H. MARSHALL.

COMPUTING MACHINE.

APPLICATION FILED JAN. 10, 1912.

1,284,405.

Patented Nov. 12, 1918.

2 SHEETS—SHEET 1.

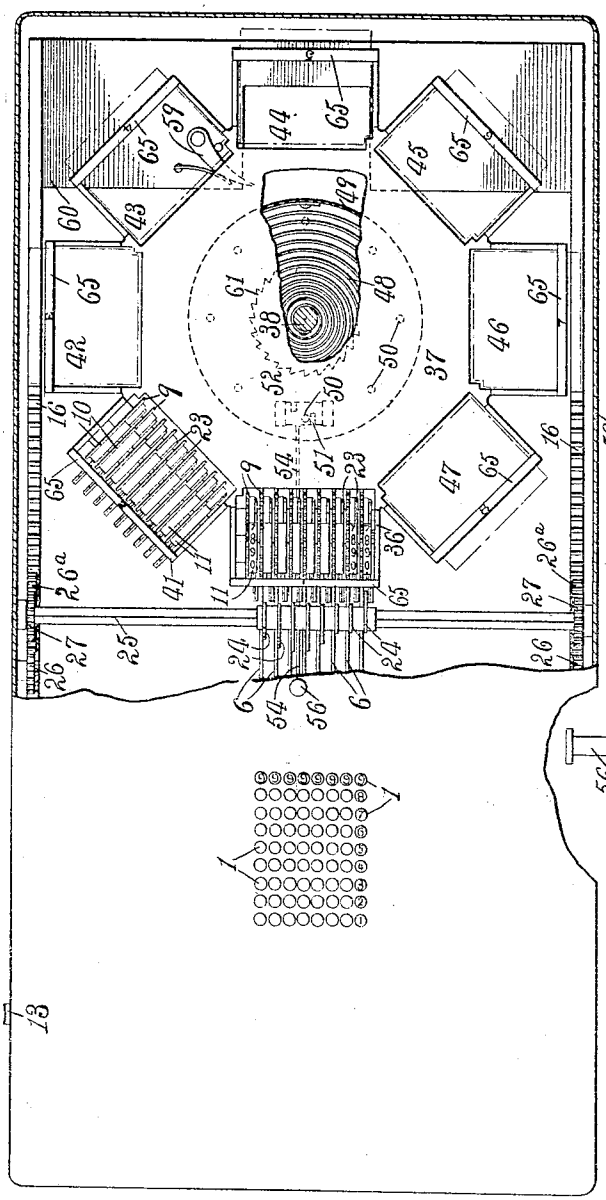


FIG. 1.

