J. W. MILLER.

COMPUTING MACHINE.

APPLICATION FILED MAY 23, 1911.

1,053,628.

Patented Feb. 18, 1913.

2 SHEETS—SHEET 1.

Fig. 1.

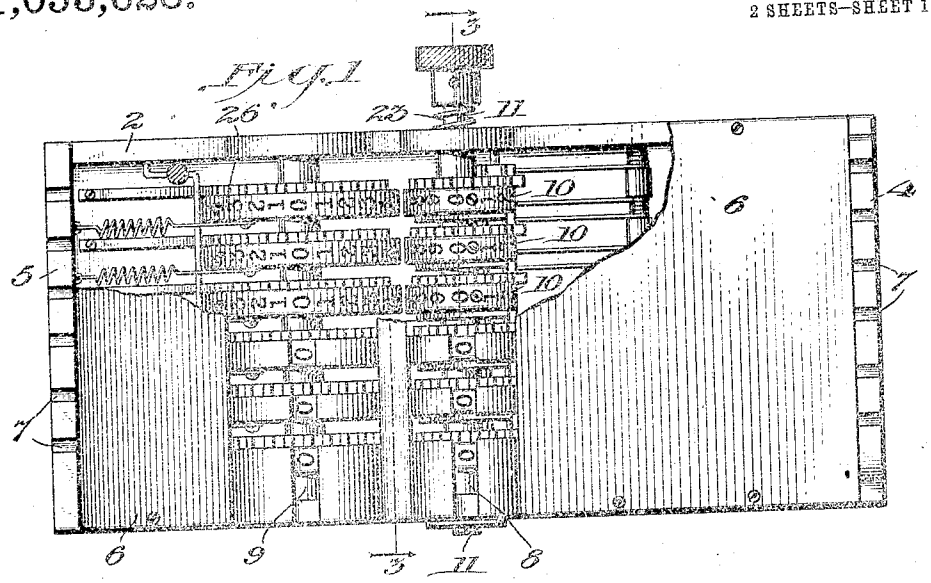


Fig. 2a.

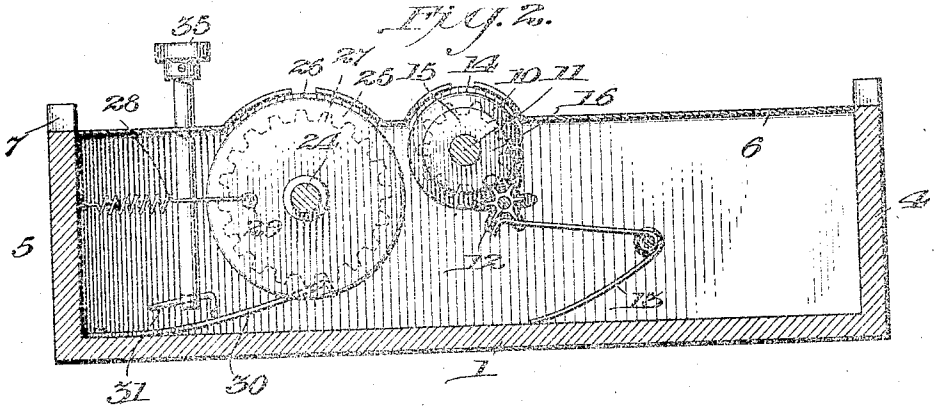


Fig. 2.

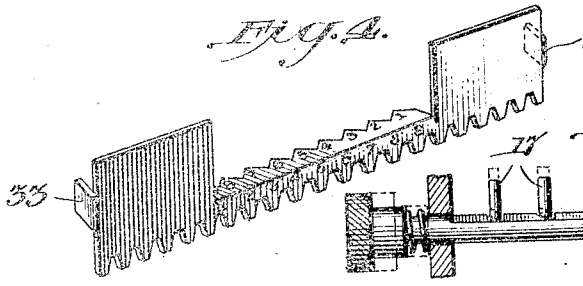
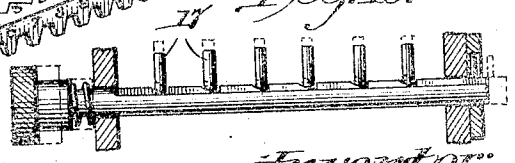


Fig. 10.



Witnesses:

Edward Pilhaus

Luther K. Burger

Inventor:

Joseph W. Miller.

J. W. MILLER.

COMPUTING MACHINE.

APPLICATION FILED MAY 23, 1911.

1,053,628.

Patented Feb. 18, 1913.

