

Nov. 13, 1923.

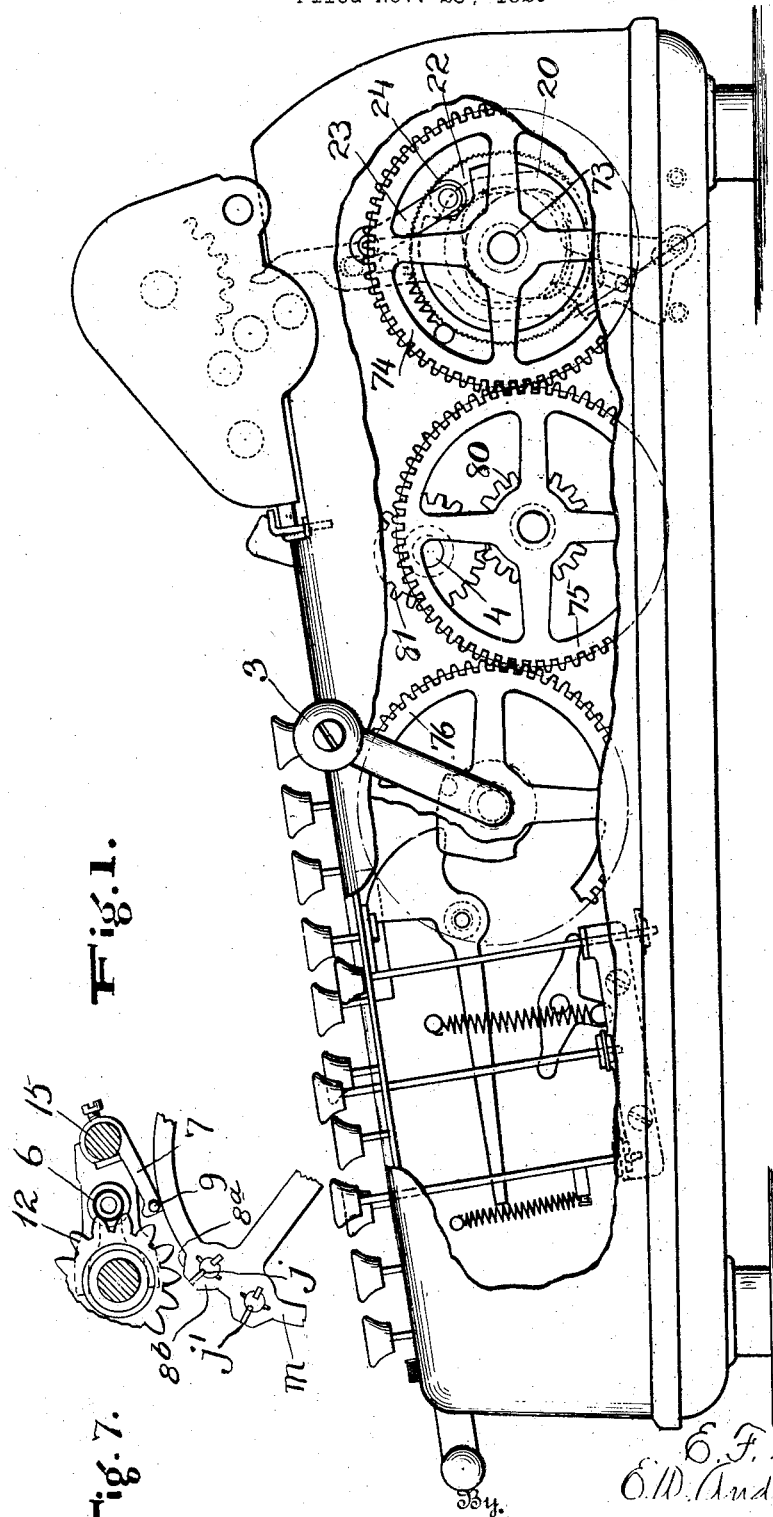
1,474,230

E. F. BRITTEN, JR

CALCULATING MACHINE

