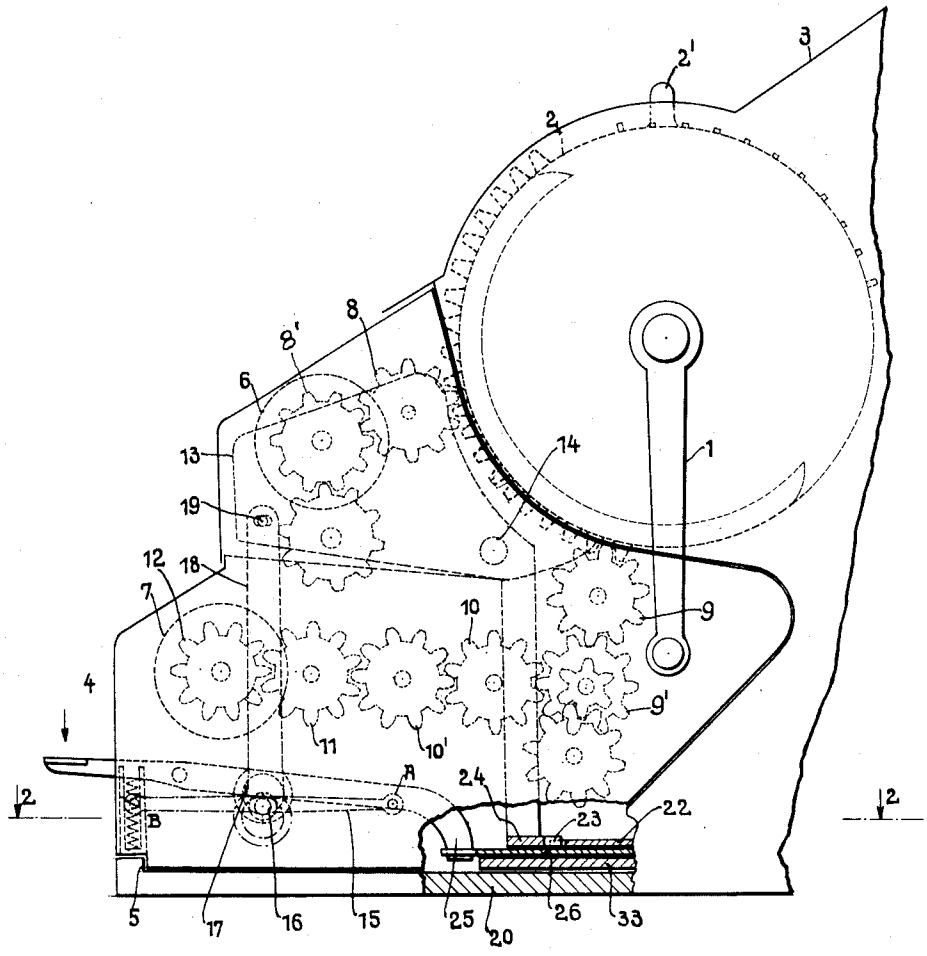
May 30, 1933. O. WERNECKE 1,911,733

CALCULATING MACHINE

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Fig.1



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