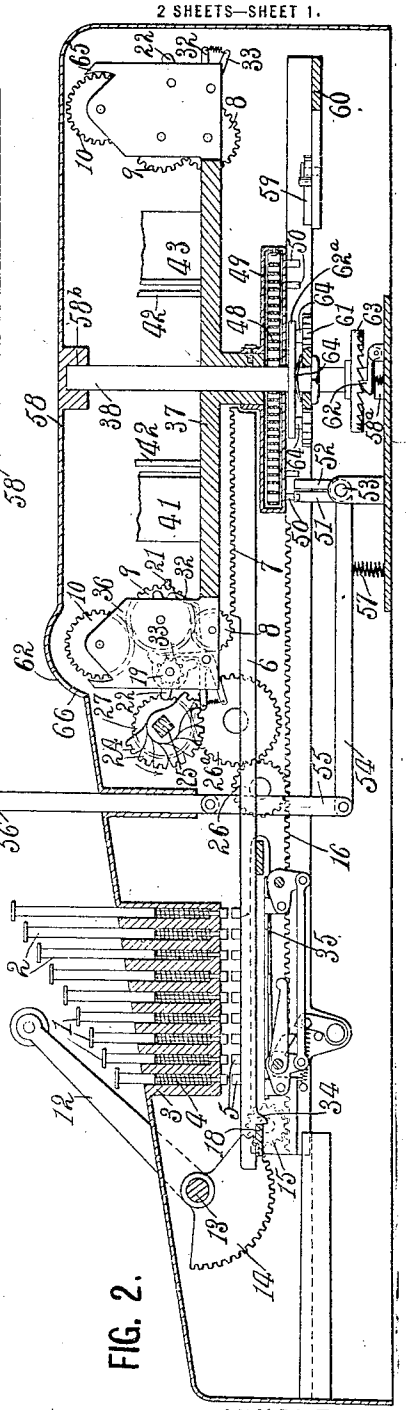


FIG. 2.

WITNESSES:

J. A. Brophy

Victor J. Evans

INVENTOR:

Holmes Marshall

BY B. B. Stickney

ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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2 SHEETS—SHEET 2.

FIG. 7.

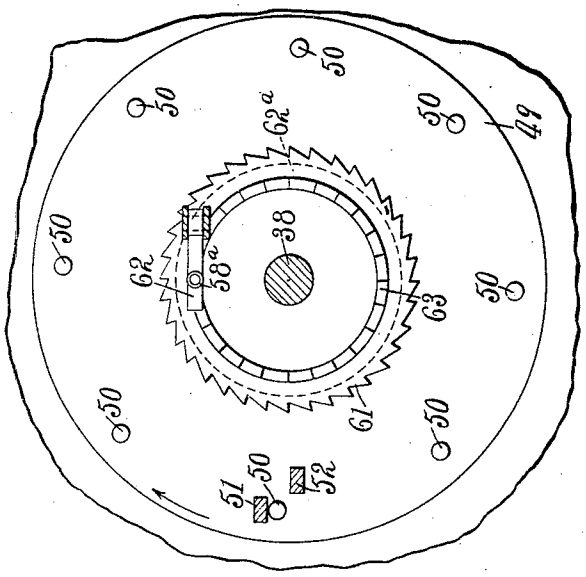


FIG. 4.

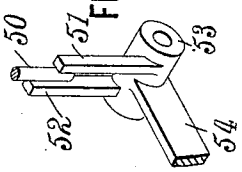


FIG. 6.

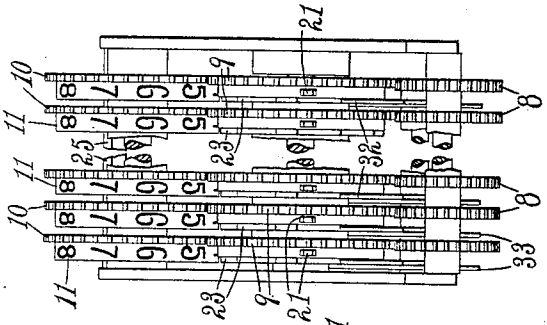
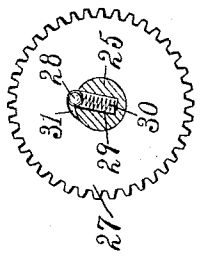


FIG. 3.



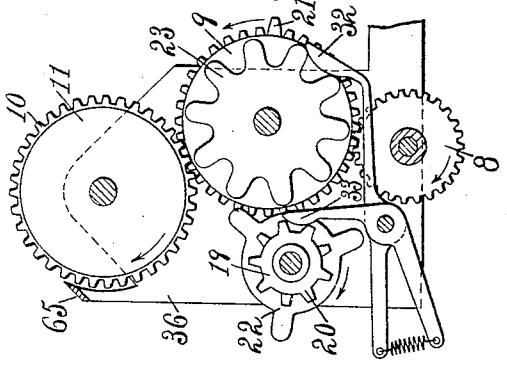


FIG. 5.