Filed Nov. 23, 1920

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

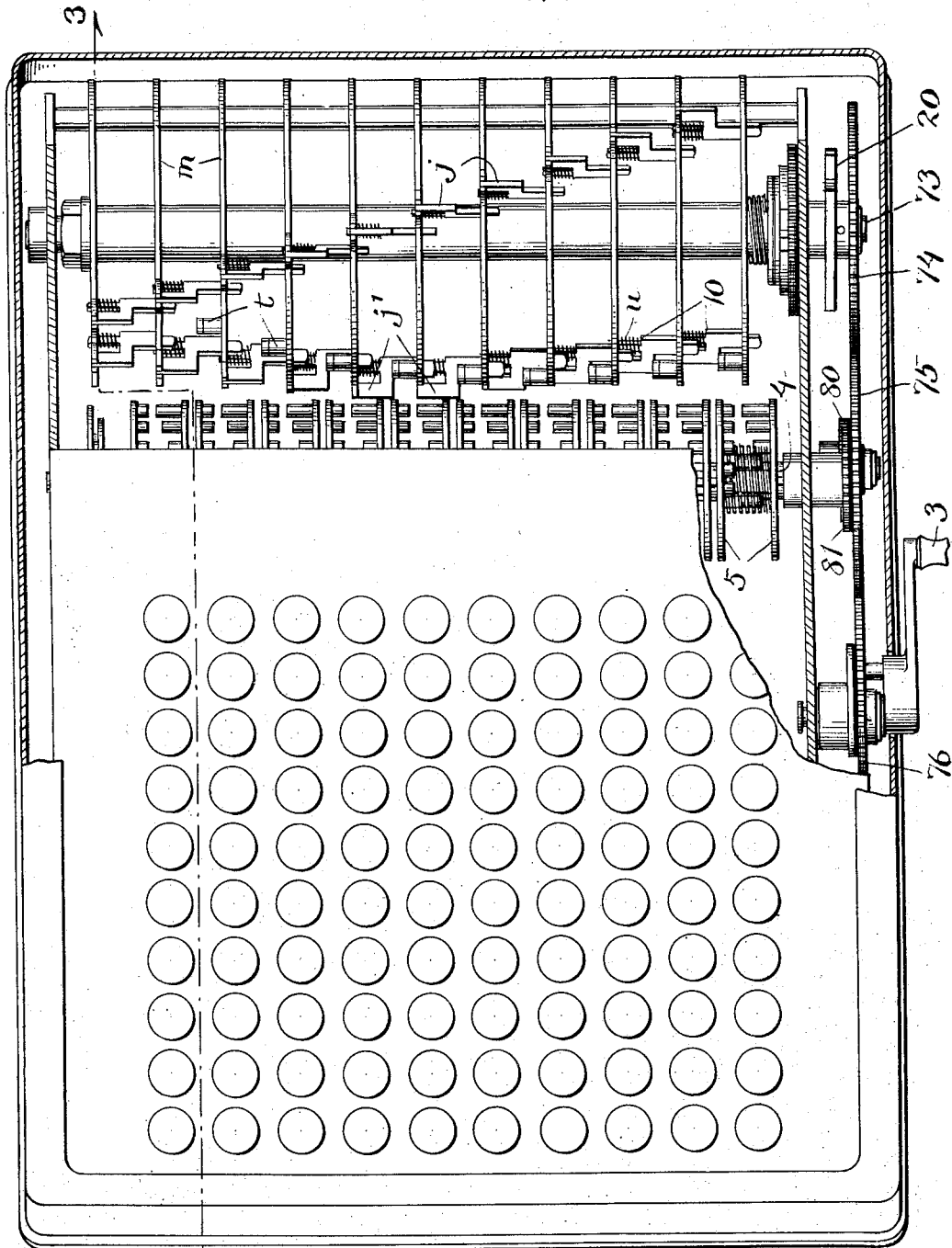


Fig. 2.

