E. JAHNZ.

CALCULATING MACHINE.

APPLICATION FILED OCT. 5, 1909.

952,257. Patented Mar. 15, 1910.

3 SHEETS—SHEET 1.

Fig. 1.

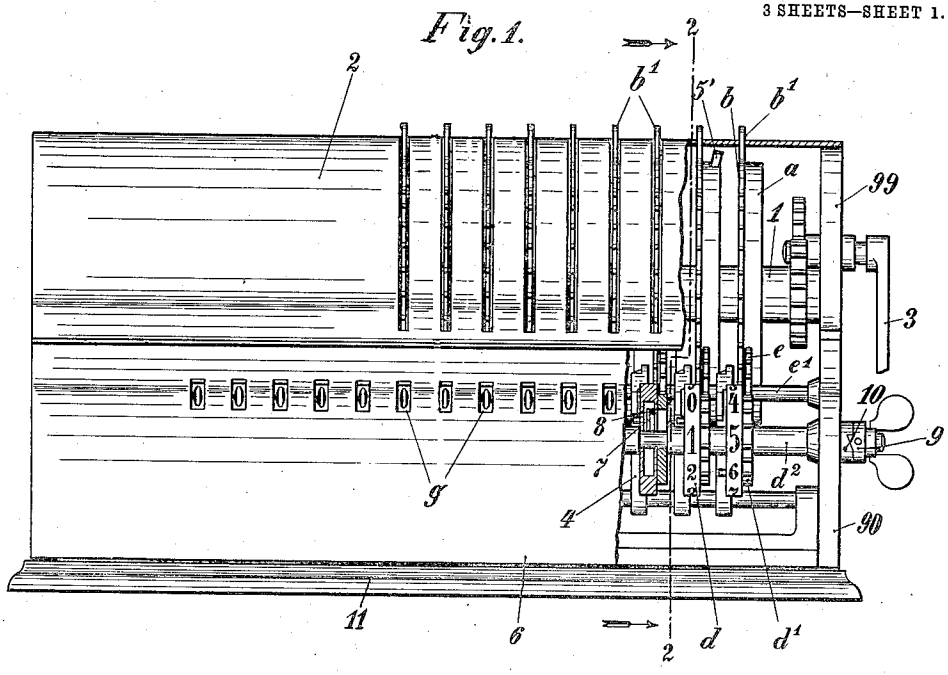


Fig. 2.

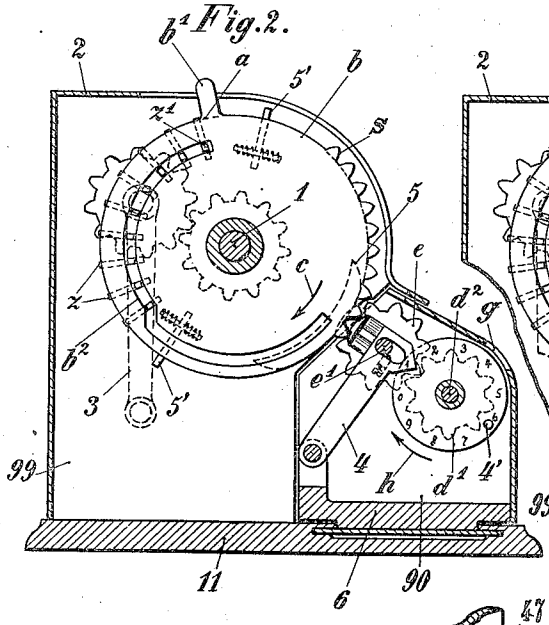
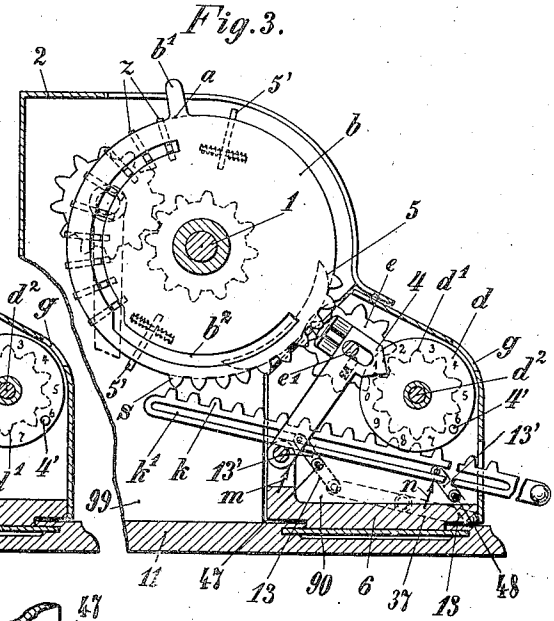


Fig. 3.