WITNESSES:

J. A. Brophy

Lelius H. Stone

INVENTOR:

Holmes Marshall

BY

B. B. Stickney

ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HOLMES MARSHALL, OF PLAINFIELD, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO UNDERWOOD COMPUTING MACHINE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

COMPUTING-MACHINE.

1,284,405. Specification of Letters Patent. **Patented Nov. 12, 1918.**

Application filed January 10, 1912. Serial No. 670,357.

To all whom it may concern:

Be it known that I, HOLMES MARSHALL, a citizen of the United States, residing in Plainfield, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Computing-Machines, of which the following is a specification.

This invention relates to a computing machine of the class in which pins or devices are set by the keys, and then a general operator is actuated to carry into the set of computing wheels or devices a number which is represented by the set pins.

The principal object of the present invention is to increase the capacity of the machine, or to equip it for performing a variety of work, without unduly complicating the mechanism or rendering it difficult to operate.

One of the main features of the invention consists in the provision of a series of computing heads which may be operated through the agency of a single set of key-set pins. These pins are usually provided upon racks, and I arrange a series of computing heads and contrive to bring these heads successively into position for coöperation with said single set of racks.

By this means, computation can be performed upon a number of computing heads independently of each other by the same set of racks. The computing heads are mounted upon a carrier which is preferably in the form of a turret, and suitable provision is made for rotating the turret to bring the computing heads successively into working position.

The turret is preferably driven by a spring, and controlled by an escapement, so that in depressing a key, the operative can bring the succeeding computing head into working position. Other objects and advantages will hereinafter appear.

In the accompanying drawings,

Figure 1 is a plan partly broken away, of one form of computing machine embodying the present improvements.

Fig. 2 is a sectional elevation taken about centrally from front to rear of the machine seen at Fig. 1.

Fig. 3 is a view of a clutch employed for the spur shaft which actuates the carry-over trains.

Fig. 4 is a perspective view of the escapement dogs for coöperation with the escapement rack of the turret which carries the computing heads.

Fig. 5 is a sectional side elevation of one of the computing heads.

Fig. 6 is a rear view of the same.

Fig. 7 is a sectional inverted plan of the turret.

Numeral keys 1 have stems 2 extending through guide openings in a block 3, and held up by springs 4. These stems project below said block to positions just over a set of computation pins 5 mounted upon rack bars 6, in the manner set forth in the application of Frederick A. Hart, No. 466,836, filed December 10, 1908.

By depressing the keys, there may be depressed or set such pins 5 as correspond to the number which is to be computed. The bars 6 have racks 7, to mesh with idle pinions 8, which mesh with computation gears 9, the latter meshing with gears 10 on dial wheels 11.

After depressing the keys 1, there is operated a handle 12, which is fixed on a rock shaft 13, extending across the machine and having at its ends segments 14 to mesh with pinions 15, the latter meshing with a pair of racks 16, connected by cross bars 17, 18; the parts from 12 to 18 forming a general operator for the computation racks and gears. The racks 16 move forwardly carrying the bar 17 into engagement with the depressed pins 5, so as to carry forward the computation or denomination racks 7, thereby rotating the idle pinions 8 and the computation gears 9, as well as the dial wheels 11.

The computation gears 9 may be provided with tens-carrying trains 19, substantially as set forth in said Hart application; each train comprising a pinion 20, which is engageable by a starting tooth 21 upon computation gear 9; and also comprising a three-toothed pinion 22, to mesh with a ten-toothed gear 23, connected to the next higher computation gear 9.

Each train, after being started by said tooth 21, is actuated by one of a series of spurs 24, carried upon a shaft 25, which makes a revolution once in each return movement of the general operator 12. One of the general operator racks 16 is connected

by two gears 26 and 26ª to a pinion 27, which has a clutch connection to the spur-shaft 25; said connection comprising a ball 28, seated in a pocket 29 in shaft 25, and pressed by a spring 30 into a recess 31 in the pinion 27, so that said pinion may move idly during the forward stroke of the general operator, but may during the return stroke, turn said shaft a full revolution. The spurs engage such pinions 20 as may have been displaced by the starting teeth 21 on the computing wheels, and complete the operations of the tens-carrying trains. Spring detents 32 and 33 are provided for the gear 23 and the pinion 20, respectively.

