F. TRINKS & C. SCHALLER.

CALCULATING MACHINE.

APPLICATION FILED JAN. 5, 1912.

1,038,464.

Patented Sept. 10, 1912.

3 SHEETS—SHEET 1.

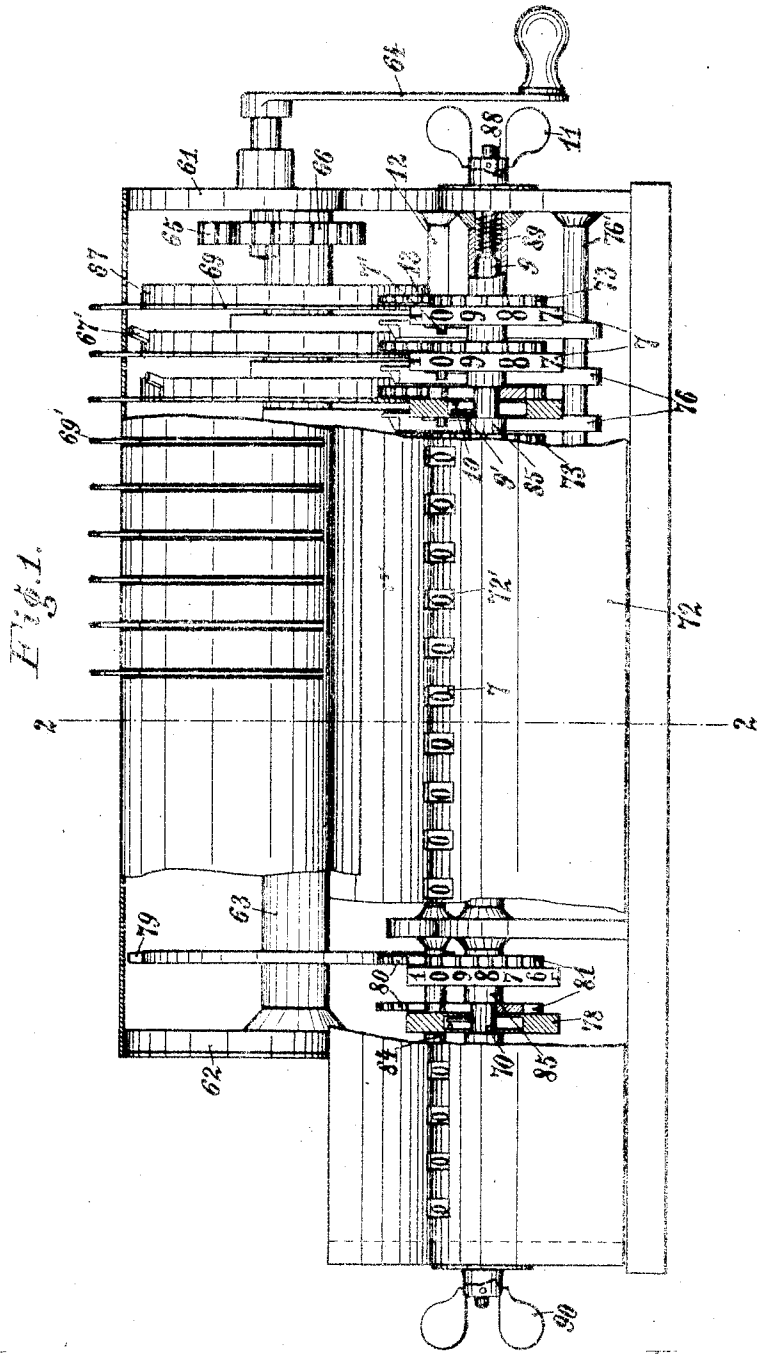

Fig. 1.

