R. H. MARCHANT.

CALCULATING MACHINE.

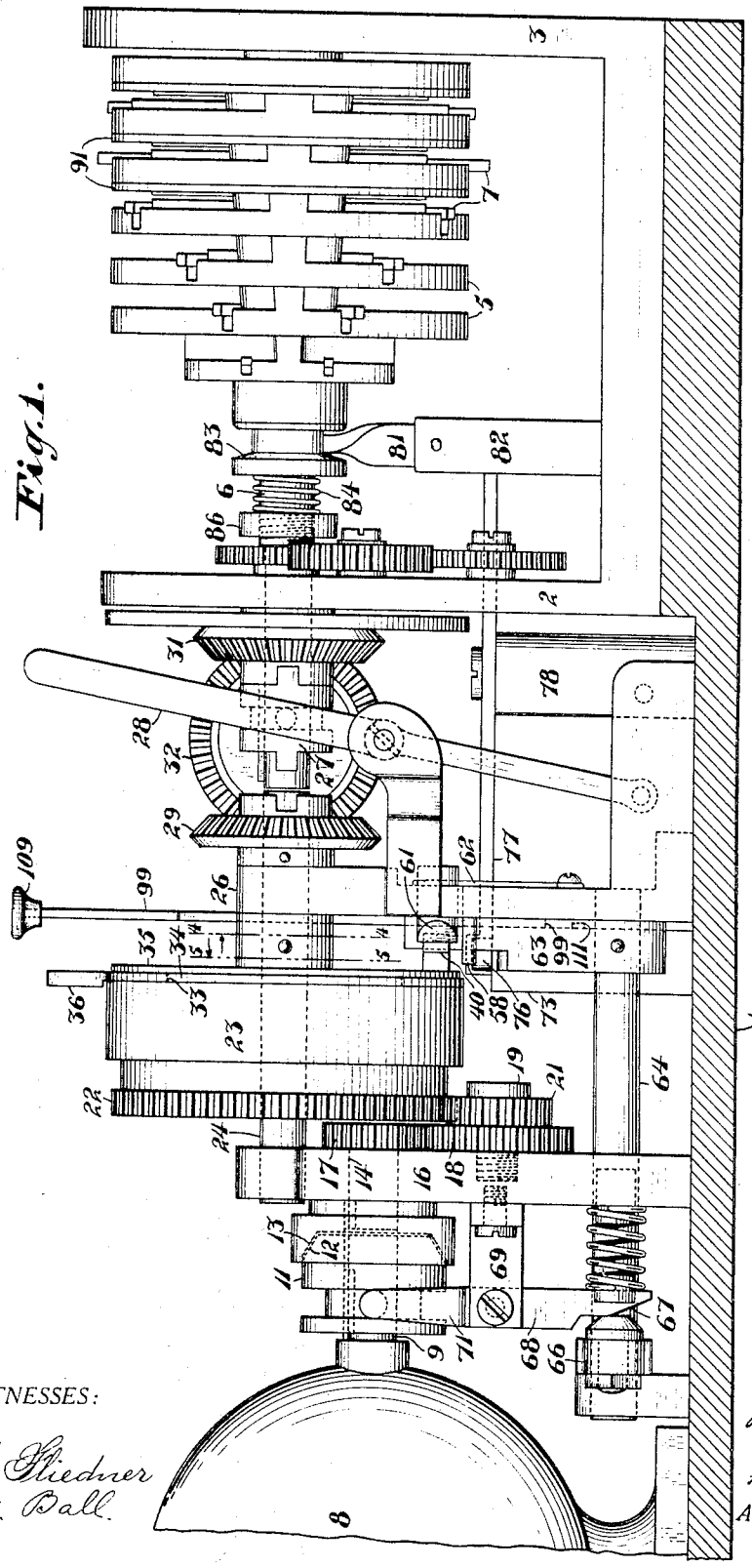
APPLICATION FILED APR. 2, 1914.