Upon the return of the general operator to normal position, the cross-bar 18 engages shoulders 34 upon the computation racks 6, and returns the latter to normal positions; and a plate 35 is raised to reset the depressed pins 5, in the manner set forth in said Hart application.

The wheels 8, 9, 10 and 11, with their appointments, are mounted in a casing or support 36, to form a computing head which is shown at Fig. 2 in position for engagement with the racks 7 and the spurs 24, but is shiftable out of such position; being for this purpose mounted upon a carrier or carriage in the form of a revoluble turret 37, which is loosely mounted upon a stationary vertical shaft 38. By revolving this turret, the computing head 36 is moved out of working position at Fig. 1, and another computing head 41 on said turret may be moved into working position. The turret may be again shifted, and the computing head 41 moved out of working position, and another computing head 42 may be moved into working position; and so on, there being preferably five more computing heads, marked from "43" to "47" inclusive, and these computing heads being arranged at equidistant points from the shaft 38 and from one another.

The turret may be revolved by a spring 48 coiled around shaft 38 and contained in a barrel 49, which is fixed to the hub of the turret. Projecting from the bottom of the spring barrel may be a series of eight equidistant teeth or pins 50, to coöperate with escapement dogs 51, 52 mounted on a rocker 53, the latter pivoted on the framework and connected by an arm 54 and link 55 to a key 56, so that upon depression of said key, the dog 51 is permitted to escape, and the spring 48 swings the turret, together with the computing heads thereon, to displace the computing head that has just been actuated, and bring its succeeding computing head to position to be operated upon by the key-controlled mechanism. A spring 57 returns key 56 to normal position.

One end of the spring 48 is fixed to shaft 38, which extends from the bottom to the top of the casing 58 of the machine, and has bearings 58ª, 58ᵇ, whereby it may be rotated, for restoring the tension of spring 48.

In order to rewind the spring 48, use is made of the forward stroke of the general operator to put a renewed tension on this spring. For this purpose, there is provided a spring-pressed pawl 59, mounted on a bar 60 on the general operator, which pawl is so arranged that while it will engage the ratchet wheel 61 on the shaft 38 idly during the return stroke of the general operator, it will engage the same effectively during the forward stroke of the general operator, to cause a rewinding of the spring. The ratchet wheel 61, however, is loosely mounted on the shaft 38 but has a slip friction clutch engagement therewith. For this purpose, there is fixed on the shaft 38, a disk 62ª and a collar 75, between which the ratchet 61 is located. The connection between the ratchet 61 and the shaft 38 is yieldingly maintained by one or more spring shims or washers 64, which are interposed between the facing sides of the disk 62ª and the ratchet wheel 61. It will thus be evident that until the spring 48 is completely wound, this arrangement will form a positive enough connection between the ratchet wheel 61 and the shaft 38; but as soon as the spring is completely wound, the connection will admit of slipping, so as to prevent any breakage of the parts.

To prevent the accidental reverse movement of the shaft 38 to unwind the spring 48, there is provided on the shaft, a locking ratchet 63, which is engaged by a spring-pressed detent 62.

Computation may thus be performed upon the computing heads in succession, by the single set of racks forming a single actuating means. It will be understood that the racks are preferably normally out of mesh with the pinions, so as not to interfere with the movement of the turret.

Each adding head may be provided with a plate 65, bearing a number, the heads being numbered consecutively from "1" to "8;" and these numbers being visible through a sight opening 66 just below a normal sight opening 68, through which may be read the number shown by the dial wheels.

It will be understood that by depressing the key 56 repeatedly, any desired computing head may be brought to working position.