2 SHEETS—SHEET 2.

Fig. 3.

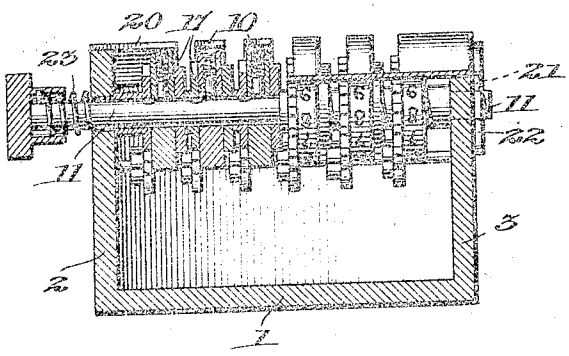


Fig. 11.

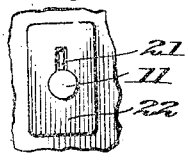
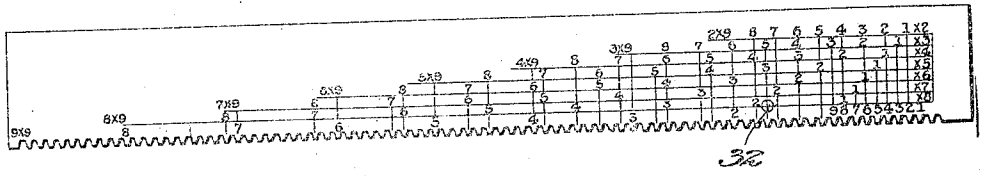


Fig. 5.



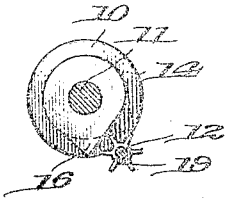


Fig. 6.

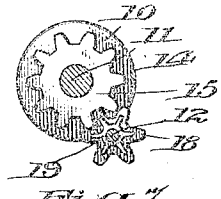


Fig. 7.

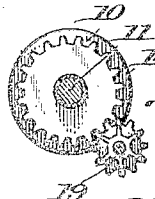


Fig. 8.

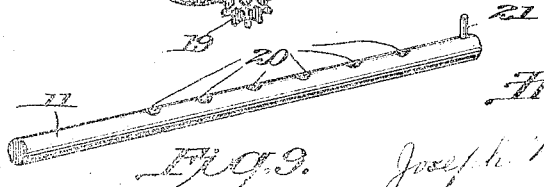


Fig. 9.

Witnesses:

Edward Oldham

Lothrop & Bryant

Inventor:

Joseph W. Miller.

UNITED STATES PATENT OFFICE.

JOSEPH W. MILLER, OF HARRISBURG, PENNSYLVANIA.

COMPUTING-MACHINE.

1,053,628. Specification of Letters Patent. Patented Feb. 18, 1913.

Application filed May 23, 1911. Serial No. 628,337.

To all whom it may concern:

Be it known that I, JOSEPH W. MILLER, a citizen of the United States, residing at No. 120 South Third street, Harrisburg, Pennsylvania, have invented new and useful Improvements in Computing-Machines, of which the following is a specification.

The object of my invention is to provide mechanism for computing devices, such as adding, subtracting, multiplying and dividing machines, registers, counters, meters and the like, that is simple, inexpensive and of few parts yet efficient.

To this end the mechanism is illustrated in the accompanying drawings and described as follows.

Figure 1 is a top view with a portion of the cover broken away. Fig. 2 is a sectional view. Fig. 3 is a cross section illustrating the turn to zero mechanism. Fig. 4 is the operating rack for addition and subtraction. Fig. 5 is the operating rack, reduced size, for multiplication and division. Fig. 6 is a view of the left hand side of one of the wheels showing the transfer pinion in normal position. Fig. 7 is the right hand side view of a registering wheel with the transfer pinion in mesh therewith. Fig. 8 is a view of the right hand side of one of the registering wheels showing a modified connection to a modified pinion. Fig. 9 is the turn to zero shaft. Fig. 10 is a modified form of turn to zero shaft. Fig. 11 is a fragmentary view of the left hand side of the case showing how the turn to zero shaft is held in normal position.

The mechanism is mounted in a suitable case.

1 indicates the bottom, 2 the right hand side, 3 the left hand side, 4 the front end, 5 the back end and 6 the top of the case respectively; 7 indicates slots in the top ends of the case, 8 and 9 the sight lines or openings for reading the indicating wheels respectively.

