerical values progressing arithmetically reversely of each other in concentric circles, an indicator arranged over one set of said characters and having an aperture through which said characters are successively visible, and a series of additional apertures, one of said apertures being disposed adjacent each of the first set of characters.

6. In a calculating-machine, the combination of two sets of characters of different numerical values progressing arithmetically in opposite direction and in concentric circles, one set being fixed with relation to the other, a rotary indicator arranged over one set of said characters and having an aperture through which the characters of said set are successively visible, a series of additional apertures adjacent the characters of the other set, and a stop projecting across the line of the said circular series of apertures for arresting the movement of the turning implement when placed in one of the said series of apertures.

7. In a calculating-machine, the combination of two rotary indicating members each

having peripheral teeth and apertures formed therein, and constituting indicating-apertures, characters of different numerical values arranged in a circular series opposite said apertures respectively, a carrier-gear having teeth meshing with the said teeth on one of said rotary members for imparting motion to the latter, fingers on said rotary indicators projecting beyond the teeth thereof, the teeth on said gear being arranged within the sweep of the said finger on one of said indicators, a second gear having teeth arranged within the sweep of the latter said finger, and a third rotary indicator member having teeth engaging the teeth of said second gear.

8. In a calculating-machine having a path of movement for an operating means, the combination of a plurality of rotary indicators, a carrier for imparting the movement of one of said indicators to the other, a stop across said path of movement, and means adjacent the stop for causing a retrograde motion of the indicators.

9. In a calculating-machine having a path of movement for an operating means, the combination of a rotary indicator, a retaining-pawl, means carried by the indicator and with which the pawl coöperates, a stop arranged in the path of said movement and so disposed as to cause the indicator to travel slightly beyond the point at which the pawl engages one of the coöperating means, and means for transmitting a retrograde motion to the indicator for seating the pawl.

10. In a calculating-machine having a path of movement for an operating means, the combination of a rotary indicator, provided with peripheral teeth, a retaining-pawl adapted to engage the teeth, a stop arranged within said path of movement, said stop being so disposed as to cause the teeth to be moved slightly beyond the point at which the pawl engages therewith, and having a slot adjacent thereto into which the operating means is deflected to cause the teeth to be moved backward against the pawl.

11. In a calculating-machine having a path of movement for an operating means, the combination of a rotary indicator provided with a series of apertures and peripheral teeth, a retaining-pawl adapted to engage the teeth, a stop within said path of movement disposed to cause one of the teeth to travel slightly beyond the point of its engagement with the pawl, and a rearwardly-disposed slot adjacent the stop and into which the operating means is deflected, the end of said slot being so disposed as to transmit a retrograde movement to the disk to cause the tooth to engage the pawl.

12. In a calculating-machine, the combination of a plurality of rotary indicators, a carrier for imparting the movement of one of said indicators to the other, a stop normally out of the plane of movement of the carrier,

and means for engaging and moving said stop into engagement with the carrier when the indicator is operat

13. In a calculating-machine, the combination of a plurality of rotary indicators, a carrier for imparting the movement of one of said indicators to the other, a stop normally out of the plane of movement of the carrier, and a projection carried by the indicator adapted to engage the carrier and stop to rotate the former and to move the latter into engagement therewith.

14. In a calculating-machine, the combination of a plurality of rotary indicators, a carrier for imparting motion from one of said indicators to the other, and provided with a

plurality of depending teeth, a stop provided with a depending portion and a radial extending lip, and a projection carried by the indicator adapted to rotate the carrier and engage the projection on the stop for moving the lip into the path of movement of the carrier-teeth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 31st day of October, A. D. 1905.

WALTER RICHARD BONHAM.

Witnesses:

FRANCIS A. HOPKINS,
J. H. JOCHUM, Jr.