1,115,950.

Patented Nov. 3, 1914.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

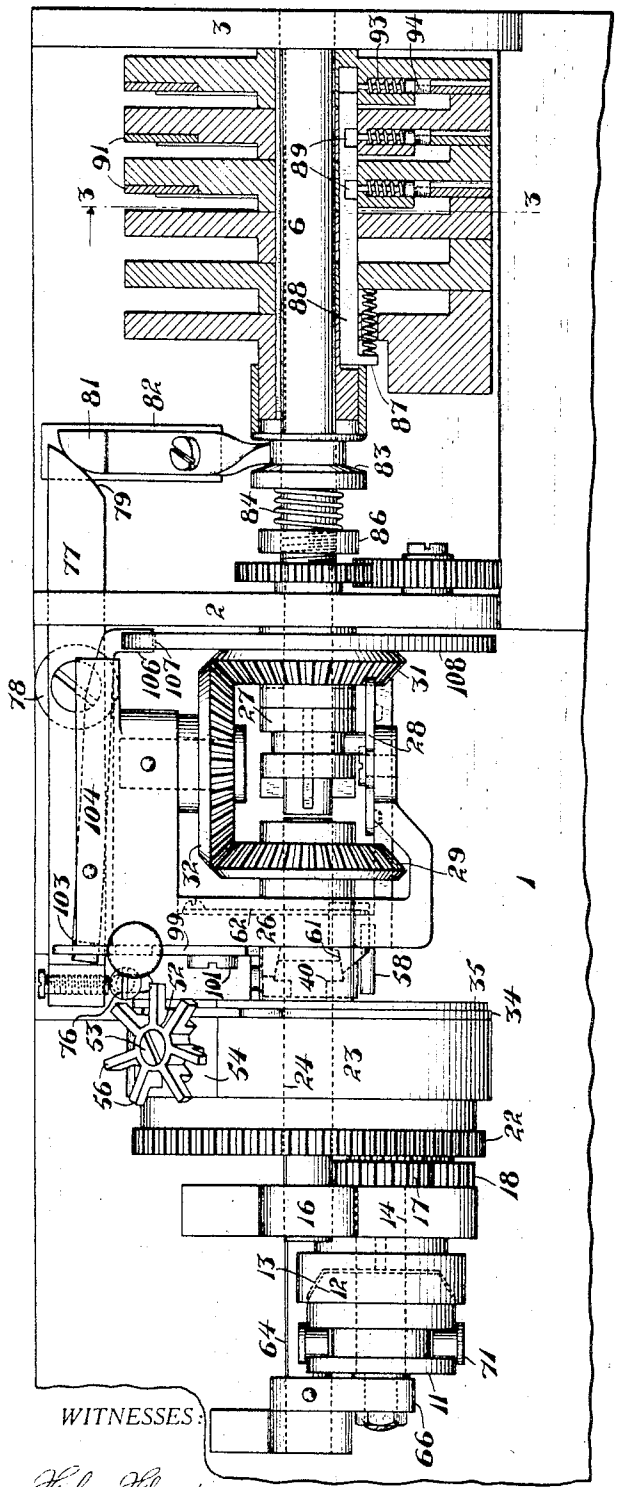

Fig. 2.

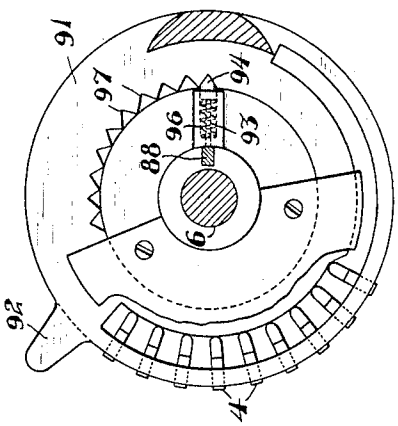

Fig. 3.

