

A. BURKHARDT.
 CALCULATING MACHINE.
 APPLICATION FILED APR. 28, 1908.

951,982.

Patented Mar. 15, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

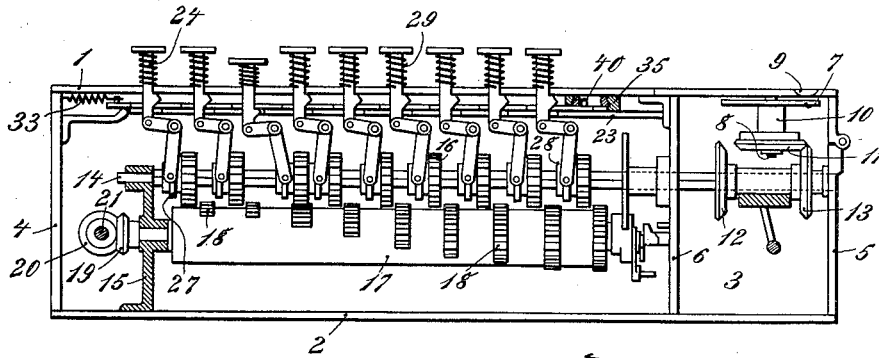
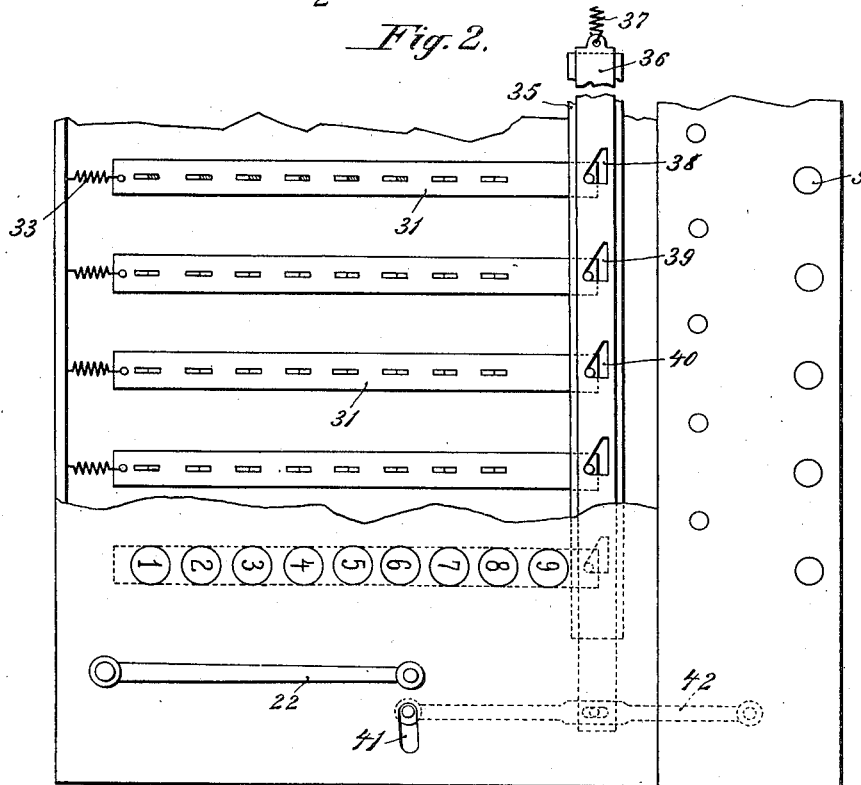


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

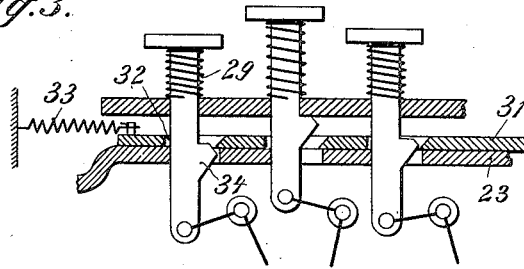
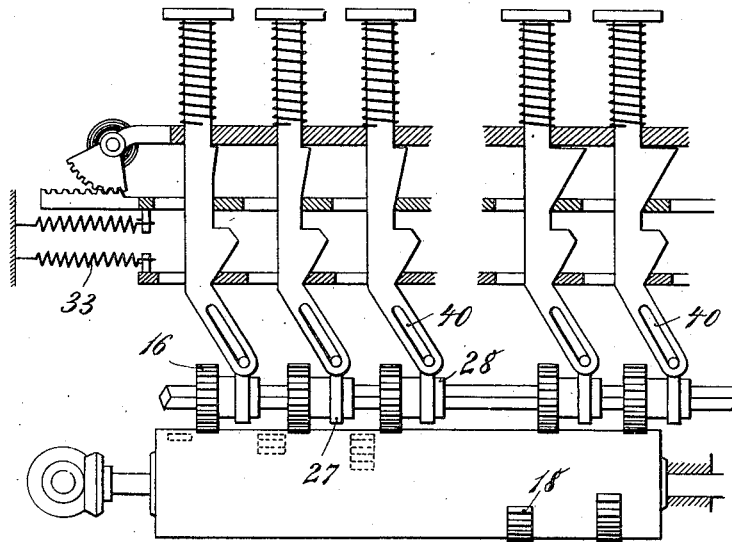


Fig. 4.



