Sept. 6, 1927. 1,641,615

R. BERK

CALCULATING MACHINE

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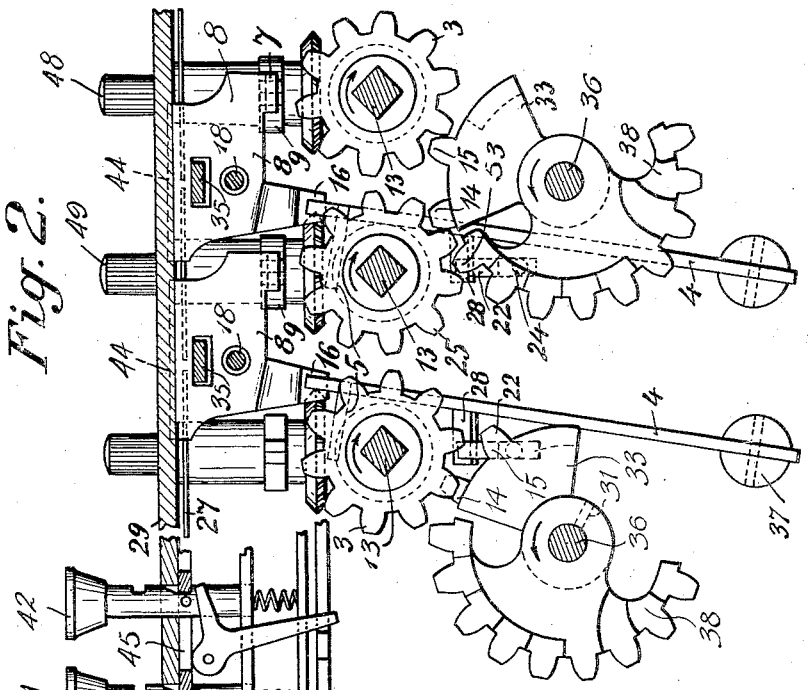

Fig. 2.

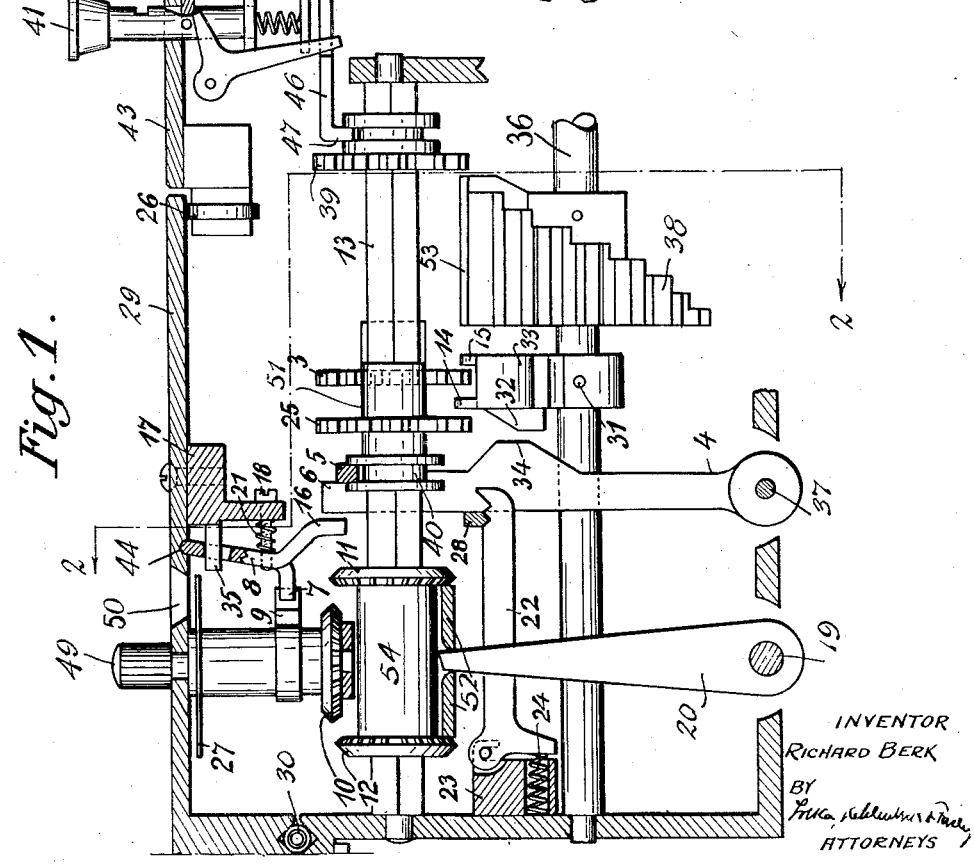

Fig. 1.