CALCULATING MACHINE

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Fig.2

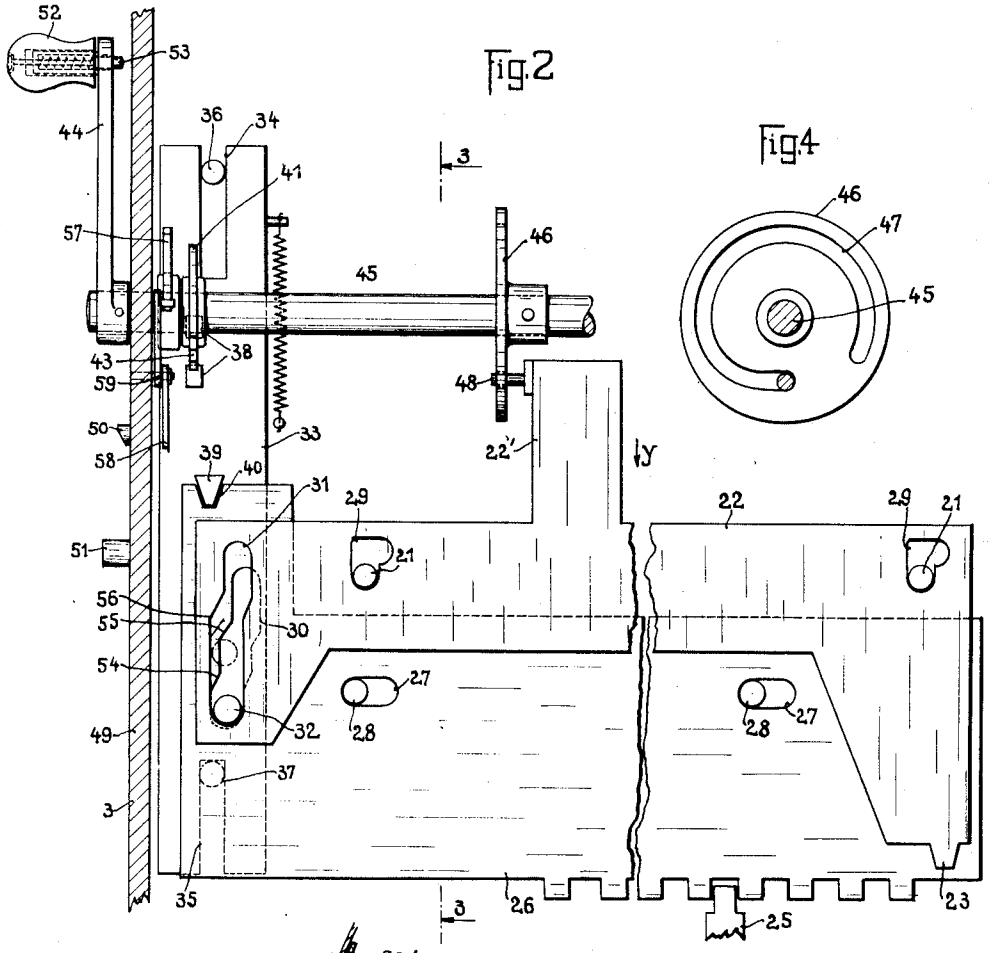
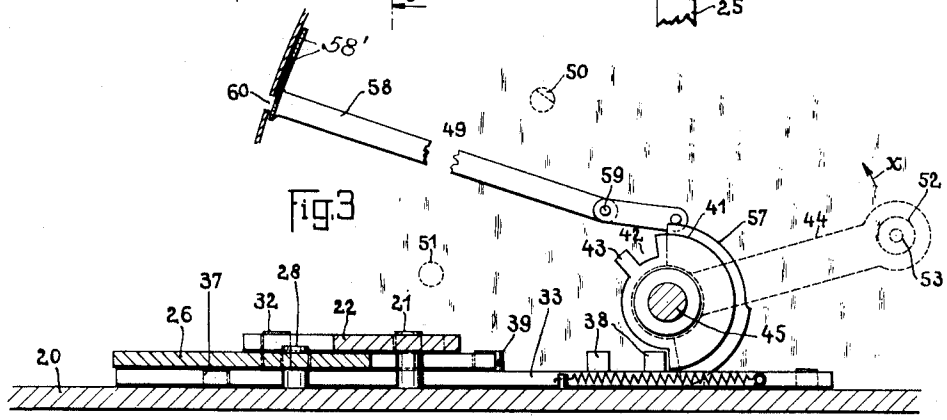