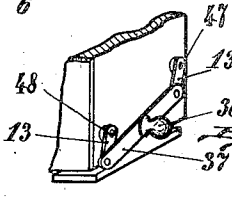


Fig. 3a.

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3 SHEETS—SHEET 2.

Fig. 4.

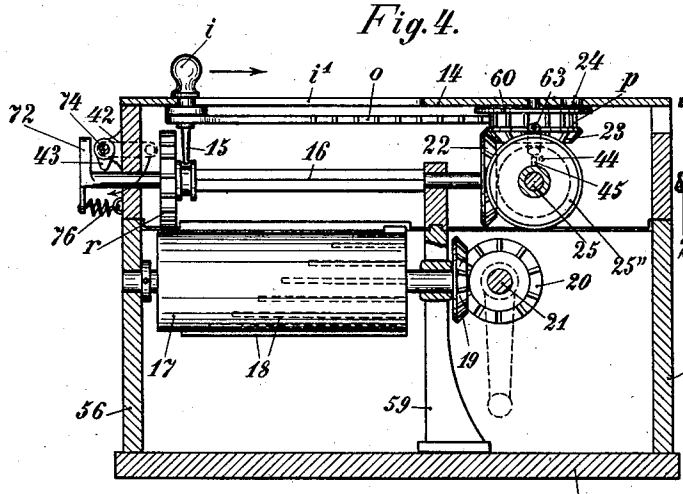


Fig. 4 a.

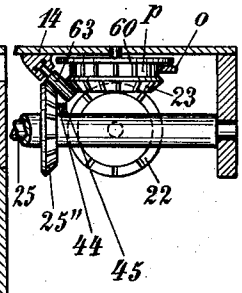
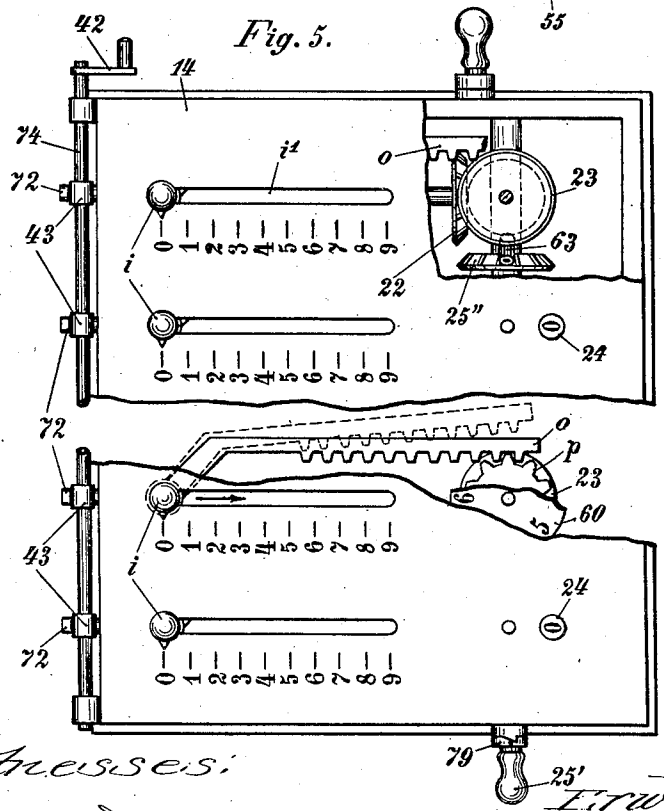


Fig. 5.



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3 SHEETS—SHEET 3.