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CALCULATING MACHINE.

Application filed May 1, 1925, Serial No. 27,139, and in Germany June 23, 1923.

This invention relates to the transfer mechanism of calculating machines, and has for its especial object to provide a simplified and improved mechanism for carrying or transferring tens, hundreds, etc., from one numeral disk to the numeral disk of the next higher denomination, and for permitting the carriage to be shifted laterally in the machine without requiring said carriage to be lifted.

The device of this invention may be substituted in numerous types of known calculators, such as those shown in the U. S. patents to Clement 1,078,662, and Blaustein, 1,369,958, and German patent to Berk, No. 319,630 which are selected not merely to show machines to which my improvement may be applied, but also to illustrate certain known details of construction which it is not thought necessary to describe in the present application.

In the drawings,

Fig. 1 is a longitudinal section of one form of the invention.

Fig. 2 is a transverse section taken on the line 2—2 of Fig. 1.

The machine illustrated has a top plate 43 which carries the usual setting keys 41, 42, the keys in each row being connected by suitable mechanism to a reciprocating bar 46, in such manner that when the key bearing the customary designation "1" is depressed, the bar 46 is moved a certain distance to the left, as viewed in Fig. 1, while the depression of the key designated in the customary manner as "2," causes the bar 46 to be moved twice as far, and so forth. After each operation of addition or subtraction, the detent 45 is automatically moved to allow the keys to resume their normal positions. The foregoing selector mechanism may be of any suitable design, and forms no part of the present invention.

The setting mechanism associated with two adjacent columns of keys will now be described, but it will be understood that a plurality of such mechanisms will be provided, depending on the range of the calculator.

Each bar 46 is provided with a flange 47, which engages an annular groove on the setting gear 39, which is splined to or otherwise slidably mounted on a countershaft 13. A drive shaft 36 is positioned between two adjacent countershafts 13, there being one drive shaft for every two countershafts. The drive shafts are rotated one revolution by a motor (not shown) to accomplish each operation of addition or subtraction, the direction of rotation of the shafts being indicated by arrows in Fig. 2. To each drive shaft is secured, by a pin 31, a segment 33 having offset teeth 14 and 15, as shown in Fig. 1, and in addition, a stepped gear 38, of known design, is also fixed to the drive shaft to mesh with setting gear 39.

A sliding carriage 29 is mounted at the forward end of the machine, and is adapted to move transversely on rail 30 and rollers 26, as is necessary in certain calculating operations. Any suitable known means may be used for moving the carriage and for holding it in the proper relation to the various setting mechanisms. The carriage carries a series of stub shafts 48, 49, each of which has a numeral disk 27, which is viewed through hole 50 in the top of the carriage 29 to give the results of the calculating operations. In place of the disks 27, cylindrical numeral members may be used. The disks 27 are of increasing denomination from right to left, as viewed in Fig. 2; thus; if shaft 48 has the "units" disk, shaft 49 has the "tens" disk, and so on. These stub shafts carry double cams 9, adapted to operate in either direction, and at their lower ends are each provided with a bevel gear 10 adapted to be driven by either of two bevel gears 11 and 12, secured to a sleeve 54 which is slidably mounted on the countershaft 13. The gears 11 and 12 may be shifted, by means of a lever 20, pivoted at 19, and shifting plate 52, so that either gear engages with gear 10, or they may remain in the neutral position shown in Fig. 1, wherein there is no engagement between the gears. The mechanism for shifting the gears is essentially the same as that described in U. S. Patent 1,078,662, previously referred to. When gears 10 and 11 are engaged, the machine is set for addition or multiplication, and when gears 10 and 12 are engaged, the machine is set for subtraction or division. When the gears are in neutral position, the carriage 29, with its attached parts, may be shifted to the

right or left without lifting and without contacting with any other part of the mechanism.