Fig.4

Fig.3



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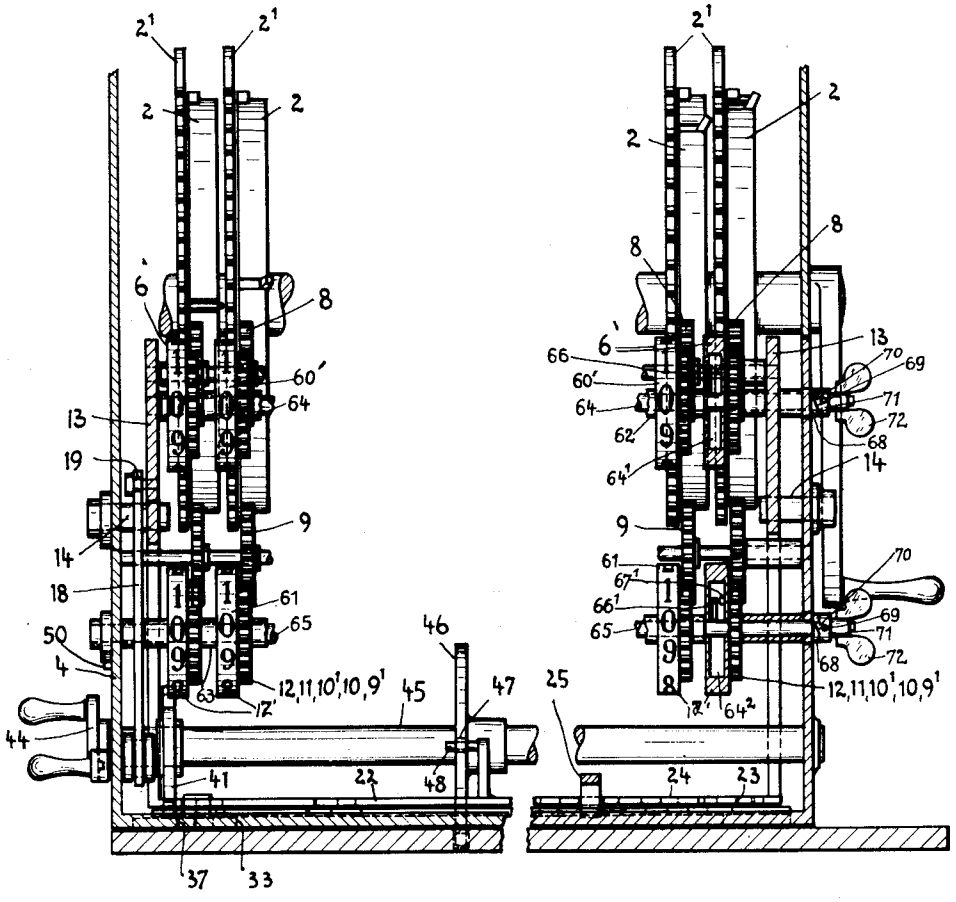
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CALCULATING MACHINE

Filed March 3, 1928 3 Sheets-Sheet 3

Fig. 5



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UNITED STATES PATENT OFFICE

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CALCULATING MACHINE

Application filed March 3, 1928, Serial No. 258,902, and in Germany May 9, 1927.

My invention relates to improvements in calculating machines, and the object of the improvements is to provide a calculating machine by means of which sums or differences of products of more than two factors can be calculated the intermediate results and the final result being displayed by the machine. With this object in view my invention consists in constructing a calculating machine combining the following elements: First, a setting mechanism cooperating with two registering mechanisms, second, means intermediate the setting mechanism and one of the registering mechanisms for carrying results from the registering mechanism to the setting mechanism, and third, means for disconnecting the second registering mechanism from the setting mechanism while the first registering mechanism is in operative position relatively to the setting mechanism, both registering mechanisms being mounted on a common slide or carriage.

In my improved calculating machine a result obtained in the first registering mechanism can be carried back to the setting mechanism and from the said setting mechanism to the second registering mechanism, and the result may be carried to any portion of the second registering mechanism by shifting the slide relatively to the setting mechanism.