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UNITED STATES PATENT OFFICE.

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CALCULATING-MACHINE.

951,982.

Specification of Letters Patent.

Patented Mar. 15, 1910.

Application filed April 28, 1906. Serial No. 314,295.

To all whom it may concern:

Be it known that I, ARTHUR BURKHARDT, engineer, a subject of the King of Saxony, and a resident of Glashütte, in the Kingdom of Saxony, Germany, have invented a certain new and useful Improvement in Calculating-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to numerals of reference marked thereon, which form a part of this specification.

My invention relates to improvements in calculating machines; and the object of my improvements is to provide a machine of this class in which, by a simple mechanism, the adding wheel is operated, according to the digit struck, by a mechanism common to all of the digits of one column.

My invention also consists in providing, in the machine described, means to lock the keys in their depressed position in which they control the operating means for the adding wheel in such a way that the proper rotation is transmitted to the latter. The locking means are constructed in such a way that, by depressing one key another one which might still be locked after the previous operation of the machine is automatically released, so that it returns to its inoperative position.

Further my invention consists in so connecting the operating means for the adding wheel that, at the end of each operation of the machine, all the keys of the different columns of digits are automatically released.

An example of a calculating machine embodying my invention is illustrated in the accompanying drawings in which similar numerals of reference refer to similar parts throughout the different views.

In said drawings Figure 1 is a cross section through my improved machine, showing the keys, the means to rotate the adding wheel, and the mechanism operated by the keys, whereby the revolution of the adding wheel is controlled. Fig. 2 is a plan of Fig. 1, a part of the top plate or cover of the machine being broken away. Fig. 3 is a cross section of a part of Fig. 1 on a larger scale, illustrating in detail the locking means for

the keys, and Fig. 4 is a cross section of a modification of the construction shown in Fig. 3.

In the example illustrated, the casing of the machine consists of a top plate 1, a base plate 2, side plates 3, a front plate 4, a rear plate 5, and a partition wall 6. Within the chamber formed by the partition wall 6 and the rear plate 5, adding wheels 7 are mounted on a vertical shaft 8 supported by the top plate 1. The number of the adding wheels corresponds to the number of columns of digits and varies according to the maximum number to be registered by the machine. The digits marked on the upper surface of the adding wheels can be seen through openings 9 in the top plate. The adding wheel is formed with a sleeve 10 by means of which it is connected with a beveled wheel 11, which can be engaged by either of two beveled wheels 12 and 13 mounted on a common sleeve and adapted to be moved longitudinally on a shaft 14 by any preferred means, said beveled gearing 11, 12, and 13 providing a clutch mechanism, whereby the shaft 14 can be coupled with the adding wheel 7 to revolve the latter for the purpose of adding or subtracting a certain number. The shaft 14 rotates in suitable bearings of the plates 5 and 6, and of a bracket 15 on the front side of the casing. It is provided with nine cog wheels 16 mounted thereon, so as to slide longitudinally; but rotation will be transmitted by the cog-wheels to the shaft, the latter being made, in this example, of square cross section.

Mounted on the bracket 15 and the wall 6, parallel to the shaft 14, there is a drum 17, having a plurality of toothed segments 18 of different lengths mounted on its periphery, every one of which coöperates with and can be brought into engagement with one of the cog-wheels 16. The length of said segments corresponds to the number which it is intended to register on the adding wheel. The drum 17 can be rotated, at each operation of the machine, by any suitable means. In the present instance a beveled gearing 19, 20 is provided, whereby the drum is operatively connected with a shaft 21, adapted to be rotated by a crank 22 or the like. In a similar way, corresponding drums 17 for each of the columns of digits are connected

with the shaft 21, so that all the drums will be simultaneously rotated upon operation of crank 22.

Extending through suitable slots of the top plate 1 and of an additional guide plate 23, supported on the walls 4 and 6, there are several rows of keys 24, nine being provided for each column, which keys have the numbers one to nine, marked on their heads. By means of these keys, the cog-wheels 16 can separately be brought into engagement with the toothed segments 18. For this purpose, they are provided with bell crank levers 25 which have their fulcrums on shafts 26 extending from side to side of the machine. With their free ends, the levers 25 are pivotally connected with rings 27 engaging sleeves 28 of the cog-wheels 18. Normally the keys 24 are held in their retracted position by springs 29.

