

Dec. 4, 1923.

1,476,197

C. M. FRIDEN

CALCULATING MACHINE

Filed Jan. 17, 1921

2 Sheets-Sheet 1

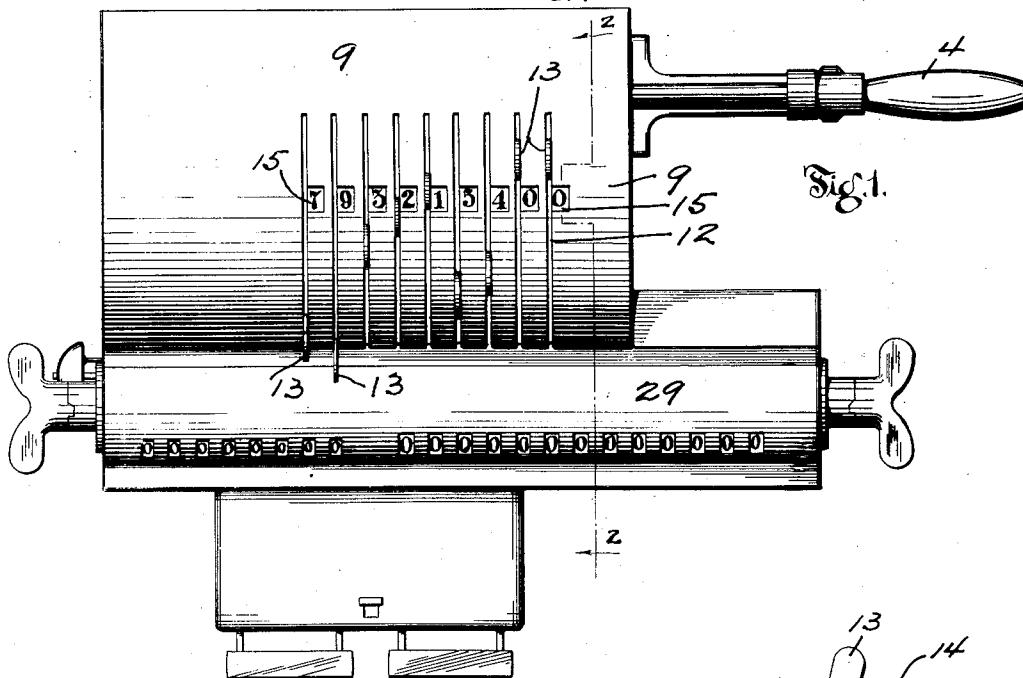


Fig. 1.

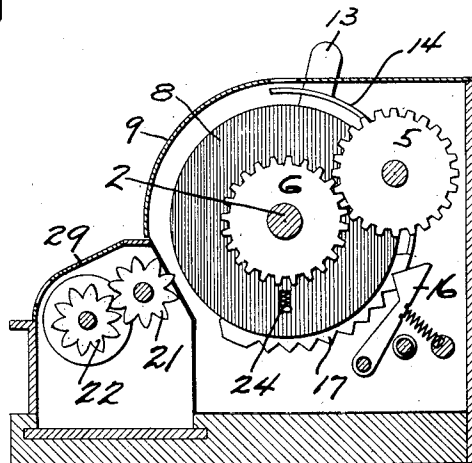


Fig. 2.

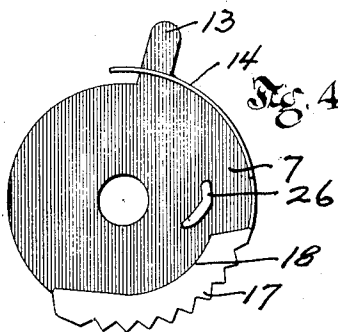


Fig. 4.

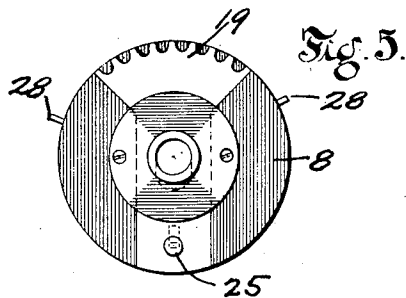


Fig. 5.

WITNESS

H. Sherburne

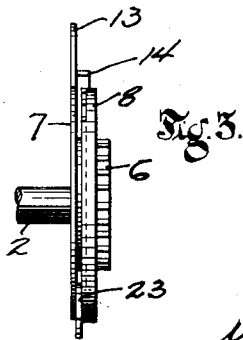


Fig. 5.