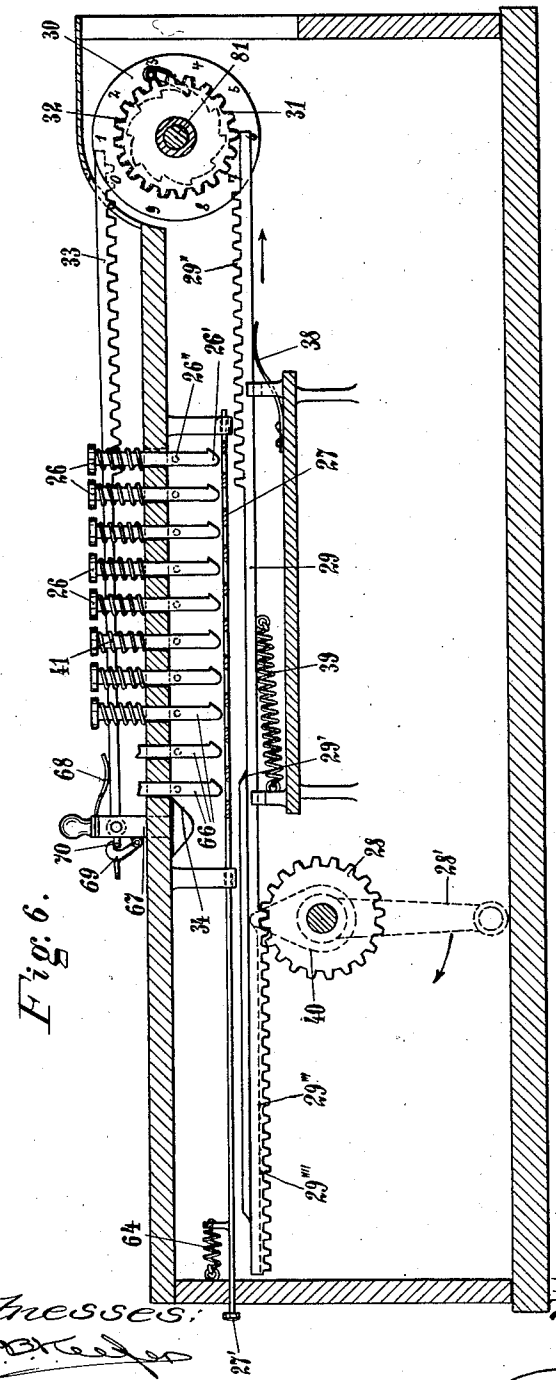

Fig. 6.

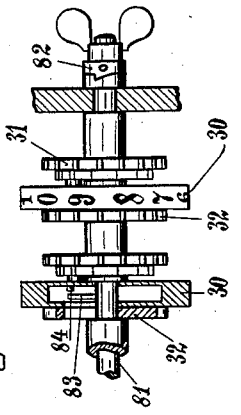

Fig. 7.

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ERWIN JAHNZ, OF BERLIN, GERMANY, ASSIGNOR TO GRIMME, NATALIS & CO., KOMMANDITGESELLSCHAFT, AUF AKTIEN, BRAUNSCHWEIG, OF BRUNSWICK, GERMANY, A CORPORATION OF GERMANY.

CALCULATING-MACHINE.

952,257. Specification of Letters Patent. **Patented Mar. 15, 1910.**

Application filed October 5, 1909. Serial No. 521,128.

To all whom it may concern:

Be it known that I, ERWIN JAHNZ, engineer, a subject of the Emperor of Germany, residing at Berlin, Province of Brandenburg, Kingdom of Prussia, Empire of Germany, have invented certain new and useful Improvements in Calculating-Machines, of which the following is a specification.

My invention relates to improvements in calculating machines in which the values of the calculation are set on a setting mechanism by means of cam disks, slides, or keys, whereupon they are transmitted to a registering mechanism. In machines of this class it is sometimes desirable to set the result obtained in the registering mechanism on the setting mechanism by means of the said cam disks, slides, or keys, which may be necessary for example, if the said result is required in a further operation, or if the result is to be printed by means of a printing mechanism coöperating with the setting mechanism.

My invention consists in providing means, whereby the said setting operation can be effected in a simple way.

For the purpose of explaining the invention several examples embodying the same have been shown in the accompanying drawings in which the same characters of reference have been used in all the views to indicate corresponding parts.