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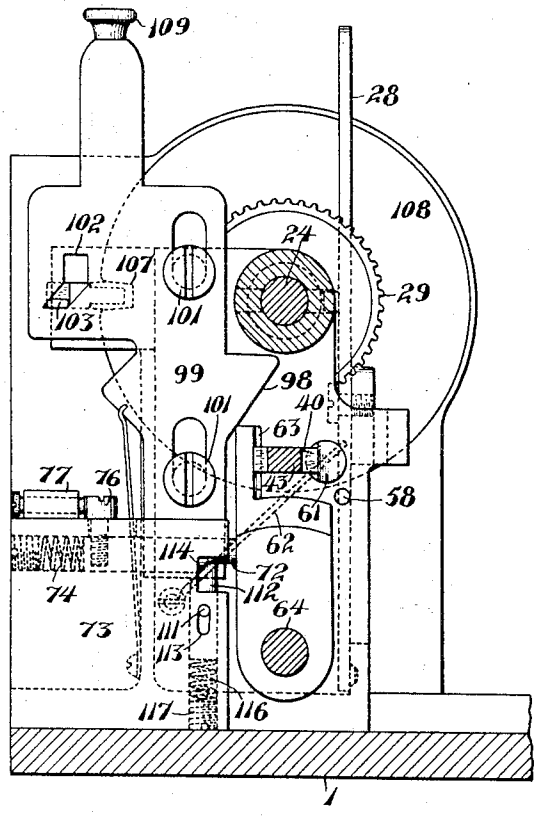


Fig. 4.

Fig. 5.

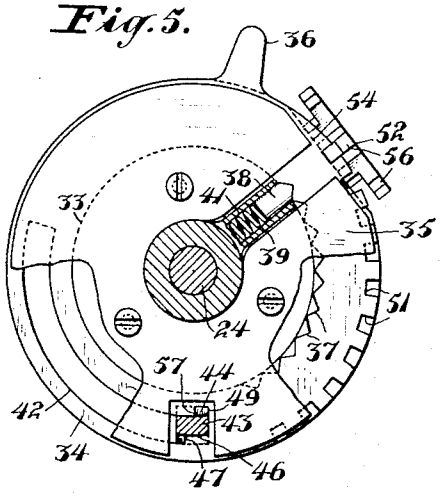
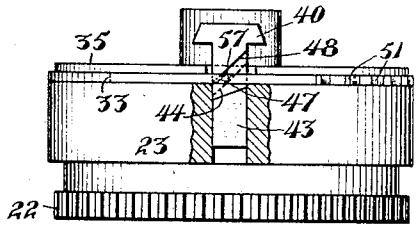


Fig. 6.



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RODNEY H. MARCHANT, OF OAKLAND, CALIFORNIA.

CALCULATING-MACHINE.

1,115,950. Specification of Letters Patent. Patented Nov. 3, 1914.

Application filed April 2, 1914. Serial No. 829,029.

To all whom it may concern:

Be it known that I, RODNEY H. MARCHANT, a citizen of the United States, residing at Oakland, in the county of Alameda and State of California, have invented new and useful Improvements in Calculating-Machines, of which the following is a specification.

This invention relates to improvements in calculating machines, especially those which perform the operations of multiplication and division, and the object of the invention is to provide an improved machine having a main shaft, preferably power-driven, which will be automatically arrested, after a variable predetermined number of revolutions of said shaft.

In the accompanying drawing, Figure 1 is a broken side view of my improved apparatus; Fig. 2 is a broken plan view thereof; Fig. 3 is a vertical section on the line 3—3 of Fig. 1; Fig. 4 is a vertical section on the line 4—4 of Fig. 1; Fig. 5 is a vertical section on the line 5—5 of Fig. 1, certain parts being broken away; Fig. 6 is a side view of a drum, partly broken away.