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Nov. 13, 1923.

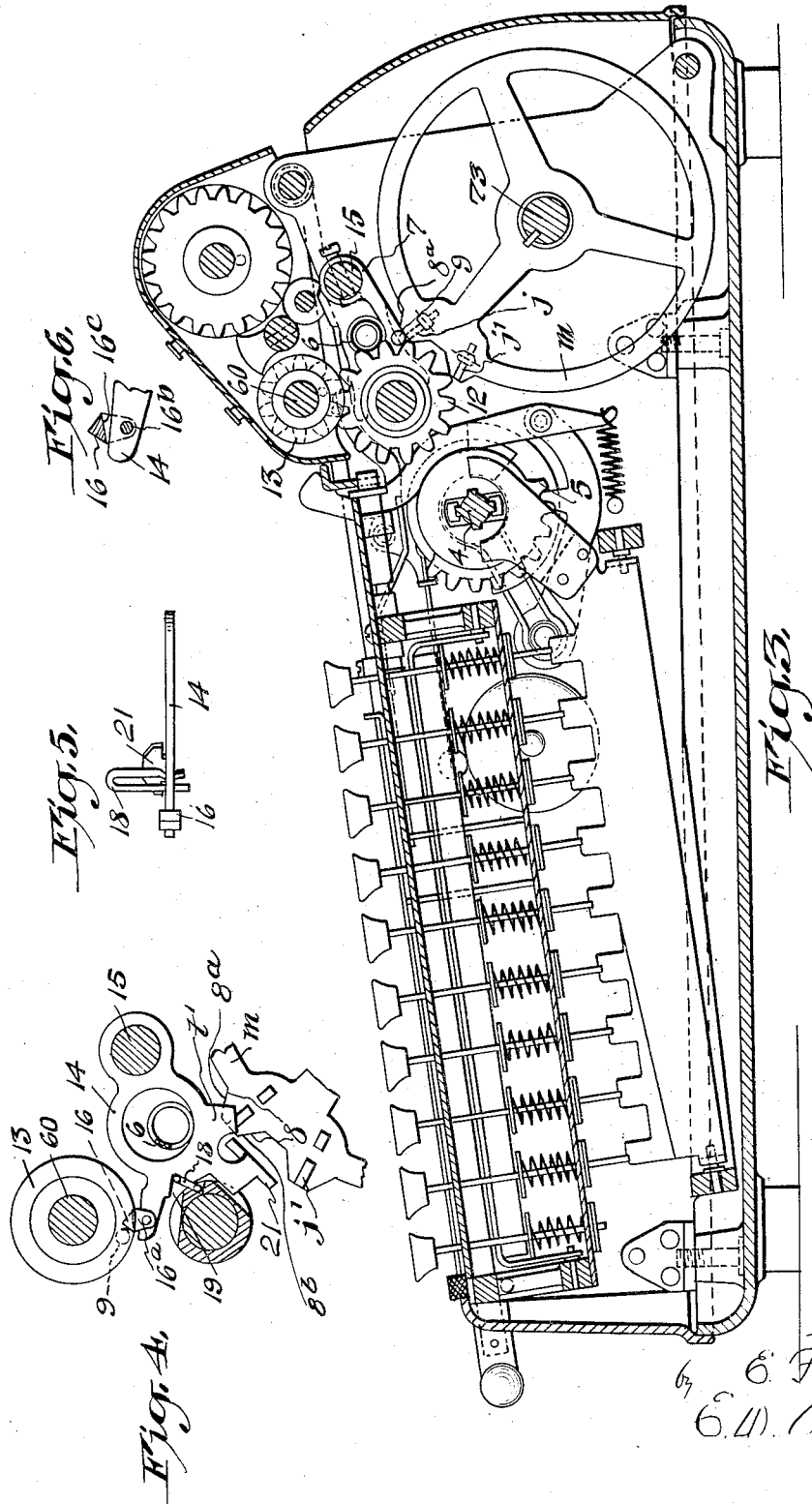
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3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE.