In the preferred construction of the machine provision is made for carrying a result from the second registering mechanism to the setting mechanism. Therefore, when calculating sums or differences of products having more than two factors several products can be multiplied by the same factor, for example $(a \cdot b \cdot c + d \cdot e \cdot f) \cdot g$, and all the individual products and partial sums can be calculated. In a machine thus constructed the two registering mechanisms must be constructed so that they can be shifted into carrying positions independently of each other, and one of the registering mechanisms must be adapted to be set in inoperative position relatively to the setting mechanism.

For the purpose of explaining the invention an example embodying the same has been shown in the accompanying drawings in which the same reference characters have been used in all the views to indicate corresponding parts. In said drawings,

Fig. 1 is an elevation of the calculating machine,

Fig. 2 is a sectional plan view taken on the line 2—2 of Fig. 1,

Fig. 3 is an elevation looking from the left of Fig. 2 with the side wall of the casing of the machine removed,

Fig. 4, an elevation showing a detail of Fig. 2 viewed from the left in Fig. 2, and

Fig. 5, a front elevation of the calculating machine partly in section.

The general construction of the machine and more particularly the mechanism for carrying values from the registering mechanisms to the setting mechanisms has been described in the patent to Erwin Jahnz, Number 952,257, dated March 15, 1910.

In the example shown in the drawings the calculating machine comprises a casing 3, a setting mechanism 2 comprising a plurality of setting disks each provided with nine settable pins or teeth any number of which may be set into operative position by means of cam disks represented in Fig. 1 by a finger piece 2′, and two registering mechanisms 6 and 7. In suitable guide ways 5 a slidable carriage 4 is shiftable longitudinally of the machine, and the registering mechanisms (totalizer or accumulator) 6 and 7 are mounted on the said carriage one above the other. The upper registering mechanism 6 cooperates with the setting mechanism through intermediate gear wheels 8 and 8′, the latter having integral therewith or secured thereto a numeral wheel 6′, as in Jahnz 952,257, and the lower registering mechanism 7 cooperates with the setting mechanism through five intermediate gear wheels 9, 9^1, 10, 10^1, and 11, gear 11 driving a gear 12 combined with a numeral wheel 12′. The upper registering mechanism 6 and its intermediate gear wheels 8 are mounted on a frame 13 rockingly mounted on a shaft 14 provided on the carriage 4 and parallel to the axis of the setting mechanism. The upper registering mechanism 6 is adapted to be rocked into and out of operative posi-

tion relatively to the setting mechanism by means of a hand operated crank 15, the positions of the said crank being indicated in Fig. 1 by the characters A and B. The said crank is fixed to a shaft 16 carrying an eccentric 17 the strap of which is connected by a link 18 with a pin 19 projecting laterally from the frame 13 of the upper registering mechanism. If the crank 15 is in the position A, the registering mechanism 6 is in position for cooperation with the setting mechanism 2, and upon rocking the crank 15 from the position A into the position B the registering mechanism 6 is set into inoperative position. By reason of the construction described the registering mechanism is automatically locked in its end positions.

The frame 13 of the upper registering mechanism 6 is adapted to be shifted on the axis 14 in lateral direction in addition to its pivotal movement thereabout, and for locking the same in either position of lateral adjustment, a slide 22 is provided, which is formed with angular slots 29 engaged by pins 21 rising from the base plate 20 of the casing of the machine, the said slide being adapted to lock the frame 13 in position relatively to the carriage by means of a tooth 23 engaging between the teeth of a rack 24 fixed to and depending from the frame 13. The slidable carriage 4 is provided with a locking arm 25 engaging in a toothed slide 26 to connect the carriage to this slide. Slide 26 is located below the slide 22 and formed with slots 27 engaged by pins 28 rising from the base plate 20. At the left hand ends of the slides 22 and 26 there are cam slots 30 and 31 located one beneath the other and engaged by a pin 32 rising from a rail 33 located below the slide 26 and movable transversely thereof. The rail 33 is formed with slots 34, 35 engaged by pins 36, 37 rising from the base plate 20. To the top side of the rail 33 two teeth 38 and a lug 39 are fixed. The lug 39 is adapted for engagement with a notch 40 made in the slide 26, and the teeth 38 are adapted for engagement by a tooth 43 rising from a cut-out portion 42 of a disk 41 fixed to a shaft 45 mounted on the frame of the machine and carrying a crank 44. To the shaft 45 a second disk 46 is secured which is formed with a cam slot 47 having a concentric and an eccentric portion. From the slide 22 an arm 22′ extends rearwardly, and to the said arm a pin 48 is fixed which engages in the cam slot 47 of the disk 46. To the outer face of the left hand side wall 49 of the casing of the machine two lugs 50 and 51 are fixed which provide stops for a crank 44 located at the outside of the casing of the machine, the handle 52 of the said crank being provided with a spring-pressed pin 53 located in position for engaging the stop 50 when turning the crank in the direction of the arrow *x*. If, however, the pin 53 is retracted by hand, the crank 44 can be turned further to the second stop 51.