Referring to the drawing, 1 indicates a base, on which are standards 2, 3 through which extends a shaft 6 on which are secured wheels or disks 5 from which are extensible pins 4 and transfer pins 7, movable in a direction parallel with their axes, said pins 4, 7 being adapted to rotate indicating wheels in the manner well known in the art and illustrated in Patent No. 514,725, dated Feb. 13, 1894, W. T. Odhner.

8 indicates a motor, upon the shaft 9 of which is slidable a clutch 11 keyed to said shaft and having a friction cone 12 engaging an internal friction cone 13 upon a short shaft 14 extending through a bearing in an upright 16, said shaft carrying on the other side of said upright a gear wheel 17 meshing with a gear wheel 18 on a stud shaft 19 carrying a pinion 21. Said pinion 21 meshes with a gear wheel 22 secured to a drum 23, secured to a shaft 24 having its bearings in the upright 16 and in an upright 26, and in line with the shaft 6. Upon said shaft 6 is slidably keyed a clutch 27 operated by a lever 28, and which can be operatively connected with the shaft 24, so that said shaft 6 is then rotated directly by the shaft 9. When the clutch is slid on the shaft 6 as far as possible from the motor, said shaft 6 is then driven in a direction reverse to its former direction by means of miter wheels 29, 31, and a miter wheel 32 meshing with both miter wheels 29 and 31.

The drum 23 is thicker in its central portion to form a circular shoulder 33 on one side, which forms a gearing for a ring 34 rotatable on said shoulder, and of a thickness equal to the height of said shoulder, and provided with a projecting finger 36 for the purpose of enabling it to be conveniently rotated by hand. A circular plate 35 secured to the drum serves to hold the ring 34 in place. The inner edge of said ring is formed with ten notches 37, into any one of which can enter the wedge-shaped outer end of a pin 38, pressed outwardly by a coiled spring 39, said spring and pin being received in a cylindrical socket 41, partly in the thicker central portion of the drum and partly in the marginal portion thereof. As the ring 34 rotates upon said shoulder, the pin 38 is repressed into said socket by the advancing side of one of the notches and then is pressed out by said spring into the next succeeding notch, said pin thus serving to retain the ring in the position to which it has been last rotated. Said ring has a concentric arcuate slot 42, through which extends a block 43, slidable in a bearing therefor formed in the drum. The outer end of said block is sufficiently narrow to pass into said arcuate slot, but the inner end is wider, and is prevented passing through said slot by means of a beveled shoulder 44 on its surface next the axis of the drum. The forward end of the arcuate slot is extended, as shown at 46, to form on its outer side a short shoulder 47 adapted to engage a shoulder 48 upon the face of said block remote from said axis, and act as a wedge to force the block outwardly in a direction parallel with the axis, this movement being permitted to take place by the fact that said extension 46 is also enlarged in a direction toward said axis, as shown at 49, so as to permit the shoulder 44 on the inner face to project into and through said extension. By this construction, when the ring arrives at the end of its oscillating movement, that is, when the slot has been moved first in a forward and then in a rearward direction, the forward end of the slot causes the block to be projected beyond the face of the ring to an extent considerably greater than before.