In said drawings—Figure 1, is a front view of a calculating machine partly in section, Fig. 2, is a vertical cross-section of the said machine taken on the line 2—2 of Fig. 1, Fig. 3, is a vertical cross-section of the machine illustrated in Figs. 1 and 2 in which a modification of the transmitting means is shown, Fig. 3^a, is a perspective view of a detail of the machine shown in Fig. 3, Fig. 4, is a vertical cross-section of a different type of a calculating machine equipped with transmitting devices, Fig. 4^a, is a detail section of a portion of the mechanism shown by Fig. 4 and taken in a plane at right angles to the plane of section of said Fig. 4, Fig. 5, is a plan of the machine shown in Fig. 5 partly in section, Fig. 6, is a vertical longitudinal cross-section illustrating the invention as embodied in a type of a machine in which keys are used for setting the values, and Fig. 7, is a detail view partly in section of a part of the machine shown in Fig. 6.

The general construction of the machine illustrated in Figs. 1 and 2 of the drawings is similar to that shown in the patent of the United States No. 928,083 granted to Franz Trinks July 13, 1909. Said machine embraces general features of construction as follows: As shown by Figs. 1, 2, 3 and 3^a, 11 indicates the base plate of the machine from which rise vertical side walls 99, 99 providing a support for the setting mechanism. The latter is inclosed by a casing 2. The registering mechanism is mounted on a carriage 6 which is longitudinally slidable in a groove of the base plate. The setting mechanism is mounted on a horizontal rotary shaft 1 to which setting disks a are secured. Each of the said disks carries nine radially movable teeth z. Adjacent to the disks a cam disks b are loosely mounted on the shaft 1 which are provided with handles b^1 projecting through slots of the casing 2, and which are formed with cam slots b^2. The teeth z are formed with lateral noses z^1 projecting into said cam slots b^2. By rotating the cam disks b at a certain angle a corresponding number of the teeth z are forced outward beyond the periphery of the disks a. If now the disks a and b are rotated by means of a crank 3, the projected teeth z engage in gear wheels e loosely mounted on a common shaft e^1, so as to advance the latter a corresponding number of teeth. Thereby also the number wheels d are rotated which are operatively connected with the gear wheels e by means of gear wheels d^1. The registering wheels d are loosely mounted on a shaft d^2 supported in side walls 90 rising from the base plate of the carriage 6. They are provided about their peripheries with the numerical characters from 1 to 9 and the zero sign, and the latter can be displayed through peep holes g. Carrying mechanisms 4, 4′, 5, 5′ of any preferred or known construction are provided in my improved machine, which do not form a part of my invention and therefore need no detailed description. By shifting the carriage 6 laterally, the setting disks a can be brought into coöperation with any of the number wheels of a higher order.

The resetting mechanism provided in my

improved machine consists of radial pins 7 secured to the shaft d^2 and coöperating with abutments 8 provided on the number wheels d. Normally the pins 7 are out of the paths of the abutments 8, but they can be shifted into the path of the latter by shifting the shaft d^2 laterally. As shown such shifting movement is imparted to the shaft d^2 by means of a cam ring 9 secured thereto and coöperating with a similar cam ring 10 secured to the side wall 90 of the carriage 6. By turning the cam ring 9 in the direction of the arrow h (Fig. 2) the shaft d^2 is shifted laterally, so that the pins 7 can engage the abutments 8 and thereby rotate the number wheels d into their zero positions.

Referring now to the features of construction constituting my present invention: in my improved machine means are provided whereby the number wheels d and the cam disks b can be operatively connected with each other in such a way, that upon resetting the number wheels d such movement is transmitted to the cam disks, and the direction of rotation is such, that when rotating the number wheels d in the direction of the arrow h shown in Fig. 2 the cam disks are rotated in the direction of the arrow c. Thereby a number of teeth is thrown outward in each of the setting disks a which corresponds to the value set on the coöperating number wheel. For this purpose each of the cam disks b is provided about its circumference with gear teeth s adapted to be thrown into mesh with the teeth of the coöperating gear wheel e. As shown in the figures, the said teeth are normally out of engagement with each other, and they can be thrown into coöperation by shifting the carriage 6 supporting the registering mechanism. Therefore, when resetting the number wheels the values represented thereby can be transmitted to the cam disks b, so that so many of the teeth z as correspond to the said values are thrown into operative position relatively to the setting disks b. If for example one of the number wheels d displays the number 4 through the peep hole g, and if now the said wheel is reset by rotating the same in the direction of the arrow h, the cam disk b is rotated by means of the gear wheel e into a position in which four teeth z are thrown into operative position. Therefore the number "4" is transmitted from the registering mechanism to the setting mechanism.