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2 Sheets-Sheet 2

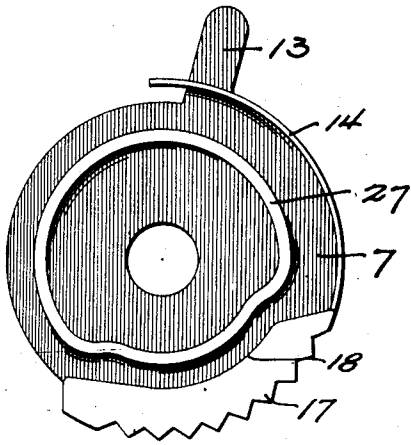


Fig. 6.

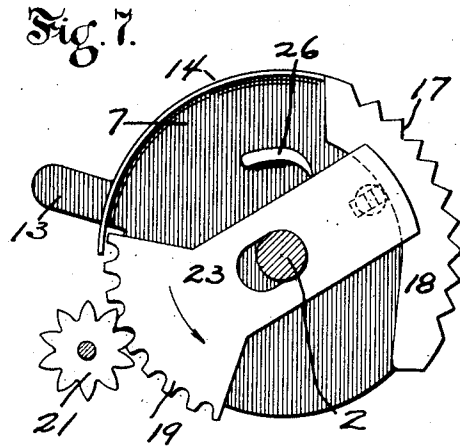


Fig. 7.

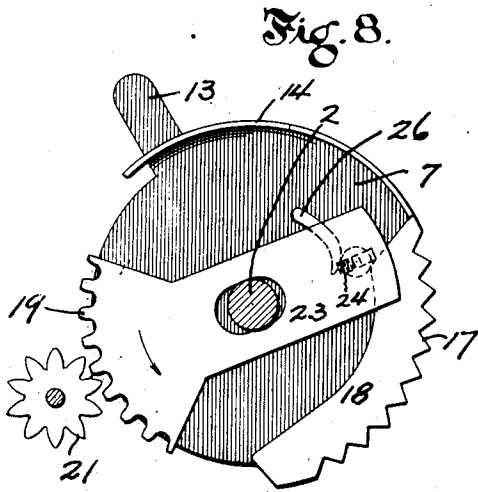


Fig. 8.

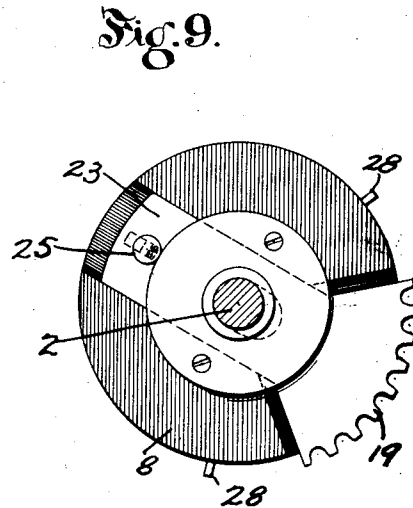


Fig. 9.

WITNESS

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UNITED STATES PATENT OFFICE.

CARL M. FRIDEN, OF PIEDMONT, CALIFORNIA.

CALCULATING MACHINE.

Application filed January 17, 1921. Serial No. 438,002.

To all whom it may concern:

Be it known that I, CARL M. FRIDEN, a subject of the King of Sweden, and a resident of Piedmont, Alameda County, and State of California, have invented a certain new and useful Calculating Machine, of which the following is a specification.

The invention relates to calculating machines of the type embodying a rotatable drum, upon which the values to be calculated are set up, rotation of the drum being effected by a handle which projects to the outside of the machine. The values adjusted on the drum are transmitted, on the rotation of the crank handle, indirectly, by means of intermediate wheels, to the figure discs of the counting mechanism, which, for the purpose of making the direct action of the selected values on the intermediate wheel of the figure discs of highest value possible, is disposed in parallel displaceable relation to the value selecting mechanism axis.

Heretofore, machines of this type, one form of which is clearly illustrated in United States Patent No. 1,088,486, issued February 24, 1914 to Franz Trinks, have comprised a drum consisting of a plurality of wheels, each provided with nine separate radially movable teeth, variable as to the number operatively projected, by cam discs arranged on the wheels, the cam discs being rotatable with the wheels upon rotation of the crank handle. The cam discs were provided with tongues extending through slots in the casing of the machine and since the discs rotated with the wheels and the clearances in the machine were small, these value selecting tongues were very small, rendering them difficult of manipulation.