Witnesses

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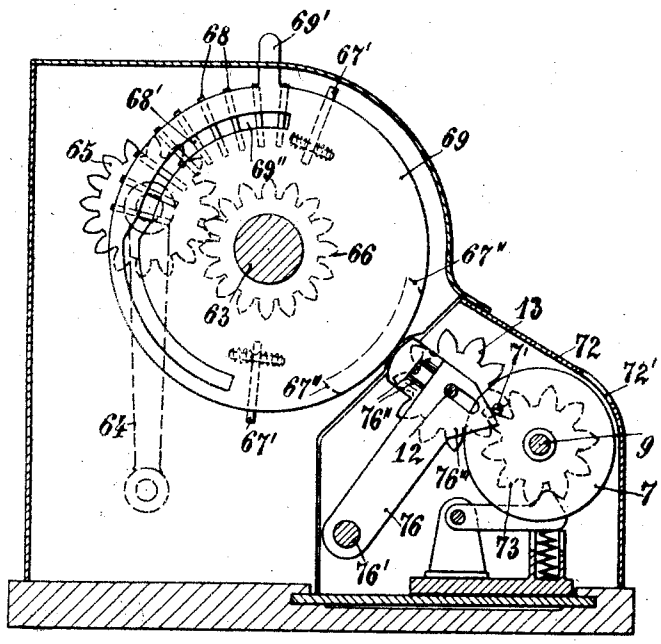
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

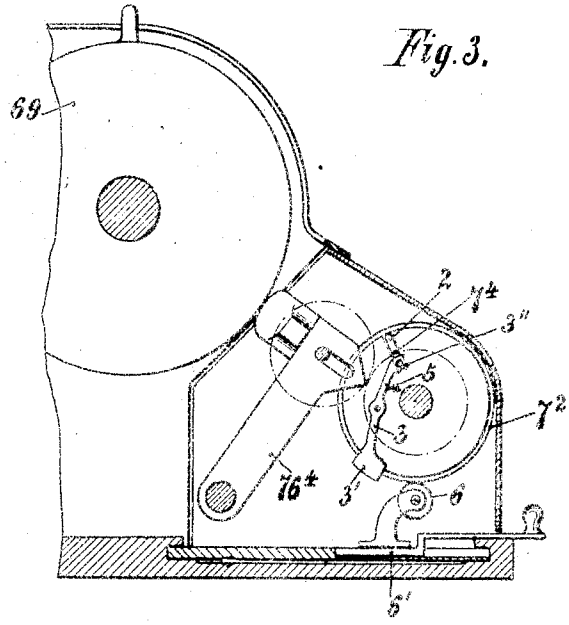
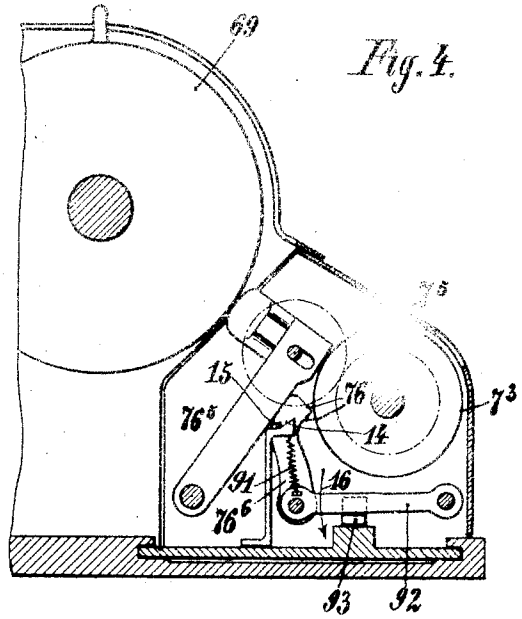


Fig. 4.



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CALCULATING-MACHINE.

1,038,464. Specification of Letters Patent. Patented Sept. 10, 1912.

Application filed January 5, 1912. Serial No. 669,623.

To all whom it may concern:

Be it known that we, FRANZ TRINKS, engineer, and CARL SCHALLER, foreman, subjects of the Duchy of Brunswick, Empire of Germany, residing at 71 Kastanicu allee and 15 Döringstrasse, Brunswick, Germany, have invented certain new and useful Improvements in Calculating-Machines, of which the following is a specification.