In the example shown in Figs. 3 and 3^a, toothed racks k are used for operatively connecting the cam disks b and the number wheels d, which racks coöperate with the gear wheels d^1 of the wheels d and with gear teeth s of the cam disks b. Normally said racks are out of mesh with the teeth s and d^1. As shown each of the racks k is supported on links 13′, 13′ the upper pivots of which engage in a longitudinal slot k^1 of the rack, so that the latter can slide in a longitudinal direction. By rocking the said links upward and in the direction of the arrows m and n the said rack is lifted into engagement with the gear teeth s and d^1. As shown all the links 13′, 13′ are mounted on longitudinal rock shafts 47 and 48 respectively which are connected by a link 37 jointed to crank arms 13, 13. The link 37 carries a button 36. By means of the latter all the links 13′ can be simultaneously rocked upward. When the said links are in their rocked positions, the setting mechanism a, b and the number wheels d are operatively connected with each other, so that upon resetting the registering wheels the values represented thereby are transmitted to the setting mechanism.

In Figs 4, 4^a and 5 I have shown an example illustrating how the invention may be embodied in a machine of a different construction. As shown in said Figs. 4, 4^a and 5 the casing of the machine consists of a base plate 55, vertical walls 56 rising from the latter, and a cover 14. The setting mechanism consists of a plurality of rotary cylinders 17 supported with one of their pivots in the wall 56 of the casing and with their opposite pivots in a bracket 59 rising from the base plate 55. Each of the cylinders 17 is provided about its circumference with nine elongated teeth 18 of gradually increasing lengths. Above the said cylinder a rotary shaft 16 is mounted in suitable bearings, and said shaft carries a gear wheel r which can slide longitudinally on said shaft, while it is rotated thereby in any of its positions. As shown the shaft 16 is made of square cross-section. The gear wheel r can be shifted laterally by means of a button i having an arm 15 extending downward through a slot i^1 of the casing and engaging in a circumferential groove of the hub of the gear wheel r. By shifting the gear wheel r longitudinally of the cylinder 17 it is brought into the path of one or more of the teeth 18. The gear wheel r can be adjusted according to the value to be set on the setting mechanism by means of a scale provided on the upper side of the casing of the machine and adjacent to the slot i^1 through which the button i extends downward. Said scale indicates the different positions of the gear wheel r from the "zero" position to the "nine" position. One of the pivots of the cylinder 17 is provided with a bevel gear 19 which is in mesh with a bevel gear 20 secured to a crank shaft 21. If the latter is rotated, such rotary movement is transmitted through the bevel gears 20, 19, the teeth 18 of the cylinder 17, and the gear wheel r to the shaft 16, so that the latter is rotated in a greater or less degree according to the position of the

gear wheel r relatively to the cylinder 17 and the number of teeth 18 engaged by the gear wheel r. The crank 21 is connected in the manner described with all the cylinders 17. The shaft 16 carries a bevel gear 22 which is in mesh with a bevel gear 23 rigidly connected with a horizontal number wheel 60. At its upper side the number wheel is provided with the numerical characters from 1 to 9 and the zero sign, and it is adapted to display the same through a peep hole 24 of the cover 14 of the machine.