EDWIN F. BRITTEN, JR., OF MAPLEWOOD, NEW JERSEY, ASSIGNOR TO MONROE CALCULATING MACHINE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

CALCULATING MACHINE.

Application filed November 23, 1920. Serial No. 426,043.

To all whom it may concern:

Be it known that I, EDWIN F. BRITTEN, JR., a citizen of the United States, resident of Maplewood, in the county of Essex and State of New Jersey, have made a certain new and useful invention in Calculating Machines; and I declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it appertains to make and use the invention, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

Figure 1 is a side view of a machine embodying my invention, with the casing partly broken away.

Figure 2 is a plan view of the same, with parts broken away.

Figure 3 is a section, taken on the line 3—3, Figure 2.

Figure 4 is an enlarged detail view of a cam-carrying arm and adjacent parts, said arm appearing in side view.

Figure 5 is a plan view of a cam-carrying arm and its spring.

Figure 6 is an enlarged detail sectional view of a pivoted carrying tooth.

Figure 7 is a detail view of a carry over-throw check and adjacent parts, said check appearing in side view and disengaged from the intermediate gear.

The invention has relation to calculating machines, having for an object the provision of means whereby a calculating machine of the type shown in the reissue patent to Baldwin, No. 13,841, may be operated entirely by gears having a ratio of one-to-one, or wherein any operative movement of the crank handle is transmitted at a constant speed ratio to the selecting elements and to the carry elements.

A further object is the provision in this connection of carry mechanism which will avoid the necessity for an idle crank movement in reversing the operation of the machine, as in the Baldwin patent hereinbefore referred to. Other objects and advantages will hereinafter appear.

The invention consists in the novel construction and combinations of parts, as hereinafter set forth.

In the accompanying drawings, illustrating an embodiment of the invention, the numeral 3 represents an operating crank

handle, adapted to communicate motion to a train of equivalent gears 76, 75, and 74. Upon the shaft and fast with gear 75 is a smaller gear 80, meshing with a similar gear 81 mounted rigidly upon the shaft 4 of the selecting or primary gears 5. These gears 5 are arranged in sets of two, each set selectively positioned by a series of digital keys and connecting rock bars, as explained in the patent to Baldwin above mentioned, the teeth of each set being arranged in approximately a half-circle, so that the gears 5 may mesh with intermediate gears 12 during approximately a half-rotation of shaft 4, the other half rotation of said shaft being idle. The gears 12 mesh with and operate the gears of the numeral wheels 13.

Gear 74 is fast upon shaft 73, to which annuli *m* are also rigidly attached, these annuli serving to support laterally movable carrying teeth *j*, *j'*, arranged in two oppositely pitched spirals each extending approximately one-fourth around shaft 73, a tooth of each spiral series being adapted to engage its respective intermediate gear 12. Approximately the first quarter rotation of shaft 73 serves to move one series of carrying teeth *j'* idly past the gears 12, and corresponds to a portion of the idle movement of shaft 4. The next half-rotation of shaft 73 is also idle, and corresponds to the active or registering movement of shaft 4. The final quarter rotation of shaft 73 brings the teeth *j* of the second series successively into position to act upon the intermediate gears 12, in case of lateral positioning of the teeth *j* by their carrying cams 21; this movement of shaft 73 corresponding to the remaining idle movement of shaft 4, completing the cycle.

Reverse or subtractive rotation of the operating handle 3 will result in the same sequence of movements described for forward or additive rotation, except that the said first named series of carrying teeth *j'* will now operate, and the second or other series *j* will not act.

At the beginning and end of each cycle of movement, forward or reverse, the handle will occupy substantially the same position, the load thereupon also being reduced to a minimum during the entire stroke, since there is no inertia to overcome in intermittently rotated parts, nor added power required to operate variable ratio gearing.