Further, in order to readily observe the values set up on the toothed wheels, it has been believed essential to provide the machine with an indicating mechanism such as is shown in the Trinks Patent No. 1,007,618 of October 31, 1911.

An object of my invention is to greatly simplify the construction and greatly lessen the cost of manufacture of calculating machines of the rotary drum type, to eliminate the indicating mechanism heretofore employed and to make a more durable and accurate machine.

The invention possesses other advantageous features, some of which, with the foregoing, will be set forth at length in the fol-

lowing description where I shall outline in full, that form of the invention which I have selected for illustration in the drawings accompanying and forming part of the present specification. In said drawings, I have shown one embodiment of the machine of my invention, but it is to be understood that I do not limit myself to such form, since the invention as set forth in the claims, may be embodied in a plurality of forms.

Referring to said drawings:

Figure 1 is a top or plan view of a calculating machine embodying my invention.

Fig. 2 is a cross section of the machine taken on the line 2—2, Fig. 1.

Fig. 3 is a front elevation of the calculating unit.

Fig. 4 is an elevation of a setting disc which forms part of a calculating unit.

Fig. 5 is an elevation of the actuating disc which forms part of a calculating unit.

Fig. 6 is an elevation of a modified form of setting disc.

Fig. 7 is a detail showing the actuating member in engagement with the intermediate wheel of the counting mechanism.

Fig. 8 is a detail showing the setting disc in a different adjusted position; the actuating member being withdrawn from the intermediate wheel.

Fig. 9 is a side elevation of the actuating disc with the actuating member projected therefrom.

The present invention relates particularly to the value selecting mechanism, whereby the values to be calculated are set up on the rotatable drum and whereby they are transmitted to the counting mechanism upon rotation of the drum. The complete machine is provided with tens carrying devices, zero-setting mechanism and carriage moving devices, such as are well known in the art, as shown in the patents above referred to, to which reference is hereby made for a disclosure of a complete machine.

The calculating machine shown in the drawings, and which embodies the present invention, comprises a suitable casing in which the shaft 2 is journaled. The shaft is rotated by the crank handle 4 through the gears 5 and 6. Mounted on the shaft in close relation, are a plurality of calculating units, each unit comprising two elements, a value setting or selecting disc 7 and a cooperating actuating disc or wheel 8. The value

setting discs 7 are rotatable on the shaft and the actuating wheels 8 are secured to and are rotatable with the shaft. The drum or cylinder formed by the plurality of calculating units is covered by a housing plate 9, having parallel slots 12 therein, through which extend fingers 13 formed integral with the respective selecting discs 7. The disc 7 is provided at the side of the finger 13 with an arcuate band 14, on the face of which are formed the numerals from 0 to 9 inclusive. One numeral on each band is visible through an aperture 15 in the plate 9, which aperture preferably opens into the slot 12. There is an aperture 15 provided for each selecting disc 7 and the apertures are alined, so that the figures appearing through the apertures indicate the value entered into the drum by the adjustment of the selecting discs. The movement of a selecting disc, for instance, to expose the figure 4 in its aperture, has so positioned the selecting mechanism that upon rotation of the handle through a complete turn from its initial position the corresponding counting wheel will be moved four steps.

The selecting disc is held in adjusted positions by a spring pressed dog 16 engaging a rack 17 on the disc, there being a dog provided for each disc and the racks being so positioned to hold the discs in accurate selected position. The selecting disc is also provided with a cam 18 which, upon rotation of the actuating disc or wheel 8, moves the actuating member into engagement with the intermediate wheel of the counting mechanism and holds such member in engagement with the intermediate wheel to advance the counting wheel the number of steps represented by the value set up by the adjustment of the selecting disc. The cam 18 extends through an arc which is equal to or greater than the arc of the actuating face of the actuating element.