The outer edge of the ring 34 is formed

with ten notches 51, which are adapted to engage a spur wheel 52 rotatably mounted on a short screw 53 screwed into a flattened portion 54 of the drum, the outer portions of the spurs of said spur wheel being extended to form fingers 56. When by means of the finger the ring 34 is rotated through an arc corresponding to any desired number of spaces between said notches, then the spur wheel 52 is also rotated through a corresponding angle, and the arcuate slot is moved through a corresponding angle, it being observed that, immediately upon the forward movement of the arcuate slot a shoulder 57 of the extension 49 of said slot engages the shoulder 44 on the thicker or inner portion of said block and withdraws said block to a position in which only a portion thereof extends beyond the ring. Now, the ring having been turned through the angle mentioned, the motor is started by means to be presently described and the drum rotates in the same direction as that in which the ring was rotated thereon. One of the fingers 56 of the spur wheel always projects beyond the side of the drum, and, in each revolution of the drum, this finger is engaged by a pin 58 secured upon the upright 26, and the spur wheel is thereby rotated through the angular distance between two fingers, causing a corresponding backward rotation of the ring 34 through the distance between two notches, and causing the arcuate slot to travel through a corresponding distance with reference to the block. When the drum has rotated as many revolutions as correspond to the number of notches through which the ring was rotated to set the device, the end of the arcuate slot arrives at the block and the shoulder 47 engages said block, and as before explained, projects the block farther from the face of the plate. The block is formed with a head 40 extending in the circumferential direction of the arcuate slot. The head 40, being now projected, first impinges against the beveled end of a pin 61 slidable in a bearing in the upright 26 and normally projected therefrom by a spring 62, forcing said beveled end backward, and passes the same, the spring immediately thereafter projecting said pin, so as to form a lock for holding the head in its position in which it has passed said pin, the object of which lock will be presently explained. As soon as said head has passed the pin, it strikes against an arm 63 secured to a shaft 64 having its bearing in the upright 16, and rocks said shaft 64. An arm 66 extends from the other end of the shaft 64, and engages the beveled or cam-shaped end 67 of a rocking lever 68 pivoted upon a forked extension 69 from the upright 16, and having an upper forked portion 71 engaging the clutch 11. Thus the rocking of the shaft 64 rocks said lever 68 and withdraws the friction cone 12 out of the internal friction cone 13 and operatively disconnects the motor shaft 9 from the shaft 14. The motive power being thus removed, the drum rotates only by its own momentum. In order to absorb said momentum and bring the drum to rest without shock there is provided the following mechanism. Said arm 63 when it is moved by the head 40, as before described, presses back a pin 72 slidable in a horizontal bearing in a block 73, and normally projected by a coiled spring 74 in said block, and compresses said spring, the compression of the spring serving to absorb the momentum of the moving parts. Said pin has screwed thereinto a vertical screw 76, the head of which impinges upon one end of a lever 77, pivoted on a short standard 78 upon the base 1. The other end of said lever 77 is formed to provide a cam or wedge 79 which engages a cam-shaped end of a lever 81 pivoted upon a short standard 82 on the base, the upper end of said lever 81 extending into a groove in a sleeve 83 around the shaft 6. Said sleeve 82 is normally pressed away from the motor by a coiled spring 84, of which one end abuts against said sleeve 83 and the other end is pressed against a nut 86 screwed on a threaded portion of the shaft. The movement of the head of said screw 76 against said lever 77 causes the lever 81 to move in such a direction as to force the grooved sleeve 83 toward the motor against the force of said compressed spring 84. In a recess in the end of the sleeve remote from the spring is received the outwardly extending head 87 of a bar 88 slidable in a groove in the shaft 6, said bar 88 having in its outer edge a series of notches 89 corresponding in width with the several disks 5. Said disks are keyed to the shaft 6 and are suitably spaced from one another and have between them setting rings 91, each provided with a suitable finger 92 for rotating the same, and rotatable in circular shoulders on the disks. In each disk section is bored a cylindrical hole 93 which receives a pin 94 and a coiled spring 96 around the pin, and the inner edge of each setting ring is formed with ten notches 97, into any one of which the outer end of said pin 94 can enter, in like manner as before explained as regards the ring 34. When the bar 88 is in its outermost position, that is, in the position nearest to the motor, said notches 89 in said bar register with, or are opposite to, the inner ends of the pins 94 of the respective disks 5, so that the inner end of each pin, upon being repressed by the rotary movement of the corresponding setting ring 91, can enter a corresponding notch 89. Consequently said setting rings can be rotated to set the machine for calculating. But when the bar is

in its innermost position, that is, in the position farthest from the motor, its notches are moved out of register with the inner ends of the pins of the setting rings, so that said pins cannot be pressed back, and consequently the setting rings cannot be rotated. This provision is made to prevent the setting rings being moved relatively to the disks by their momentum due to their rapid motion, since the shaft 6 rotates very rapidly, between 300 and 400 revolutions a minute. The notched bar 88 is in its innermost position when the drum is rotated, and in its outermost position when the drum is at rest.