The computing mechanism consists of a series of like indicating or registering wheels 10 loosely mounted on a shaft 11, which has its bearings on the sides of the case 2 and 3, and a series of like pinions mounted on a parallel shaft 12, that gear with the said indicating wheels, and a series of like springs 13 to engage with said pinions to aid in locating and to hold the indicating wheels 10 with one each of their figures respectively at the sight opening. Each set of registering wheels 10 consists of a disk 14 with the figures 0 to 9 on its periphery, with a spur gear 15 of ten teeth, of a certain pitch diameter, attached to its right side and an intermittent gear of one tooth 16, of a different pitch diameter, to its left side and a spring pressed pin 17 in a hole in the said disk. Each pinion consists of a gear 18 to mesh continuously with the spur gear 15 and a smaller gear 19 rigidly attached to it to be intermittently engaged by the single tooth 16. The teeth of gear 19 of the pinion are preferably made thin and flat with rounded faces and the single tooth 16 > shaped so that it will the more quickly engage when being moved from 9 to 0, the carrying over step and continue the engagement to the end or nearly so of said step or in other words until the tooth clears itself. It is apparent that this construction permits the wheels to operate in either direction thus enabling both addition and subtraction to be performed.

The pinions are placed between the indicating wheels 10, their gear 18 meshing with the wheel of higher denomination and their gear 19 for engaging the single tooth 16 of the wheel of next lower denomination whereby the wheel of higher denomination is made to move one step at each revolution or carrying over period of the said wheel of lower denomination.

The turn to zero mechanism consists of the revoluble shaft 11 with a line of teeth 20 cut in its periphery, one tooth for each wheel 10, this shaft has its bearings on the sides of the case and in its left hand end is a pin 21 which holds it in normal position by being drawn into the slotted plate 22, on the side of the case, by the spiral spring 23; upon this shaft 11 (Fig. 3) are loosely mounted the series of wheels 10 with their spring pressed pins 17 riding thereon, when the shaft is in normal position, and which are engaged by the teeth of said shaft when the shaft is shifted so that the teeth are in the path of said pins, whereby said teeth pick up and bring to zero the wheels respectively, as is common, with one revolution of said shaft. A modification of shaft 11 can be made by making a longitudinal groove on the shaft and filing a nick for each pin 17 in each wheel 10 to ride through when the shaft is in normal position. See Fig. 10. On a stationary shaft 24 (Fig. 2) are revolubly mounted a series of like item

indicating wheels 25 and above them is a sight opening 9, in the top of the case, for reading the items as they appear respectively. Each wheel 25 consists of a disk 26 with two sets of figures 0 to 9 half way around in one direction and 0 to 9 half way around in the other direction. to one side of each disk a spur gear 27 of twenty teeth is secured, to correspond with the figures respectively, a spiral spring 28 is fastened to each wheel at 29 and secured to the back 5 and a spring 30 is placed in operative engagement with the gear 27, a crank bar 31 common to all of the springs 30 is pivoted to the sides of the case to release the wheels 25 when held by the springs 30 in operated position so that the springs 28 may draw them back to normal position. In operation these wheels 25 revolve toward the back of the case when adding and toward the front when subtracting.

The operating means in this construction consists of a rack (Fig. 4) made of sheet metal. The rack is cut down in the middle the length of nine teeth and bent over at a right angle, the bent portion having nine saw shaped teeth in line with the rack teeth and the figures 9 to 1 stamped thereon at the said 9 teeth respectively and the ratchet teeth corresponding marked in reverse order 1 to 9; the said nine teeth including the next tooth to number 1 are used for addition and subtraction; the teeth at each end are used to engage the item indicating spur gear 27. This rack has a portion bent over at right angles at each end so that the rack will be stopped by the bent parts striking the back and front of the case in addition and subtraction respectively.