The actuating element is mounted in the actuating wheel 8 and comprises an element having a toothed actuating face 19 which is moved by the cam 18 into and out of engagement with the intermediate wheel 21 of the counting mechanism 22. The actuating element preferably comprises a radially movable slide 23, slidably mounted on the actuating wheel 8. In the constructions shown in Figs. 2 and 5, the slide is held normally in depressed or inoperative position by a spring 24, disposed in the wheel 8. The slide is moved to extended or operative position, with the toothed actuating face 19 projected from the wheel, by contact of the roller 25 on the slide with the cam 18. The cam is secured to the setting or selecting disc, and angular adjustment of the disc varies the position of the cam with respect to the intermediate wheel, so that by adjustment of the disc, the actuating face is caused to re-

main extended a sufficient time to cause the intermediate wheel to be rotated an amount corresponding to the setting of the selecting disc. The actuating toothed face 19 is provided with nine teeth, all or any selected number of which engage the intermediate wheel, on rotation of the wheel, depending on the setting of the cam disc 7. In Fig. 7, the disc 7 is set at 9 so that all of the teeth of the actuating element engage the intermediate wheel. In Fig. 8, the disc 7 is set at 4 and the actuating element is shown retreating from the intermediate wheel after four teeth have engaged the wheel. The cam is of such length and is so positioned, that for rotation of the wheel in one direction, that is, counter-clockwise, as shown in Figs. 7 and 8, the slide 23 is projected before the actuating toothed face moves into the zone of the intermediate wheel and permits the slide to recede as soon as the intermediate wheel has moved the selected number of steps. When the selecting disc is set at zero, the slide recedes before the actuating face reaches the zone of the intermediate wheel. When the wheel is rotated in a clockwise direction, the slide is projected as it is passing the intermediate wheel and at such time that the number of teeth on the slide which engage the intermediate wheel is equal to the value at which the selecting disc has been set. The position of projection and retraction of the slide with respect to the intermediate wheel is determined by the setting of the selecting disc. Means are provided for insuring and making positive, the recessional movement of the slide, after the intermediate wheel has been moved the selected number of steps. Formed on the selecting disc adjacent the end of the cam 18, is an auxiliary or backing-off cam 26, with which the roller 25 contacts as it reaches the end of the cam 18, and which causes an abrupt and positive recessional movement of the slide. The slide is then held in its inoperative position by the spring 24.

Instead of employing a spring to hold the slide normally inoperative, the selecting disc may be provided with a continuous cam 27 which engages the roller and holds the slide inoperative except when the roller is in contact with the projecting cam 18. In either construction, the actuating wheel is provided with carry-over fingers 28, arranged in any suitable manner, such as is shown in the patents herein before referred to, which cooperate with transfer levers to carry tens on the counting wheels.

The counting mechanism is arranged in a laterally movable carriage 29, and means are provided for shifting the carriage laterally and for resetting the counting mechanism to zero after the completion of an operation. Suitable means for these purposes are well known in the prior art.

I claim:

1. In a calculating machine, a counting mechanism including a toothed wheel, a rotatable element, a toothed slide carried by the rotatable element and adapted to cooperate with said toothed wheel and means operative upon rotation of said element to move said slide with respect to said element into position to co-operate with said wheel.

2. In a calculating machine, a counting mechanism including a toothed wheel, a rotatable element, a slide carried by said rotatable element provided on its end with a plurality of teeth adapted to cooperate with said toothed wheel on rotation of said element and means operative during the rotation of said element for moving said slide with respect to said element to cause a predetermined number of said teeth to engage with said toothed wheel.

3. In a calculating machine, a counting mechanism including a toothed wheel, a rotatable element, a slide carried by said rotatable element provided on its end with a plurality of teeth adapted to cooperate with said toothed wheel on rotation of said element and angularly adjustable means operative during the rotation of said element for moving said slide with respect to said element to cause a predetermined number of said teeth to engage with said toothed wheel.

4. In a calculating machine, a counting mechanism including a toothed wheel, a rotatable element, a slide carried by said rotatable element provided on its end with a plurality of teeth adapted to cooperate with said toothed wheel on rotation of said element, an angularly adjustable normally stationary disc cooperating with said rotatable element and means on the disc arranged to move said slide with respect to said element, on rotation of said element, to cause a predetermined number of said teeth to engage with said toothed wheel.

5. In a calculating machine, a counting mechanism including a toothed wheel, a rotatable element, a slide carried by said rotatable element provided on its end with a plurality of teeth adapted to cooperate with said toothed wheel on rotation of said element, an angularly adjustable disc cooperating with said rotatable element, means on said disc for indicating the extent of its angular adjustment and means on the disc arranged to move said slide with respect to said element, on rotation of said element, to cause a number of teeth on the slide, corresponding to the adjustment of the disc, to engage with said toothed wheel.