The operation of the machine is as follows:

The crank 15 being in position A, upon turning the crank 44 from the initial position shown in the figures into position for engagement with the stop 50 the pin 48 slides in the cam slot 47 of the disk 46, so that the slide 22 is shifted in the direction of the arrow *y* until its nose 23 engages the teeth of the rack 24 connected with the frame of the upper registering mechanism 6 thus preventing lateral displacement of the said registering mechanism. Further, the tooth 43 of the disk 41 engages the teeth 38 and shifts the rail 33 rearwardly. Thus the lug 39 gets out of engagement with the notch 40, and the pin 32 acting on the first shoulder 54 of the cam slot 30 shifts the slide 26 to the left. The slide 22 is not carried along because the first part of its slot 31 is rectilinear. The slidable carriage 4 carrying the lower registering mechanism is connected to the slide 26 by the arm 25 engaging between two teeth of the said slide. Therefore it takes part in the lateral movement of the slide, and the lower registering mechanism 7 is shifted into position for transferring the values previously transmitted thereto to the setting mechanism. If now the said registering mechanism is reset the value previously transmitted thereto is carried back to the setting mechanism 2.

Now the pin 53 is retracted, and the crank 44 is turned beyond the stop 50 and into engagement with the second stop 51. The slide 22 remains in engagement with the rack 24 of the upper registering mechanism 6, the pin 48 engaging the concentric portion of the cam slot 47 of the disk 46. The tooth 43 of the disk 41 shifts the rail 33 rearwardly, so that the pin 32 engages the rear parts of the slots 30 and 31, thus riding on the shoulders 55 and 56 of the slots 30 and 31 and shifting both slides 22 and 26 equal spaces to the left. Thereby the lower registering mechanism 7 mounted on the carriage 4 is shifted into a position in which carrying of values to the setting mechanism is impossible, while the upper registering mechanism 6, which is coupled to the rack 24 by the nose 23, is brought into position for carrying values back to the setting mechanism. Now the upper registering mechanism 6 is reset for transmitting the values displayed thereon to the setting mechanism. The registering mechanism 7 does not interfere with this operation.

By returning the crank 44 into the initial position the registering mechanisms 6 and 7 are again set into calculating positions, the slide 26 being locked by the lug 39 engaging in the notch 40.

Further, by means of the rail 33 or the shaft 45 a sign is given indicating that the

upper or the lower registering mechanism is in carrying position.

To show what may be done, the shaft 45 carries a stepped disk 57 acting on a lever 58 rockingly mounted on a shaft 59 and carrying a plate 58^1 located at the rear of a peep hole 60 made in the front wall of the casing, the said plate 58^1 being provided with indications showing what registering mechanism if any is in carrying position.