The rack (Fig. 5) for multiplication and division is made of a piece of sheet metal with eighty two teeth, a table is stamped thereon, the table is a division of eighty one teeth by vertical lines, which are numbered and marked on horizontal lines as follows:—The first line counting from the bottom up is the 9's line and has 9 divisions. the first division is indicated by the figures 1 to 9 from the right hand end, the other divisions in numerical order 2 to 9, this line is indicated by 9^{x} at its left end, the second line is the 8's line indicated by 8^{x} at both ends and numerically divided into 9 spaces from 1 to 9 respectively, the 7's to 2^{x} line are indicated successively above each other each being divided and marked into 9 divisions; a pin 32 is secured to the rack which constitutes the stop. When using this rack a device without the item indicating wheels 26 is used or else these wheels are shifted out of engagement with the rack in any well known manner. It will be observed that this rack will, in use, pass through the slots 7 until arrested by the pin 32. To operate in addition place the rack (Fig. 4) with the ratchet tooth bearing the figure of the number you want to add, as indicated by the saw teeth, into engagement with the spur gear 15 of the wheel 10 of the denomination you want to add and push it till the bend 33 on its end strikes the back of the case. To subtract place the rack tooth bearing the figure of the number you want to subtract into engagement with the spur gear 15 of the wheel 10 of the denomination that you want to subtract and pull it until the bend 34 strikes the front end of the case. It will be observed that when placing the rack, Fig. 4, into engagement with the wheels 10 that it will also engage the wheel 25 and move it as many steps as it moves the wheel 10 thus proving the operation. The wheel 26 must always be released by the bar 31 through the push button 35 after each item has been registered. To multiply say 357 by 52 run your eye along the 5^{x} line until it rests at 3, place the tooth indicated by the vertical line at said 3 into engagement with the gear on the thousands wheel and push it till the pin 13 strikes the back of the case, then place the 5×5 tooth on the hundreds wheel and operate as before, then with the 5×7 tooth on the tens wheel operated upon you will get the result of 50×357 indicated; then with the 2×3 tooth engage the hundreds wheel, then the 2×5 tooth the tens wheel, then the 2×7 tooth the units wheel and you will have the result of 52×237 indicated at the sight opening 8.

To perform division turn the case end for end and operate the same as in multiplication, mark down the number of each denomination as it is operated thus in dividing 7504 by 8 you would mark down 938 as the 9 in the hundreds, 3 in the tens and 8 in the units denominations were manipulated, respectively.

Modifications may be made in construction from the herein disclosed means without departing from the spirit and scope of my invention hence I do not wish to be limited to the details as set forth.

Having thus described my invention what I claim and desire to secure by Letters Patent, is:—

1. In a computing machine and like devices a series of like wheels having respectively a full gear of a certain pitch diameter on one side and an intermittent gear of one tooth of a different pitch diameter on the other side and a series of like differential transfer or carrying over pinions, said pinions respectively meshing and engaging each two adjacent wheels therewith, the gear of the wheel of higher denomination being in mesh with the one end of the pinion and the gear with one tooth of the wheel of next lower denomination in intermittent engagement with the other end of said pinion whereby said single tooth drives the trans-

fer gear intermittently in either direction, substantially as described and set forth.

2. In a computing machine and like devices a series of like wheels having respectively a full gear of a certain pitch diameter on their one side and an intermittent gear of one > shaped tooth of a different pitch diameter on the other side and a series of like differential transfer or carrying over pinions, said pinions respectively meshing and engaging each two adjacent wheels therewith, the gear of the wheel of higher denomination being in mesh with the one end of the pinion having suitable teeth and the gear with one tooth of the wheel of next lower denomination in intermittent engagement with the other end of said pinion having flattened teeth whereby said single tooth drives the transfer gear intermittently in either direction, substantially as described and set forth.

3. In a computing device and the like in combination with a series of indicating wheels each having a spring pressed pin therein, a rotatable and laterally movable shaft with a line of teeth cut in its periphery, one tooth for each wheel revolubly mounted thereon, said pins riding on the periphery of the shaft when it is in normal position and in the path of said teeth when the shaft is shifted whereby the said wheels are picked up respectively and turned to zero, as described and set forth.

4. In a computing device a series of indicating wheels, with a double set of figures on their peripheries, being 0 to 9 one half way around in one direction and 0 to 9 half way around in the opposite direction, revolubly mounted on a shaft, a spur gear attached to the side of each, a returning and locating to zero spring, a spring pawl and a release crank bar with push pin, substantially as described and set forth.

5. For a computing device a rack with the middle portion cut down and bent at a right angle with nine saw teeth on the edge of said bent part and numbered 9 to 1 respectively and nine of the ratchet teeth corresponding therewith numbered reversely 1 to 9 as described and set forth.

6. For a computing device a rack with a pin attached, combined with the teeth numerically divided into a scale by vertical lines which are numbered and marked on cross horizontal lines substantially as shown and described and for the purpose set forth.

7. In a computing device and the like a rotatable and laterally movable shaft with a line of teeth cut in its periphery, one tooth for each wheel revolubly mounted thereon.

Witness my hand at Harrisburg, Pennsylvania, this twenty second day of May 1911.

JOSEPH W. MILLER.

Witnesses:

EDWARD PELHAM,

LUTHER K. BURGER.