A transfer lever 8 is pivoted in a groove 44 between each pair of adjacent stub shafts 48, 49, and is held in position by a stud 35, projecting from a bar 17 extending transversely throughout the counting mechanism, said stud passing through a rectangular slot in the lever 8. A screw 18 is threaded in the bar 17 and projects through a second aperture in lever 8, a coiled spring 21 encircling the screw 18 between bar 17 and lever 8, and yieldingly urging the lever toward cam 9; the screws 18, in addition to their other functions, serve also as set screws for adjusting the position of the projections 7 relatively to the cam 9. The lever 8 has a stud 7 adapted to cooperate with cam 9 of one stub shaft, and a finger 16, adapted to contact with the shifting mechanism of the next higher denomination, as will be described.

Sleeve 51, on countershaft 13, carries a transfer gear 25, the hub of which is formed with a circumferential groove 40 for the accommodation of a member 5, fixed upon and projecting from a shift lever 4 pivoted at 37. A pawl 22, journaled in a block 23, is pressed upwardly by a compression spring 24, and in its upper edge has two notches to receive a detent 28, secured to lever 4, to releasably hold the lever in either of two positions. A double cam surface 34 on the lever 4 is adapted to engage a projection 32 on segment 33.

The adjacent countershaft 13 has a transfer gear 3, similar in every way to transfer gear 25, except that its collar 51 is longer, thereby normally offsetting gears 3 and 25 longitudinally by an interval equal to the longitudinal distance between teeth 14 and 15.

The operation is as follows:

Suppose the range of the machine to be 99,999, and that this figure is displayed by the numeral disks, and it is desired to add one to the figure mentioned. The machine is set for addition, and key "1" of the units row is depressed, bringing its setting gear 39 into engagement with the longest cog 53 of gear 38. All the shafts 36 are thereupon caused to make one counterclockwise revolution as viewed in Fig. 2, the cog 53 turning gear 39 and the "units" shaft 13 through one-tenth revolution. Gears 10 and 11 being in mesh in all the denominations, the "units" disk 27 is turned from "9" to "0", and the cam 9 moves the lever 8 to cause the transfer gear 25 to aline with the tooth 14, which thereupon rotates gear 25 one-tenth revolution. This causes the next higher lever 8 to shift its corresponding transfer gear 25, and so on until each disk 27 reads "zero."

It will be seen that the arrangement of the various teeth and gears is such that tooth 15 will first come into juxtaposition with gear 3, then tooth 14 with gear 25, then tooth 15 of the next higher order will come into juxtaposition with the next gear 3, and so on. Each drum 38 and each segment 33 lags behind the corresponding drum or segment on its right in order to allow the carrying operation to progress from the right to the left.

Segment 33, upon continued rotation, reaches a position adjacent lever 4, whereupon the projection 32 engages the cam surface 34, moving the lever 4 and gear 25 to the left to prevent further rotation of shaft 13.

Detent 45 is then actuated, by means not shown, to release the keys and allow the bar 46 to move rearwardly, thereby shifting the setting gear 39 out of further engagement with the stepped gear 38.

The registering mechanism being cleared, suppose it is now desired to subtract one. Gears 12 are shifted to mesh with gears 10, and key "1" of the "units" column is depressed as before. The resulting operation is the same as that just described, except that each stub shaft rotates in the opposite direction, with the result that each numeral "0" is changed to "9." In both addition and subtraction, the change is necessarily progressive from right to left, rather than simultaneous.

I claim:

1. In transfer mechanism for a calculating machine of the type embodying a shiftable intermediate gear, a shift lever connected to said gear for shifting the same, and a carriage; a transfer lever adapted to engage and actuate said shift lever, said transfer lever having a rounded edge seated in a groove in said carriage, and being provided with an aperature, and a stud fixed to said carriage and passing through said aperature to hold said edge in said groove to permit the edge to pivot in said groove.

2. In transfer mechanism for a calculating machine of the type embodying a shiftable intermediate gear, a shift lever connected to said gear for shifting the same, and a carriage; a transfer lever adapted to engage and actuate said shift lever, said transfer lever having a rounded edge seated in a groove in said carriage, and being provided with two apertures, a stud fixed to said carriage and passing through one of said apertures to hold said edge in said groove to permit the edge to pivot in said groove, a pin secured to said carriage and passing through a second aperture in said transfer lever and a coiled spring encircling said pin and yieldingly urging said transfer lever out of engagement with said shift lever.

In testimony whereof I have affixed my signature.

RICHARD BERK.