Example.—For explaining the operation of the machine I shall now describe the manner of solving the problem $(4 \cdot 5 \cdot 6) + (7 \cdot 8 \cdot 9)$, the intermediate results being kept on the machine. The crank 15 is turned into the position B, so that the upper registering mechanism 6 is out of cooperation with the setting mechanism, and the figure 4 is set in the setting mechanism. The machine crank 1 is rotated five times, so that the product $4 \cdot 5 = 20$ is transmitted to the lower registering mechanism 7. Now the crank 44 is turned to the stop 50, whereby the registering mechanism 7 is brought into position for carrying its value to the setting mechanism. Now the registering mechanism 7 is reset, so that the value 20 is transmitted to the setting mechanism. The crank 44 is returned into initial position. By turning the crank 15 into the position A the upper registering mechanism is brought into operative position. By six rotations of the machine crank 1 the product $20 \cdot 6 = 120$ is transmitted to both registering mechanisms 6 and 7. The crank 15 is brought into the position B, so that the upper registering mechanism 6 is out of position for engagement by the setting mechanism, and the registering mechanism 7 is reset. Now the figure 7 is set in the setting mechanism 2, and the crank 1 is rotated eight times, so that the product $7 \cdot 8 = 56$ appears in the registering mechanism 7. The crank 44 is now turned to the stop 50 so that the registering mechanism 7 is brought into position for transferring values back to the setting mechanism. By resetting the mechanism 7 the value 56 is carried to the setting mechanism 2, and after returning the crank 44 into initial position the machine crank 1 is rotated nine times, so that the product $56 \cdot 9 = 504$ appears in the registering mechanism 7. If before thus rotating the machine crank 1 nine times the crank 15 has been brought from the position B into the position A, so that the registering mechanism 6 is again in operative position, the value 504 is added to the value 120 while being calculated in the registering mechanism. Now the final result 624 appears in the registering mechanism 6.

The registering mechanism 6, 7 exhibits number disks 60, 61 which carry on their periphery the numbers 0 to 9. These disks (Fig. 5) are strung along the rods 64, 65, between the collars 62, 63 respectively. Each of the disks 60, 61 has therein a recess 64′, 62^2 respectively for engagement by pins 66, 66′ secured respectively to the rods 64, 65. On a side wall defining each of the recesses 64′, 64^2 there is carried by each disk a projection 67′ upon which the pins carried by the respective rods can act, when these pins together with the rods are pushed sufficiently far to the right. Upon each of the rods 64, 65 there is mounted a ring 68, the latter being secured to a side wall of the adding machine. The rings 68, each have a notch 69 into which the noses 70 of the respective rings 71 can enter, the latter being keyed respectively to the rods 64, 65. Each of the rods 64, 65 in addition carries a winged handle 72.

If, for example, it is desired to transfer a sum from the registering mechanism 7 to the setting mechanism 2, the crank 44 is turned until it strikes the stop 50, and the lower registering mechanism is brought to the resetting position, and then the shaft 64 is turned by means of the handle 72. At the beginning of the turning of the shaft the nose 70 emerges from its notch 69 and thus moves the shaft 65 to the right so that the pins 66′ of the shaft reach the vicinity of the projection 67′ of the disk 61 and a further turning carries the disk along with the shaft. This movement or turning is transferred through the gears 12, 11, 10′, 10, 9′, 9 to the toothed disk of the setting mechanism 2 and this is rotated to an extent corresponding to that in the registering mechanism 7.

After a single rotation of the rod 65 the nose 70 again falls into the notch 69, and the rod moves with its pin 66′ back again to its starting position, so that the disks 61 are not further carried along.

The manner of resetting is the same, if after the movement of the crank 44 to the stop 51, the upper registering mechanism 6 is brought to the resetting position. Then through the turning of the rod 64 of the counting mechanism by means of the winged handle 72, the result is transferred through the agency of the gears 8 to the setting mechanism 2.

A machine in accordance with this disclosure will ordinarily be supplied with any conventional or desirable means to prevent overloading of the setting mechanism by return of values thereto from the registering mechanism.

I claim:

1. A calculating machine, comprising a setting mechanism, two registering mechanisms adapted for cooperation with said setting mechanism, a slidable carriage for supporting both registering mechanisms, means cooperating with said setting mechanism and one of said registering mechanisms for carrying values from said registering mechanism to the setting mechanism, means for moving the other registering mechanism into a position

out of cooperative relation with the setting mechanism, and means operative when moving the first named registering mechanism into carrying position for locking the other registering mechanism against movement therewith.