The resetting mechanism consists of means for disconnecting the registering mechanism from the setting mechanism, and of means for rotating the number wheels into their zero positions. As shown the means for disconnecting the registering mechanism from the setting mechanism consist of a rock shaft 74 carrying a plurality of cams 43 one for each of the shafts 16. The latter are provided with arms 72 adapted to be engaged by said cams. Normally the shafts 16 are forced into their right hand positions by means of springs 76. If the shaft 74 is rocked in the direction of the arrow shown in Fig. 4, for example by means of a crank 42, the cam disks 43 shift the shafts 16 toward the left, until the bevel gears 22 are out of engagement with the bevel gears 23. When the crank 42 is released, the shafts 16 are forced into their normal positions by the springs 76. Extending longitudinally of the casing of the machine a rotary shaft 25 is mounted in the side walls of the casing of the machine, and the said shaft is provided with a cam ring 79 whereby it can be shifted laterally. The said cam ring and coöperating parts are similar to the corresponding parts 9 and 10 described with reference to Figs. 1 and 2, and they need no further description. Loosely mounted on said shaft 25 is a plurality of gear wheels 25″ one for each of the number wheels 60, and each of the said gear wheels carries a pin 44 adapted to be engaged by a radial pin 45 secured to the shaft 25. Normally the pins 45 are out of the paths of the pins 44. If the shaft 25 is shifted laterally, the pins 45 are moved into their operative positions relatively to the pins 44, and when rotating the said shaft the gear wheels 25″ are rotated. The gear wheels 25″ are operatively connected with the bevel gears 23 through intermediate gear wheels 63, so that the rotation of the shaft 25 is transmitted to the bevel gears 23 and the number wheels 60 so as to reset the latter.

A gear wheel p is rigidly connected with each of the number wheels 60, and is adapted to coöperate with a toothed rack o pivotally connected to the button i. The rack o is normally thrown out of engagement with the gear wheel p by turning the button i, and to set up engagement between the rack and gear the said button is turned in a reverse direction. If the button i is in its zero position, as shown in Figs. 4 and 5, and the rack o is thrown into engagement with the gear wheel p, the resetting movement of the coöperating number wheel 60 is transmitted to the button i, so that the latter, and the gear wheel r connected therewith are shifted into the position corresponding to the value represented by the number wheel. Thereby the values represented by the registering mechanism are transmitted to the setting mechanism, so that the said values can directly be used in a further calculation.

In Figs. 6 and 7 I have shown a type of a calculating machine in which the values are set on the setting mechanism by means of vertically movable keys 26 normally held in their elevated or inoperative positions by coiled springs 41 and adapted to be held in their depressed positions by means of a spring actuated slide bar 27 common to all the keys of the same column. If a key is depressed, the slide bar 27 is pushed rearward against the action of its spring 64 by an inclined heel 26′ formed at the lower end of the stem 66 of each key, and it is at once pulled forward again, so as to engage a shoulder formed by the upper part of said heel. When thus locked in its depressed position the stem 66 of the key 26 forms an abutment for a bar 29 which at its rear end is formed with rack teeth 29″. The latter are in engagement with a gear wheel 31 connected with a number wheel 30. The bars 29 are formed with cam faces 29′ which strike against the lower ends of the key stems 66, when they are thrown rearward by means of gear wheels 28 rotated by a crank 28′ and coöperating with teeth 29″″ formed on the lower sides of the bars 29. When the bars 29 strike against the key stems 66, they are rocked downward sufficiently as to retract their teeth 29″ out of engagement with the gear wheels 31. Therefore each bar 29 can advance its number wheel only a distance which corresponds to the value represented by the depressed key 41, though upon each rotation of the crank it performs a full rearward stroke. After the teeth 29″ of the bar 29 have been thrown into engagement with the gear wheel 31, which may be done for example by means of a spring 38, the rack is retracted either by hand, or, as shown, by means of a spring 39 which has been put under tension by the previous rearward shifting movement of the bar 29. To prevent the gear wheel 28 from interfering with the return movement of the bar 29, a cam 40 is provided which engages below a cam face 29‴ and thereby lifts the bar 29 out of engagement with the gear wheel 28. as soon as the crank 28′ has completed a full revolution, and the bar 29 has been shifted to the right. While

the bar 29 is thus being retracted, the elongated cam face 29''' prevents the teeth 29'''' and the gear wheel 28 from coming into mesh with each other, because the cam 40 slides along the face 29'''. The keys 41 locked in their depressed positions by the slides 27 are released by means of push buttons 27' which when forced rearward permit the springs 41 to throw the keys upward into their normal positions.