Our invention relates to improvements in calculating machines, and more particularly in calculating machines by means of which continuous multiplications and additions of the form $a.m+b.n+c.n+$etc., can be performed by means of a single registering mechanism, for which purpose a set of numeral wheels located at one side of the machine is used for performing the multiplications $a.m$, $b.n$, etc., while a set of numeral wheels located at the other side of the machine is used for performing the addition of the said products. Ordinarily calculations of this character show but small numbers, so that the sets of numeral wheels do not interfere with each other. However errors can occur by reason of the carrying mechanism which connects all the numeral wheels from the lowest order to the highest order. For this reason it has heretofore been suggested to interrupt the carrying mechanism provided between the two sets of numeral wheels.

The object of our improvements is to provide a carrying mechanism in which the member controlled by one numeral wheel and adapted to carry a ten to the numeral wheel of the next higher order is so constructed, that it can be thrown out of operative position from the outside of the casing.

In describing the invention reference will be had to calculating machines in which the values of the calculation are set on setting disks by shifting the corresponding number of teeth outward and transmitted to the numeral wheels of either set according to the position of the slide carrying the setting disks, and in which the carrying mechanisms consist of pins revolving with the numeral wheels and adapted to actuate rocking levers in the form of hammers. But we wish it to be understood, that our invention is not limited to the use in combination with the construction of the calculating machine described hereinafter, and that various changes may be made in the construction of the carrying mechanism and the device for throwing the same out of operation.

In order that our invention be more clearly understood two examples embodying the same have been shown in the accompanying drawings in which the same letters 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 of known construction in which our invention may be embodied, Fig. 2, is a vertical cross-section taken on the line 2—2 of Fig. 1, Fig. 3, is a similar cross-section showing one embodiment of our invention, and Fig. 4, is a similar cross-section showing a modification of the carrying mechanism which is adapted to be thrown out of operative position.

Before explaining the invention we shall describe a calculating machine of known construction in which our invention may be embodied. Such a machine is illustrated in Figs. 1 and 2. A rotary shaft 63 is mounted in a pair of side walls 61 and 62 of the casing of the machine. The said shaft is operatively connected with the machine crank 64 through spur gears 65 and 66, and it carries a plurality of setting disks 67 each of which is provided with nine radial slots. Within the latter radially shiftable teeth 68 are located which with lateral noses 68′ engage in a cam slot 69″ formed in a cam disk 69 loosely mounted on the shaft 63. By rotating the said cam disk on the shaft 63 by means of a handle 69′ any desired number of the teeth 68 can be shifted into a position beyond the periphery of the setting disks. The number of the teeth 68 shifted beyond the periphery of the setting disks represents the value to be introduced in the calculation in each column of the registering mechanism. In front of the said setting disks, the whole of which may be termed the setting mechanism, numeral wheels 7 are loosely mounted on a shaft 9 disposed parallel to the shaft 63. Each of the said numeral wheels is provided at its circumference with the numerical characters from "1" to "9" and the "0" sign, and one of the said characters of each column of numeral wheels is at a time displayed through a peep hole 72′ made in a cover 72 which is common to all the numeral wheels. Each of the numeral wheels 7 has a spur gear 73 secured to its side which is provided

with ten teeth, and the latter are in mesh with the teeth of a transmission wheel 13 which is loosely mounted on a shaft 12 disposed parallel to the shaft 9 of the numeral wheels. The said transmission wheels 13 which as shown are mounted on the same axis 12 are located in the plane of the radially shiftable teeth 68 of the setting disks 67, and when rotating the said disks 67 by means of the machine crank 64 the teeth 68 mesh with the teeth of the transmission wheels 13 so as to advance the same. Thereby also the numeral wheels are advanced a distance which corresponds to the number of teeth 68 projected into their operative positions beyond the periphery of the setting disks 67. In order to transmit a certain number to the numeral wheels 7 the operator sets the said number on the setting disks 67, 68 whereupon he rotates the crank 64.