2. A calculating machine, comprising a setting mechanism, two registering mechanisms adapted for cooperation with said setting mechanism, a slidable carriage for supporting both registering mechanisms, means cooperating with said setting mechanism and one of said registering mechanisms for carrying values from said registering mechanism to the setting mechanism, and means for moving said last named registering mechanism into carrying position and moving the other registering mechanism into a position out of cooperative relation with the setting mechanism.

3. A calculating machine, comprising a setting mechanism, two registering mechanisms adapted for cooperation with said setting mechanism, a slidable carriage for supporting both registering mechanisms, means adapted to connect said setting mechanism and each of the registering mechanisms for carrying values from said registering mechanisms to said setting mechanism, a rack connected with one of said registering mechanisms, a crank acting on said rack and adapted to shift the same with the registering mechanism connected therewith into carrying position, locking means operative when thus shifting the last named registering mechanism for locking the other registering mechanism in position, means connected with said crank and operative upon further movement thereof for shifting the last named registering mechanism into carrying position, and means for moving said registering mechanisms into and out of positions for transmitting thereto values from the setting mechanism.

4. A calculating machine, comprising a setting mechanism, two registering mechanisms adapted for cooperation with said setting mechanism, a slidable carriage for supporting both registering mechanisms, means cooperating with said setting mechanism and one of said registering mechanisms for carrying values from said registering mechanism to the setting mechanism, the other registering mechanism being independently slidable laterally and being pivotally mounted on said slide to rock into and out of position for cooperation with said setting mechanism, and means for moving said pivoted registering mechanism on its pivot.

5. A calculating machine, comprising a setting mechanism, two registering mechanisms adapted for cooperation with said setting mechanism, a slidable carriage for supporting both registering mechanisms, means for connecting said setting mechanism to each of the registering mechanisms for carrying values from said registering mechanisms to the setting mechanism, means for individually moving said registering mechanisms into position for carrying values to the setting mechanism, indicating means cooperating with said registering mechanisms for indicating whether or not they are in carrying positions, and means for throwing one of said registering mechanisms out of operation.

6. A calculating machine comprising a setting mechanism, a plurality of registering mechanisms, a slidable carriage for carrying the registering mechanisms, and means for moving the registering mechanisms relatively to one another lengthwise of the slide carriage to bring them successively into resetting relation to the setting mechanism.

7. A calculating machine comprising a setting mechanism, a plurality of registering mechanisms, a slidable carriage for carrying the registering mechanisms, means for transferring values from a registering mechanism to the setting mechanism, means for moving one registering mechanism lengthwise relatively to another for varying the operative relation of the registering means to the setting and transferring mechanisms, and means for locking the last-named registering mechanism against lengthwise movement during such movement of the first.

8. A calculating machine comprising a setting mechanism, a plurality of registering mechanisms, a slidable carriage for carrying the registering mechanisms, means for transferring values from a registering mechanism to the setting mechanism, means for moving one registering mechanism lengthwise relatively to another for varying the operative relation of the registering means to the setting and transferring mechanisms, means for locking the second registering mechanism against lengthwise movement during such movement of the first, and means for imparting longitudinal movement simultaneously to both registering mechanisms, the locking means for the first-named registering mechanism traveling with both registering mechanisms into a position for transferring values to said setting mechanism from said second registering mechanism.

9. A calculating machine comprising a setting mechanism, a plurality of registering mechanisms, a slidable carriage for carrying the registering mechanisms, means for moving the registering mechanisms lengthwise of the carriage to vary their operative relation to the setting mechanism, and means for disconnecting one of the registering mechanisms from the setting mechanism by movement about a horizontal axis.