6. In a calculating machine, a rotatable actuating unit, comprising an actuating wheel, a slide carried by said wheel, a plurality of actuating teeth on said slide, a value selecting disc cooperating with said wheel and means on the disc for moving said

slide at selected points in the rotation of the actuating unit.

7. In a calculating machine, a rotatable actuating unit comprising an actuating wheel, a slide carried by said wheel, a plurality of actuating teeth on said slide, an angularly adjustable value selecting disc cooperating with said wheel, and a cam on said disc cooperating with said slide to move said slide at selected points in the rotation of the actuating unit.

8. In a calculating machine, a rotatable actuating unit comprising an actuating wheel, a slide carried by said wheel, a plurality of actuating teeth on said slide, a value selecting disc mounted concentrically with said wheel, means for angularly adjusting said disc, a cam on said disc and a roller on said slide arranged to engage said cam, to cause movement of the slide with respect to the wheel on rotation of the wheel.

9. In a calculating machine, a counting mechanism including a toothed wheel, an actuating mechanism including a wheel, a slide carried by said wheel, a plurality of teeth on said slide adapted to engage said toothed wheel upon projection of said slide from said wheel during rotation of said wheel and value setting means for varying the time of projection of said slide during the rotation of said wheel, whereby a predetermined number of teeth on said slide engage said wheel.

10. In a calculating machine, a counting mechanism including a toothed wheel, a rotatable element, a slide carried by said rotatable element provided on its end with teeth adapted to cooperate with said toothed wheel on rotation of said element, and angularly adjustable means operative during the rotation of said element with respect to said means for causing a predetermined number of said teeth to engage with said toothed wheel.

11. In a calculating machine, a counting mechanism including a toothed wheel, an element movable with relation to said toothed wheel, a member mounted on and movable with said element in the plane of said toothed wheel and having a movement in the plane of the toothed wheel with respect to said element into and out of a path intersecting said toothed wheel, teeth on said member adapted to engage the toothed wheel during movement of the element when the member has been moved into said path, and means operative by the rotation of said element for moving said member into and out of the path intersecting said toothed wheel.

12. In a calculating machine, a counting mechanism including a toothed wheel, an element movable with relation to said toothed wheel, a member mounted on and movable with said element in the plane of