Variations may be resorted to within the scope of the invention, and portions of the improvements may be used without others.

Having thus described my invention, I claim:

1. In a computing machine, the combination of a series of horizontally disposed computing actuators, indexing devices at the forward portion of said actuators, racks at

the rear portion thereof, a general operator for operating said actuators, a carrier movable in a horizontal plane above said rack portion of said actuators and having a succession of computing heads thereon, each head comprising a set of computing wheels operable by said racks, and means for moving said carrier transversely of said racks for carrying one computing head out of and another into coöperative relation with said racks.

2. The combination of a series of computation racks, a turret having a succession of computing heads thereon, each computing head comprising a set of computing wheels operable by said racks, said turret mounted for rotation, a spring for rotating said turret, an escapement device for said turret, means to control said escapement device, and means for automatically re-tensioning said spring.

3. The combination of a series of computation racks, a general operator for operating said racks, a turret having a succession of computing heads thereon, each computing head comprising a set of computing wheels operable by said racks, said turret mounted for rotation, a spring for rotating said turret, an escapement device for said turret, means to control said escapement device, and means connected to said general operator for re-tensioning said spring.

4. The combination of a series of computation racks, a general operator for operating said racks, a turret having a succession of computing heads thereon, each computing head comprising a set of computing wheels operable by said racks, said turret mounted for rotation, a spring for rotating said turret, an escapement device for said turret, means to control said escapement device, a ratchet wheel connected to said spring, and a pawl connected to said general operator for re-tensioning said spring.

5. The combination of a series of computation racks, a turret having a succession of computing heads thereon, each computing head comprising a set of computing wheels operable by said racks, said turret mounted for rotation, a spring for rotating said turret, an escapement device for said turret, means to control said escapement device, means for automatically re-tensioning said spring, and a pawl-and-ratchet device to hold said spring in its tensioned condition.

6. The combination of a series of computation racks, a general operator for operating said racks, a turret having a succession of computing heads thereon, each computing head comprising a set of computing wheels operable by said racks, said turret mounted for rotation, a spring for rotating said turret, an escapement device for said turret, means to control said escapement device, a ratchet wheel connected to said spring, a pawl connected to said general operator for re-tensioning said spring, and a friction device between said ratchet wheel and said turret.

7. The combination with a series of computing heads of actuating means for said computing heads, spring means for shifting said computing heads *seriatim* into coöperation with said actuating means, said actuating means coöperating with said computing heads to run up numbers thereon, and winding means for re-tensioning said spring means after the running-up of each number.

8. The combination with a series of computing heads, of actuating mechanism, spring means for shifting said computing heads *seriatim* into individual coöperation with said actuating mechanism, re-tensioning means for renewing the tension on said spring means, and a slip connection between said re-tensioning means and said spring means to prevent overwinding of said spring means.

9. The combination with a series of computing heads, of actuating mechanism for said computing heads, a general operator for manipulating said actuating mechanism, spring means for shifting said heads to bring about the coöperation of different heads with said actuating mechanism, and means operated at each actuation of said general operator to re-tension said spring means.

10. In a computing machine, the combination with a series of computing racks, a carrier rotatable transversely of said racks, said carrier having a succession of computing heads thereon, each head comprising a set of computing wheels operable by said racks, said wheels when moved by rotation of said carrier to a position adjacent said racks occupying a position free therefrom, but so that the driving movement of said racks will cause engagement thereof with said wheels.

11. The combination with a series of rack bars having racks on one end thereof, of indexing mechanism for determining the extent of movement of said rack bars, including a series of pins on said rack bars, and a computing head to be operated by said rack bars amounts corresponding to the pins set thereon, and located, when said rack bars are in a normal passive position, intermediate said racks and said pins.

HOLMES MARSHALL.

Witnesses:
LORENZ L. PRITZL,
B. GOLDBERG.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."