Carrying means are provided between consecutive numeral wheels which shift a numeral wheel forward or backward the distance corresponding to one value, if the numeral wheel of the next lower order passes from its "9" position into its "0" position, or vice versa. In the example illustrated rocking levers 76 having the form of hammers are used for this purpose, which levers are loosely mounted on a shaft 76′ disposed parallel to the axis of the registering mechanism, and which extend with their free upper ends to points adjacent to the gear wheels 13. Each of the numeral wheels 7 is provided with a pin 7′ which strikes the head 76‴ of the hammer 76 so as to rock the latter, when the numeral wheel passes from its "9" position into its "0" position, or vice versa. Thereby a cam face 76″ of the rocking lever 76 is thrown into the path of a laterally shiftable tooth 67′ of the cooperating setting disk 67. Upon rotation of the setting disk 67 the cam face 76″ shifts the tooth 67′ laterally and into mesh with the teeth of the transmission wheel 13 cooperating with the numeral wheel 7 of the next higher order. Thereby the said numeral wheel 7 is advanced the distance of one value. As, for the purpose of performing additions or subtractions, or multiplications or divisions, the crank can be turned either to the right or to the left, two teeth 67′ and cam faces 76″ are provided, only one of which is operative when turning the crank in one direction. At the end of the carrying operation cam faces 67″ rock the levers 76 into their normal positions shown in Fig. 2.

At the left of the registering mechanism, and preferably coaxially therewith, a second registering mechanism 78 is provided, the numeral wheels of which are used for counting the revolutions of the machine crank. The said revolutions counting mechanism is actuated from the shaft 63 which at its left end carries a single tooth wheel 79 adapted upon each revolution of the shaft 63 to advance a spur gear 80 the distance of two consecutive teeth. In the position of the registering mechanisms 7, 78 shown in Figs. 1 and 2, the said gear wheel 80 is in mesh with a gearing 81 of the numeral wheel 78 of the lowest order which is located at the right hand end of the set of numeral wheels 78. Therefore the said numeral wheel is advanced a distance corresponding to one value, if the crank of the machine performs a revolution. Each of the numeral wheels is connected with a gearing 81, and all the gear wheels 80 meshing with the gearings 81 are loosely mounted on a shaft 84 disposed parallel to the shaft 70 of the registering mechanism 78. Carrying devices are not required for the revolutions counting mechanism.

Both registering mechanisms 7 and 78 are provided with resetting mechanisms adapted to set the numeral wheels into their zero positions. In the example shown the resetting mechanism is constructed as follows: At its outer end the shaft 9 carries a nut 11, and within each of the numeral wheels 7 it is provided with a radial pin 9′. Each of the numeral wheels is provided with an abutment 10. In the normal position of the shaft 9 and the abutments 10 the latter are located out of the path of the pins 9′. Upon rotation of the shaft 9 by means of the nut 11 the shaft 9 is shifted laterally against the action of a spring 89 by means of a cam face 88, so that the pins 9′ are shifted into the path of the abutments 10. Therefore, if the shaft 9 is further rotated, the pins 9′ engage the abutments 10 so as to move the numeral wheels into their zero positions. At the end of the resetting operation the shaft 9 is shifted backward again, so that the pins 9′ are again out of engagement with the abutments 10. Resetting mechanisms of the same construction are provided on the shaft 70 which carries a nut 90 at its outer end. Short sleeves 85 prevent the axial displacement of the wheels 7 and 78.

In describing those parts to which our invention more particularly relates reference will be had to Fig. 3, in which the setting mechanism is represented by one of the setting disks 69 and the registering mechanism by one of the numeral wheels 7^2 and its gear wheel 73^2 secured thereto. The tens carrying pin 7^4 which corresponds to the pin 7′ shown in Fig. 2 is a shiftably mounted on the numeral wheel for which purpose it is embedded in a substantially radial groove 2 of the numeral disk 7^2. It is provided with a laterally projecting pin 8 which is engaged by the bifurcated end 3″ of a rocking lever 3 mounted on the numeral wheel 7^2. A spring 5 secured with one end to the numeral wheel and with the