The shaft 6 is positively brought to rest by the following mechanism. The upper portion of the arm 63 engages a beveled shoulder 98 of a vertically slidable starting plate 99, guided by means of two screws 101 extending through slots in said plate and screwed into said upright 26, so that the forward motion of the arm 63 raises said starting plate. Said starting plate has a bent slot 102, which is engaged by a reduced end of a latching lever 103, pivoted on a vertical pivot in a horizontal extension 104 of the upright 26, and received within a groove in said extension. By reason of the shape of the bent slot the upward motion of the starting plate causes the end of the lever projecting through said slot to move rearwardly and the other end of said lever to move forwardly. Said other end is formed with a forwardly projecting finger 106, which, when said end is moved forwardly, moves rapidly into a notch 107 in the edge of a disk 108 fastened to the shaft 6, and positively arrests said shaft.

To start the machine for multiplying or dividing, as the case may be, the finger 36 is rotated through an angular distance corresponding to the number with which the multiplication or division is to be effected. This motion immediately, by means of the arcuate slot 42, causes the head of the block 43 to be moved nearer to the drum 23, so that the arm 63 can be rocked backward, the head of the block being no longer between the arm 63 and the locking pin 61. The starting plate 99 is now depressed by means of a finger piece 109 secured on the upper end thereof, this depression being permitted by reason of the arm 63 being able to move backward. When the starting plate is depressed, its bottom edge engages a projecting end of a transverse pin 111 secured to a vertical pin 112 slidable in a vertically extending recess in the block 73 closed at the lower end by a screw 117, the ends of the pin 111 being slidable in vertical slots 113 in said block. The upper end of the vertical pin 112 is beveled at the rear, as shown at 114, to engage a beveled cut away portion of the pin 72. When said pin 72 was pressed back by the pressure of the arm 63, said vertical pin 112, pressed upwardly by a coiled spring 116 in said recess, prevented the return movement of said horizontal pin. But when the starting plate is depressed, then the vertical pin 112 is also depressed, for the reasons just described, and the horizontal pin 72 is permitted to move forwardly, which it does under the action of the coiled spring 74. The levers 77 and 81 are then free to move under the action of the coiled spring 84, and the notched bar 88 is returned to its innermost position in which the setting rings are locked. The friction cone 12 engages the friction cone 13, and the shaft 14 is rotated. The shaft 6 is also rotated in a forward or backward direction according to the position of the clutch 27.

I claim:—

1. In combination, a series of computing wheels, a shaft carrying the same, means for arresting said shaft, a device rotatable with said shaft, and adapted, in an operative position, to actuate said arresting means, and means for moving said device from an inoperative to an operative position after a predetermined number of revolutions of said shaft.

2. The combination of a series of computing wheels, a rotary shaft for rotating the same, a device movable relatively to said shaft, means for rotating the shaft, means, adapted in the rotation of the drum to move said device relatively to said shaft to an extent corresponding with the number of rotations of the shaft, and means, adapted to be actuated by the device when so moved, for arresting the motion of the shaft.

3. The combination of a series of computing wheels, a rotary shaft for rotating the same, a device movable relatively to said shaft, means for rotating the shaft, means, adapted in the rotation of the drum to move said device relatively to said shaft to an extent corresponding with the number of rotations of the shaft, a motor for said shaft, mechanism for disconnecting said motor from said shaft, mechanism for absorbing the momentum of the moving parts, mechanism for positively arresting the shaft, and means adapted to be actuated by said device for operating all of said mechanism.