10. A calculating machine comprising a setting mechanism, a plurality of registering mechanisms, a slidable carriage for carrying the registering mechanisms, means for

moving the registering mechanisms relatively lengthwise of the carriage to vary their operative relation to the setting mechanism, means for disconnecting one of the registering mechanisms from the setting mechanism by movement about a horizontal axis including an eccentric, and a handle for moving the eccentric into two opposite positions whereby the registering mechanism is automatically locked in or out of action.

11. A calculating machine, comprising a setting mechanism, two registering mechanisms adapted for simultaneous or independent cooperation with said setting mechanism, said registering mechanisms each having numeral wheels combined with driving gears, a slidable carriage for carrying both registering mechanisms, means cooperating with said setting mechanism and one of said registering mechanisms for transferring from said registering mechanism to the setting mechanism, and means whereby the other registering mechanism may be disconnected from the setting mechanism when values are to be transferred from the first-named registering mechanism to said setting mechanism.

12. A calculating machine provided with a setting mechanism having a plurality of settable pins for running values into a totalizer and a pin-adjusting means for varying the number of pins that are effective, a plurality of totalizers, a slidable carriage for the totalizers, means for moving the carriage laterally to bring a totalizer into operative relation to the pin-adjusting means for transferring values from the registering mechanism to the pin-adjusting means upon zeroizing the totalizer, and means for moving another registering mechanism laterally relative to the carriage whereby the registering mechanisms may be selectively brought into operative relation to the pin-adjusting means.

13. A calculating machine comprising a setting mechanism, a slide, means for moving the slide laterally out of each of its various value positions, a lower registering mechanism mounted in fixed bearings on said slide and an upper registering mechanism on the slide, means for holding the upper registering mechanism in fixed position relatively to the frame of the machine while the slide moves relatively to said frame so that the teeth of the counting wheels of the lower registering mechanism may be made to engage the setting mechanism in order to transmit values from said registering mechanism to the setting mechanism upon zeroizing said registering mechanism, and means for moving the upper registering mechanism laterally with said slide to cause the teeth of said upper registering mechanism to engage those of the setting mechanism while disengaging the teeth of the lower registering mechanism therefrom, whereby upon zeroizing the upper registering mechanism values are transferred therefrom to the setting mechanism.

14. A calculating machine comprising a setting mechanism, upper and lower registering mechanisms, a slide carrying said registering mechanisms, means for moving said slide laterally out of its various value positions, means for holding the upper registering mechanism stationary in the machine while the slide moves laterally to engage the teeth of the lower registering mechanism with those of the setting mechanism whereby zeroizing of the lower registering mechanism transfers values to the setting mechanism, means for thereafter moving the upper registering mechanism laterally together with the slide to engage the teeth of the upper registering mechanism with those of the setting mechanism and to disengage the teeth of the lower registering mechanism from those of the setting mechanism whereby zeroizing of the upper registering mechanism transfers values therefrom to the setting mechanism, and means for moving the upper registering mechanism out of its operative position at a time when both registering mechanisms are operatively engaged with the setting mechanism for transmission of values from the setting mechanism to the registering mechanism.

15. A calculating machine comprising a setting mechanism, a slide, means for moving the slide laterally out of each of its various value positions, a plurality of registering mechanisms on the slide, means for holding one of the registering mechanisms stationary while the slide and the other registering mechanism move to a position where the counting wheels of said last-named registering mechanism are brought to a position to transfer values to the setting mechanism upon zeroizing said last-named registering mechanism, and means for moving both registering mechanisms laterally with the slide to disconnect the last-named slide from the setting mechanism and to bring the first-named registering mechanism into a position for transferring values to the setting mechanism.

16. A calculating machine provided with a rotatable actuator having a plurality of settable pins for running values into a totalizer and a pin-adjusting means for varying the number of pins that are effective, a plurality of totalizers, means for independently moving said totalizers in a direction parallel to the axis of the rotatable actuator to bring them selectively into operative relation to the pin-adjusting means, and means for independently moving a totalizer in a direction transverse to such axis to take it out of operative relation to the pin-adjusting means.

In testimony whereof I have affixed my signature.

OTTO WERNECKE.