In order to lock the keys in their depressed position, in which a cog-wheel engages its segment 18, I provide a slide 31 for each column, which extends from the front to the rear of the machine, and engages the keys 24 by slots 32. A spring 33, or the like, has the tendency to pull the slide toward the front side of the machine. Adjacent to the slide, and coöperating therewith, I provide a lug 34 on each key, which lug, by an inclined portion, is adapted to move the slide laterally against the action of the spring 33. When, however, the key has assumed its depressed position, it will be locked by the slide, which is pulled back by the spring and thereby forms an abutment for the upper part of the key 24. It will be noticed, that, upon operation of one of the keys 24, another one which may still be in its depressed position will automatically be retracted by its spring 29, at the moment the slide is moved, by the operated key, into its extreme rearward position. This arrangement is also advantageous, when, by mistake, a wrong key has been struck. In such a case it will but be necessary to strike the correct one, whereby the wrong one will automatically assume its retracted position.

In order to release the keys of all the columns at the end of each operation of the machine, I provide the following mechanism: Mounted in suitable guides 35, and extending crosswise of the slides 31, there is a bar 36 actuated by a spring 37. It is provided with suitable slots 38 having inclined sides 39 engaging pins 40 of the slides 31. Normally the bar 36 is held by the spring 37 in a position in which it does not engage the slides 31. But in order to release the keys it is engaged by a rocking lever 42, having a pin or the like extending through a slot 41 of the top plate, which pin can either be actuated by hand, or, as in the example illustrated automatically by the crank 22.

In Fig. 4, I have illustrated a modification of the connection of the keys 29 and the cog-wheels 18. In this example, the keys are formed with a lower inclined portion having a slot 43 formed therein. Said slot engages the ring 27 of the sleeve 28, so as to move the cog-wheel 16 sidewise and into engagement with its segment 18.

The operation of the machine is as follows: It will be understood that the mechanism described above with reference to one adding wheel is the same for all the wheels. Now, to register a number on the machine, the operator strikes one of the keys of each column according to the digit to be registered, as is well known in the art. By thus striking a key, one of the cog-wheels will be brought into engagement with its segment 18, the length of which is proportional to the number marked on the key. Should a mistake occur, the operator will just strike the correct key, whereby the wrong one automatically returns into its inoperative position. When the keys indicating the number to be registered are depressed and locked by the slides 31, the operator turns the crank 22, which rotation is transmitted through the shaft 21, and gearing 19, 20 to the drum which will perform a full revolution. The segment engaged by a wheel 16 will therefore rotate the latter according to the length of the segment 18, which rotation will be transmitted to the adding wheel 7. At the end of the operation of the crank 22, all the keys will be released by the crank striking the lever 42. Then the operation can be repeated.

The mechanism to transmit a partial revolution at the end of a complete revolution of one adding wheel to the next succeeding one may be of any preferred construction.

I claim:

1. In a calculating machine, the combination, with a plurality of adding wheels, of operating means therefor, a selecting mechanism comprising rows of depressible keys, means to lock said keys in their depressed position comprising slides movable longitudinally of the rows of keys, pins carried by said slides at their ends, and a releasing bar for said slides extending transversely thereof and having recesses with inclined sides fitting over said pins.

2. In a calculating machine, the combination with adding mechanism embodying a plurality of adding wheels, of selecting mechanism comprising rows of depressible keys having projections, there being one row of keys for each adding wheel, independent slides for each row of keys to lock the latter in depressed position and moved in one direction to lock the keys by the projections on the said keys, the keys being movable through the slides, a releasing mechanism for the slides and keys consisting of a bar extending

across and engaging portions of the said slides, means controlled by the depression of the keys for operating the adding mechanism, differential mechanism having means
5 coöperating with each row of keys, and means movably connected to the lower extremities of the keys and engaging different portions of the differential mechanism to set said portions in accordance with the key operated.

10 3. In a calculating machine, the combination with adding mechanism including a plurality of adding wheels, of selecting mechanism comprising rows of keys for each adding wheel, means for locking the keys of
15 each row in depressed position, a shaft having a plurality of gear wheels shiftably mounted thereon, means connected to the keys and to said gear wheels, shifting connecting means between the keys and said
20 gear wheels, and an exteriorly operative drum for each set of gear wheels and provided with segments of different lengths for engagement by the gear wheels.

25 4. In a calculating machine, the combination with an adding wheel, of selecting mechanism comprising depressible keys, means to lock said keys in depressed position, releasing means embodying a lever car-

rying a projection, and mechanism for operating said adding wheel and including means 30 which abuts against said projection and actuates said releasing mechanism.

5. In a calculating machine, the combination with an adding wheel, of selecting mechanism comprising a row of depressible 35 keys, a slide through which said keys have movement to lock the keys in depressed position, the slide being movable in one direction by the depression of the keys and having means for automatically moving it in the 40 opposite direction to lock the keys after the latter have been depressed a certain distance, a releasing bar for said slide having a lever coöperating therewith and provided with a projection, operating mechanism for said 45 adding wheel, and a crank coacting with a part of said mechanism and with said lever to operate the releasing bar.

In testimony, that I claim the foregoing as my invention, I have signed my name in 50 presence of two subscribing witnesses.

ARTHUR BURKHARDT.

Witnesses:

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PAUL HERRMANN.