4. The combination of a series of computing wheels, a rotary shaft for rotating the same, a ring movable relatively to said shaft, means for yieldingly holding the ring in the position to which it has been moved, means for rotating the shaft, a stationary device, adapted in the rotation of the shaft to move said ring relatively to the shaft to an extent corresponding with the number of rotations of the shaft, a block slidable in a direction parallel with the axis of rotation of the shaft, said ring being adapted, at the end of its said relative movement,

to move the block in said direction, and means, adapted to be engaged by said block, for arresting the motion of the shaft.

5. The combination of a series of computing wheels, a rotary shaft for rotating the same, a drum carried by said shaft, a ring rotatably carried by said drum and provided with means for rotating it on the drum, means for yieldingly holding the ring in the position to which it has been moved, means for rotating the shaft, a stationary device, adapted in the rotation of the drum to move said ring backward thereon to an extent corresponding with the number of rotations of the drum, a block slidable in the drum in a direction parallel with its axis of rotation, said ring being adapted at the end of its backward movement, to project the block farther from the drum, and means, adapted to be engaged by said block, for arresting the motion of the shaft.

6. The combination of a series of computing wheels, a rotary shaft for rotating the same, a drum carried by said shaft, a ring rotatably carried by said drum and provided with means for rotating it on the drum, means for yieldingly holding the ring in the position to which it has been moved, means for rotating the shaft, a stationary device, adapted in the rotation of the drum to move said ring backward thereon to an extent corresponding with the number of rotations of the drum, a block slidable in the drum in a direction parallel with its axis or rotation, said ring being adapted at the end of its backward movement, to project the block farther from the drum, a motor for said shaft, mechanism for disconnecting said motor from said shaft, mechanism for absorbing the momentum of the drum, mechanism for positively arresting the drum, and means adapted to be actuated by said block for operating all of said mechanisms.

7. The combination of a series of computing wheels, a rotary shaft for rotating the same, a drum carried by said shaft, a ring rotatably carried by said drum and provided with means for rotating it on the drum, means for yieldingly holding the ring in the position to which it has been moved, means for rotating the shaft, a stationary device, adapted in the rotation of the drum to move said ring backward thereon to an extent corresponding with the number of rotations of the drum, a block slidable in the drum in a direction parallel with its axis of rotation, said ring being adapted, at the end of its backward movement, to project the block farther from the drum, and means, adapted to be engaged by said block, for arresting the motion of the shaft.

8. The combination of a series of computing wheels, a rotary shaft for rotating the same, a drum carried by said shaft, a ring rotatably carried by said drum and provided with means for rotating it on the drum, means for yieldingly holding the ring in the position to which it has been moved, means for rotating the shaft, a stationary device, adapted in the rotation of the drum to move said ring backward thereon to an extent corresponding with the number of rotations of the drum, a block slidable in the drum and through an arcuate slot in the ring in a direction parallel with its axis of rotation, said block having a shoulder, and the ring having a shoulder at the end of the arcuate slot adapted to engage the shoulder in the block and project the same farther from the drum, and means, adapted to be engaged by said block, for arresting the motion of the shaft.

9. The combination of a series of computing wheels, a rotary shaft for rotating the same, a drum carried by said shaft, a ring rotatably carried by said drum formed on its outer edge with notches and provided with means for rotating it on the drum, means for yieldingly holding the ring in the position to which it has been moved, means for rotating the shaft, a stationary device, a spur wheel rotatably carried by the drum and the teeth of which mesh with said notches, the outer portions of said spurs being extended to form fingers, adapted in the rotation of the drum to be engaged in turn by said stationary device, whereby, in the rotation of the drum, said ring is moved backward thereon to an extent corresponding with the number of rotations of the drum, a block slidable in the drum and through an arcuate slot in the ring in a direction parallel with its axis of rotation, said block having a shoulder, and the ring having a shoulder at the end of the arcuate slot adapted to engage the shoulder in the block and project the same farther from the drum, and means, adapted to be engaged by said block, for arresting the motion of the shaft.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

RODNEY H. MARCHANT.

Witnesses:
F. M. WRIGHT,
D. B. RICHARDS.