opposite end to the rocking lever has the tendency to hold the same in the position in which the pin 7^4 is retracted away from the circumference of the numeral wheel. Upon the rotation of the numeral wheel and once for each rotation thereof the free end 3′ of the lever 3 strikes against a relatively stationary part which in the example shown consists of a roller 6 mounted on a slide 6′. The position of the said roller is such, that the lever 3 is rocked and the pin 7^4 shifted outwards, when the latter passes along the rocking lever 76^4, so that a ten is carried from one numeral wheel to the numeral wheel of the next higher order. If it is desired to interrupt the carrying operation between the two sets of numeral wheels the roller 6 and the slide 6′ are shifted to the left by means of a handle 6^2 provided on the slide and projecting to the outside of the casing. When the roller has thus been shifted to the left and out of the path of the rocking lever 3, the pin 7^4 can not be shifted outwards, so that no carrying takes place between the numeral wheels connected by the carrying device. Therefore the calculations performed on the two sets of numeral wheels can not interfere with each other.

In the example shown in Fig. 4 the construction of the setting mechanism and the registering mechanism is the same as the one described with reference to Figs. 1, 2 and 3. The carrying mechanism, or the carrying device located between the highest numeral wheel of the right hand set and the lowest numeral wheel of the left hand set is constructed in a slightly different way. As shown the rocking lever 76^5 is not directly operated by the pin 7^5, mounted on the numeral wheel 7^5, but through the intermediary of a rocker 76^6 which is adapted to be rocked by the pin 7^5. The rocker is so mounted, that it can be shifted out of the path of the pin 7^5. In the example shown it is for this purpose jointed to a lever 92 which is pivotally mounted on the bottom of the carriage at 92′. Normally the rocker 76^6 is held out of the path of the pin 7^5 and in inoperative position by means of a compressed spring 91 attached with one end to the lever 92 or to the rocker 76^6 and with the opposite end to a bracket 14 rising from the bottom of the slide 1. If it is desired to throw the carrying mechanism into operative position a wedge 93 located below the lever 92 is shifted laterally so as to force the said lever 92 and the rocker 76^6 upwards against the action of the spring 91. At its top the bracket 14 is formed with an inclined shoulder 14^1 which in the inoperative position of the rocker 76^6 engages a pin 15 of the latter, so as to prevent the same from dropping between the numeral wheels.

We claim herein as our invention:

1. In a calculating machine, the combination with the setting mechanism, the registering mechanism comprising a plurality of numeral wheels, and means to bring said setting mechanism into coöperation with either one of two sets of numeral wheels, of carrying mechanism located intermediate said sets of numeral wheels and comprising a rocking member controlled by the revolution of one numeral wheel and means to transmit carrying operation from said member to the numeral wheel of next higher order, and slide means associated with said member and carrying a device to control the operative and inoperative position of the member.

2. In a calculating machine, the combination with the setting mechanism comprising setting disks provided with shiftable teeth and means to shift the desired number of teeth into operative position, the registering mechanism comprising a plurality of numeral wheels, and means to bring said setting mechanism into coöperation with either one of two sets of numeral wheels, of carrying mechanism located intermediate said sets of numeral wheels and comprising a rocking member controlled by the revolution of one numeral wheel and means to transmit carrying operation from said member to the numeral wheel of next higher order, and slide means to control said member as to its inoperative and operative position.

3. In a calculating machine, the combination with the setting mechanism, the registering mechanism comprising plurality of numeral wheels, and means to bring said setting mechanism into coöperation with either one of two sets of numeral wheels, of carrying mechanism located intermediate said sets of numeral wheels and comprising a member controlled by the revolution of one numeral wheel, a rocker controlled by said member, means to transmit carrying operation from said rocker to the numeral wheel of next higher order, and slide means to move said member out of operative position relatively to the rocker.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

FRANZ TRINKS.
CARL SCHALLER.

Witnesses:
WILHELM LEHRKE,
JULIUS SECKEL.