- said toothed wheel and having a movement in the plane of the toothed wheel with respect to said element toward and from said toothed wheel, teeth on said member adapted to engage the toothed wheel during movement of the element when the member has been moved toward said wheel, and means operative during the movement of said element with respect to said wheel, for moving said member with respect to said element.
13. In a calculating machine, a counting mechanism including a toothed wheel, an element movable with relation to said toothed wheel, a member mounted on and movable with said element in the plane of said toothed wheel and having a movement in the plane of the toothed wheel with respect to said element toward and from said toothed wheel, teeth on said member adapted to engage the toothed wheel during movement of the element when the member has been moved toward said wheel, and means for positively moving said member toward and from said toothed wheel during the movement of the element.
14. In a calculating machine, a counting mechanism including a toothed wheel, a rotatable shaft, a wheel secured to said shaft, a slide carried by said wheel, teeth on said slide adapted to coact with said toothed wheel upon rotation of said wheel, a normally stationary disc surrounding said shaft and positioned adjacent said wheel, and means on the disc for causing the slide to move with relation to the wheel, during rotation of the wheel, to bring said teeth into engagement with the toothed wheel.
15. In a calculating machine, a counting mechanism including a toothed wheel, a rotatable shaft, a wheel secured to said shaft, a slide carried by said wheel, teeth on said slide adapted to coact with said toothed wheel upon rotation of said wheel, a normally stationary disc surrounding said shaft and positioned adjacent said wheel, means on the disc operative during rotation of the wheel to move the slide to bring the teeth into engagement with the toothed wheel, and means for varying the angular position of the disc whereby the number of teeth which engage the toothed wheel may be varied.
16. In a calculating machine, a counting mechanism including a toothed wheel, an actuating element movable with respect to said toothed wheel, teeth on said actuating element movable in the plane of movement of the actuating element into position to engage the teeth of the toothed wheel and selecting means operative upon movement of the actuating element to cause said endwise movement of the teeth.
17. In a calculating machine, registering dials, a series of rotatable disks, an integral toothed sector mounted and radially movable in each of said disks and adapted when projected to operate one of the trains of said dials, and setting mechanism for variably projecting said toothed sectors.
18. In a calculating machine, registering dials, a series of rotatable disks, an integral toothed sector mounted and radially movable in each of said disks and adapted when projected to operate one of the trains of said dials, a cam dial for each disk mounted coaxially therewith and independently adjustable to control the projection and retraction of its toothed sector, and means for selectively setting said cam dials.
19. In a calculating machine, a setting couple for actuating the registering dial trains thereof, comprising a rotatable disk, an integral toothed sector carried thereby and adapted to be moved radially therein to engage and disengage a dial train, a cam dial having an irregular cam groove therein and mounted co-axially with said disk but rotatable independently thereof, means for setting said cam dial to a given digit value, and means intermediate said cam dial and said disk and operated by said cam groove when said disk is rotated for projecting said toothed sector to actuate a registering dial train in accordance with the value to which the cam dial has been set.
20. In a calculating machine, a setting couple for actuating the registering dial trains thereof, comprising a rotatable disk, an integral toothed sector carried thereby and adapted to be moved radially therein to engage and disengage a dial train, a cam dial having an irregular cam groove therein and mounted co-axially with said disk but rotatable independently thereof, means for setting said cam dial to a given digit value, means intermediate said cam dial and said disk and operated by said cam groove when said disk is rotated for projecting said toothed sector to actuate the registering dial train in accordance with the value to which the cam dial has been set, and means on said cam dial for visually indicating the value to which said cam dial is set.
21. In a calculating machine, a counting mechanism, a rotatable element, a slide carried by said rotatable element, a plurality of teeth on said slide, a setting-up device for controlling the motion of said slide during rotation of said element, whereby a selected number of said teeth engage said counting mechanism on rotation of said element.
22. In a calculating machine, a counting mechanism, a rotatable element, a toothed rack carried by said rotatable element and movable radially with respect to the axis of rotation thereof, a setting-up device for controlling the motion of said rack with respect to said element during rotation of said element, whereby a selected number of the teeth on the rack engage said counting mechanism on rotation of said element.

23. In a calculating machine, a counter, a counter actuating unit comprising a rotatable element, a curved toothed rack carried by said element and concentric with the axis thereof, and a setting-up device associated with said rack and operative on rotation of the element with respect to the device to cause the rack to be moved radially with respect to the axis of said element to engage and disengage the counter, on rotation of said element.

24. In a calculating machine, a counting mechanism having a toothed wheel, a rotatable element, a counting mechanism actuating rack carried by said element, rotatable therewith and movable radially with respect thereto during rotation thereof into and out of a path intersecting the toothed wheel and manipulative means for determining the points of projection and retraction of said rack with respect to the toothed wheel whereby the toothed wheel is advanced a predetermined amount depending upon the setting of the manipulative means.

25. In a calculating machine, a counting mechanism having a toothed wheel, a rotatable rack adapted to actuate said toothed wheel, means operative during the rotation of the rack for projecting said rack outward from the center of rotation into a path intersecting the toothed wheel and means for positioning said projecting means to cause the rack to be projected at variable selected points during successive rotations thereof.

26. In a calculating machine, a counting

mechanism having a toothed wheel, a movable rack having the same distance of movement for each operation of the machine and means operative during the movement of said rack for moving said rack into a path intersecting the toothed wheel, means for holding the rack in said path for the same distance of movement for each operation of the machine and means for varying the point at which said rack moves into said path.

27. In a calculating machine, a counting mechanism having a toothed wheel, a rotatable element, a slide carried by said element, a rack having nine teeth on the outer end of said slide, means for rotating said element, manipulative means associated with said element adapted on rotation of said element to move said rack with respect to said element to cause a selected number of teeth on said rack to engage said toothed wheel.

28. In a calculating machine, a counter comprising a series of number bearing wheels, a series of rotatable wheels, an integral toothed sector mounted and radially movable in each of said wheels and adapted, when projected, to operate one of said number bearing wheels and manipulative devices for variably projecting the toothed sectors on rotation of said wheels, so that variable numbers of the teeth of said sectors will engage said number wheels.

In testimony whereof, I have hereunto set my hand.

CARL M. FRIDEN.