Pivotal carry-setting arms 14, having

carry cams 21, are employed, each arm being provided with a cam extension 16, preferably formed upon a tooth or element 16^a, pivoted at 16^b to said arm. Pins *q* of the numeral wheels engage the teeth 16^a to actuate the arms 14 pivotally and bring the cams 21 into the path of the carry teeth, *j j'*, the arms 14 being yieldably held in either extreme pivotally moved position by means of springs 18. The pivotal movement of teeth 16^a is limited in each direction by contact of a stop wall 16^c thereof with the top of arm 14, this movement being provided in order to position the teeth differently when operated in forward or in reverse rotation of the numeral wheels, and being sufficient to prevent incorrect carry operation by over-rotation, under momentum, of said wheels, since no impulse will be transmitted to arm 14 until the numeral wheel has moved approximately half way between registering positions.

During subtractive or reverse rotation of the parts, a roller *t* upon the annulus *m* (Figure 2) engages one wall of a double cam extension *t'* (Figure 4) of any arm 14 which may have been depressed, to restore the arm to normal position after the tooth *j'* has acted; while during additive or forward rotation the tooth *j* itself engages the opposite wall of cam extension *t'* after said tooth has been acted upon by cam 21, and will restore the arm 14 to normal position.

A spring brake 6 is employed, acting upon the teeth of the intermediate gears 12 in the manner described in the Patent No. 1,349,628, dated August 17, 1920. This brake is constantly active, and tends to prevent overthrow of the numeral wheels under momentum, when acted upon by gears 5 or carry teeth *j j'*. With the reduced speed of rotation of the primary gears made possible by the present invention, it has been found that the braking tension of this spring may be reduced materially, provided carry overthrow checks are employed, made necessary by the carry teeth *j j'* moving more rapidly than the gears 5. Otherwise, were no carry overthrow checks used, the braking tension of the spring 6 would have to be increased instead of reduced, in order to check said numeral wheels against overthrow in carrying.

The carry overthrow checks in the present case consist of a series or arms 7, pivoted upon rod 13 and lying in the planes of the annuli *m* at the left-hand side of each tooth *j*. A cam extension 8 of each annulus *m* acts to throw the related arm 7 toward the intermediate gear immediately upon the completion of the carry action of the corresponding carry tooth *j* or *j'* a pin 9 at the end of said arm engaging between the teeth of the gear 12 at this time and being held by said cam to positively prevent overthrow.

Figure 3 of the drawings illustrates the normal position of the parts related to the extreme left-hand column of keys, either carry tooth, *j* or *j'* having just passed through active position, according to the direction of rotation, and pin 9 having been engaged between the teeth of gear 12, by the action of cam face 8^a or 8^b. In the other columns, the additive carry tooth *j* and the subtractive carry tooth *j'* will be spaced apart by greater intervals, but it is to be understood that the cams are so designed that all cam faces 8^a will be located at a uniform distance from the corresponding additive teeth *j*, and all cam faces 8^b will be located at a uniform distance from the corresponding subtractive teeth *j'*.

Owing to the fact that the braking tension of the spring 6 is materially reduced, the machine is rendered more sensitive, smooth and easy running, these advantages being accentuated by the reduction of the load on the handle to a minimum during the entire stroke thereof, as previously stated.

The laterally movable carrying teeth *j j'* are slidable as in the Patent No. 1,272,083, dated July 9, 1918, the return spring *u*, however, being compressed in the movement of the carry tooth to active position, and bearing at one end against the annulus *m* and at the other end against a shoulder 10 of the tooth *j j'*.

Means are provided for indicating to the operator, through sense of hearing and touch, the normal or neutral position of the crank handle 3, consisting preferably of a disk 20, fast upon shaft 73 and provided with a notch 22. An arm 23, pivoted to the framing, carries a roller 24, which will ride upon the periphery of disk 20, falling into the notch at the end of the stroke with a slight clicking noise, and creating a slight frictional resistance against the wall of the notch to continued movement of the operating handle at the end of the stroke thereof in either direction.