In the present example the connection between each of the number wheels and its setting mechanism consists of a toothed rack 33 adapted to be thrown into engagement with a gear wheel 32 secured to the number wheel 30. At its front end the said rack is connected with a sliding cam 34 coöperating with all the keys of the same column. The stems 66 of the keys 41 are provided with pins 26'' projecting laterally therefrom and into the path of the cam 34. If the rack 33 is in engagement with the gear wheel 32 and the registering mechanism is reset in any known or preferred way, the rack is shifted rearward, and upon such rearward movement the cam 34 successively engages the pins 26'' of the keys. Each key is thereby depressed and locked in its depressed position by the slide bar 27 and it is released again by the next key forced downward by the cam 34, so that finally only the last one of the keys engaged by the cam 34 is held in its depressed position. As in the resetting operation the number wheel is rotated a certain angle which corresponds to the value represented by said number wheel, the rack is shifted backward a distance which corresponds to such angle, so that it is stopped below a key the value of which corresponds to the value represented by the number wheel.

In the preferred form of the machine means are provided whereby the racks 33 can be thrown in or out of operation. As shown the racks are pivotally mounted on posts 67 extending upward from the cams 34, and they can be held in engagement with the gear wheels 32 by a spring 68. At the front side of each of the posts 67 a latch 69 is provided which can be rocked into engagement with an arm 70 extending forward from the rack 33. If the said latch is in engagement with the arm, the rack 33 is in a slightly lifted position as shown in Fig. 6, in which its teeth are out of mesh with the gear wheel 32.

Any preferred resetting mechanism may be provided in my machine. As shown the machine is equipped with a resetting mechanism which is similar in construction to that described with reference to Figs. 1 and 2. In Fig. 7 the said resetting mechanism is shown in detail. As shown in said figure, the number wheels are loosely mounted on a rotary shaft 81 adapted to be shifted laterally by means of a cam ring 82. The said shaft carries radial pins 83 one for each of the number wheels, and the latter are provided with coöperating abutments 84. As shown the said pins are normally out of the paths of the abutments 84, and they are shifted into their operative positions by the shifting movement of the shaft 81. If now the shaft 81 is rotated its pins move the number wheels into their zero positions.

I claim:

1. In a calculating machine, the combination with registering mechanism, setting mechanism, and resetting mechanism for the registering mechanism, of gear mechanism to transmit resetting movement of the registering mechanism to the setting mechanism and having temporary engagement with relation to the registering and setting mechanisms.

2. In a calculating machine, the combination with registering mechanism, setting mechanism, and resetting mechanism for the registering mechanism, of gear mechanism coöperating with both the registering and setting mechanisms to transmit the resetting movement of the registering mechanism to the setting mechanism and normally in inoperative position relatively to the registering and setting mechanisms, and means for throwing the said gear mechanism into operation.

3. In a calculating machine, the combination with registering mechanism, setting mechanism, and resetting mechanism for the registering mechanism, of toothed devices operating both with the registering mechanism and setting mechanism to transmit the resetting movement of the registering mechanism to the setting mechanism, and means to throw said toothed devices into or out of operation relatively to the registering and setting mechanisms.

4. In a calculating machine, the combination, with the setting machanism, the registering mechanism, the resetting mechanism, and a carriage supporting said registering mechanism and resetting mechanism and adapted to be shifted longitudinally of said setting mechanism, of toothed gearings on said setting mechanism and registering mechanism adapted to be thrown into engagement with each other by the combined resetting and carriage shifting operations and to transmit the resetting movement to the setting mechanism.

5. In a calculating machine, the combination with a rotary setting disk provided with a plurality of radially movable teeth, a rotary cam disk adapted to shift one or more of said teeth into operative position and provided about its circumference with gear teeth, a number wheel, and a gear wheel connected therewith and adapted to be rotated by the operative teeth of said

setting disk, of resetting means for said number wheel, and a carriage supporting said number wheel and its gear wheel and adapted to be shifted relatively to said setting and cam disks, the gear wheel connected with said number wheel being adapted to be thrown into engagement with the gear teeth on said cam disk upon the combined resetting and carriage shifting operations and to transmit the resetting movement to said cam disk.

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

ERWIN JAHNZ.

Witnesses:
HENRY HASPER,
WOLDEMAR HAUPT.