Applicant is aware that it is not new to operate the selecting and the carry mechanism of a calculating machine by continuous, constant ratio gearing, but the difficulty of applying such gearing to the present type of machine has been great.

The patent to Baldwin, No. 706,375, shows a one-to-one ratio constant drive in a lever set machine having radially adjustable selector pins. The Patent No. 890,888, issued to the same inventor in 1908, shows a machine possessing two principal features of improvement, namely a keyboard and a bodily shiftable selector member. Each of these improved features rendered it difficult to continue the use of the one-to-one ratio constant drive, since the addition of the keyboard left less room for the location of a selecting gear of sufficient size, and the

bodily shiftable nature of this selecting gear also imposed limitations of size, owing to the inertia and friction to be overcome. The drive arrangement of the Patent No. 706,375, was therefore abandoned, in order to secure the other advantages of the new construction.

Since the date of this second Baldwin patent there have been constant attempts to evolve a machine of this type wherein any operative movement of the crank handle is transmitted at a constant speed ratio to the selecting and to the carry shafts and possessing the consequent advantages of smoothness, ease and silence of operation and of a single starting and stopping point for the crank in forward and in reverse rotation. These experiments have resulted in various partial successes or improvements upon the original drive, but never before the present invention in the attainment of the objects stated.

I claim:

1. In a calculating machine, selecting mechanism including a shaft, a plurality of driving elements mounted thereon and a series of digital keys for each element, carry mechanism including a shaft and a plurality of driving elements mounted thereon, numeral wheels operable by the selecting elements and carry elements, an operating device rotatable in either of two directions, and means whereby any operative movement of said device in either direction is transmitted at a constant speed ratio to the selecting elements and to the carry elements.

2. In a calculating machine, selecting mechanism including a shaft, a plurality of driving elements mounted thereon and a series of digital keys for each element, carry mechanism including a shaft and driving elements arranged in two equal spirals about said shaft, numeral wheels rotatable in either direction by the selecting elements and carry elements, an operating device selectively movable in the performance of arithmetical problems of opposite nature, and means whereby any selective operative movement of said device is transmitted at a constant speed ratio to the selecting elements and to the carry elements, said selecting elements being in active radial position throughout one portion of the operation of said device, and said carry elements being in active

radial position substantially throughout the complementary portion of the operation of said device.

3. In a calculating machine, selecting mechanism including a shaft, a plurality of driving elements mounted thereon and a series of digital keys for each element, carry mechanism including a shaft and driving elements arranged in two equal spirals about said shaft, numeral wheels operable by the selecting elements and carry elements, a reversible operating crank, and means whereby any rotary movement of said crank in a selected direction will produce a corresponding degree of forward or reverse rotary movement of the selecting elements and the carry elements, said selecting elements being in active radial position throughout one portion of the rotation of said crank, and said carry elements being in active radial position substantially throughout the complementary portion of the rotation of said crank.

4. In a calculating machine, selecting mechanism including rotary elements, carry mechanism including a shaft and driving elements arranged in two equal spirals about said shaft, numeral wheels operable by the selecting elements and carry elements, a reversible operating crank, and means whereby any rotary movement of said crank in a selected direction will produce a corresponding degree of forward or reverse rotary movement of the selecting elements and the carry elements, said selecting elements being in active radial position substantially throughout a half cycle of movement of said crank and said carry elements being in active radial position substantially throughout the complementary half cycle of movement of said crank, and said carry elements being adapted to operate the numeral wheels more rapidly than they are operated by said selecting elements, whereby the carry elements of each spiral series are enabled to act successively upon a plurality of numeral wheels.

In testimony whereof I affix my signature in presence of two witnesses.

EDWIN F. BRITTEN, JR.

Witnesses:

H. A. DANIELS,
P. F. HARNETT.