June 12, 1945. B. D. SPRABERRY 2,377,977

CALCULATOR

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Fig. 1.

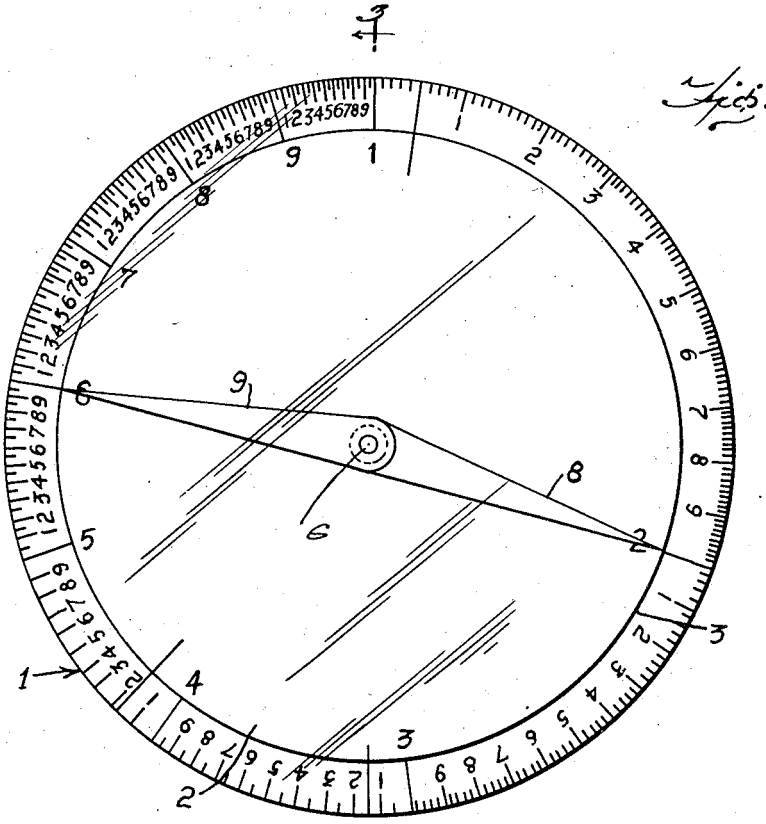

Fig. 4.

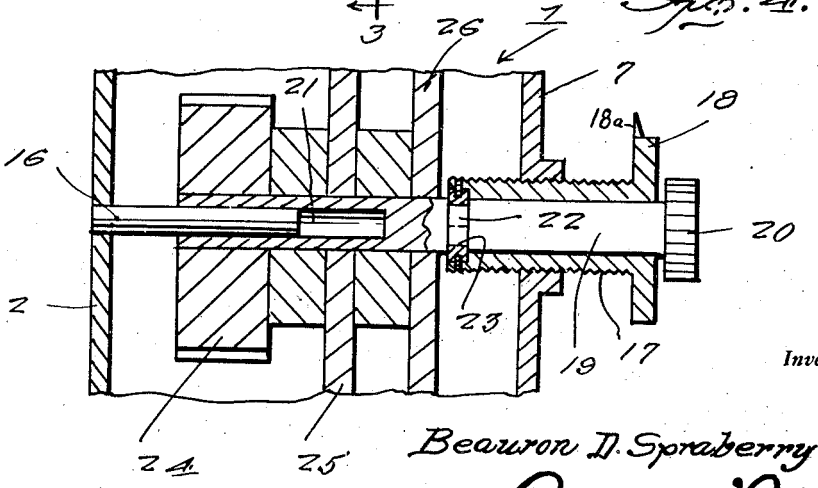

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Fig. 2.

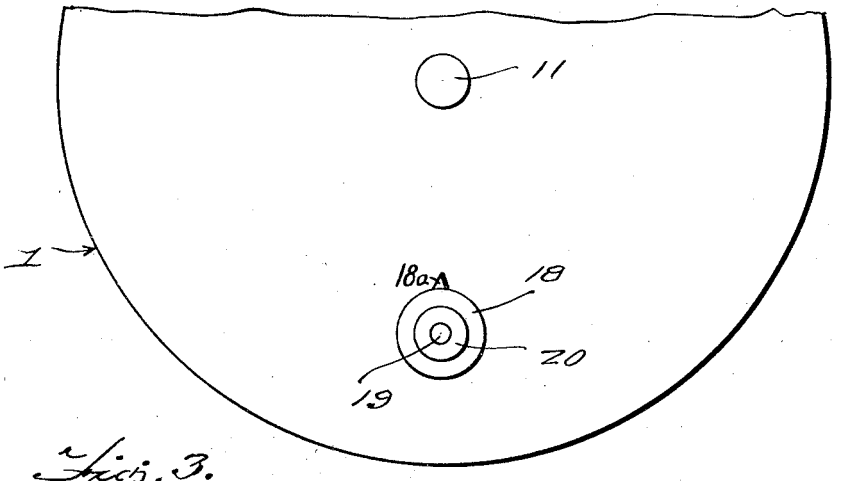


Fig. 3.

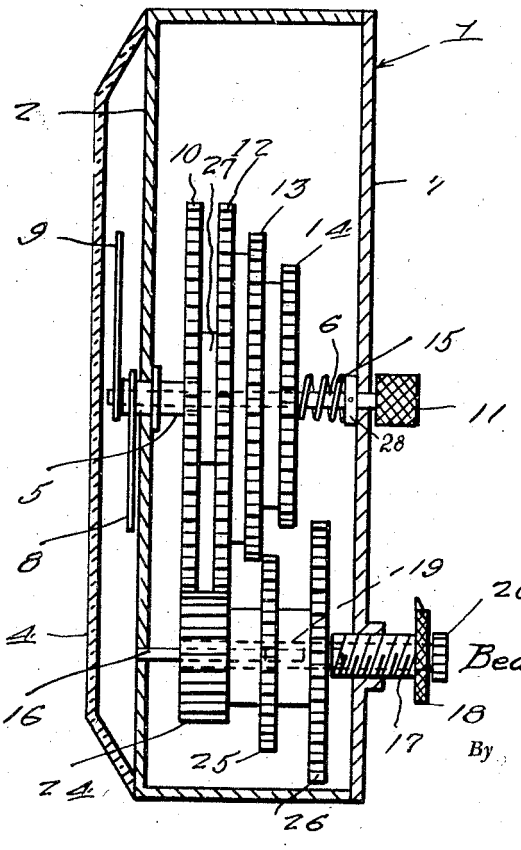
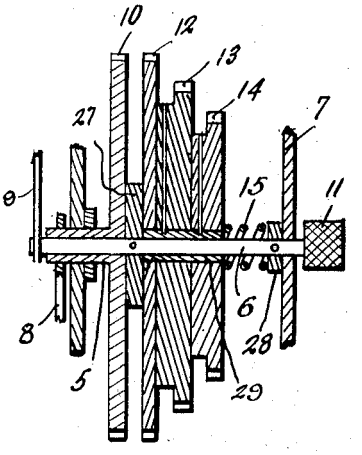


Fig. 5.



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UNITED STATES PATENT OFFICE

2,377,977

CALCULATOR

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Application July 30, 1943, Serial No. 496,749

2 Claims. (Cl. 235—77)

The present invention relates to new and useful improvements in mechanical calculators, and has for its primary object to provide, in a manner as hereinafter set forth, a device of this character comprising novel means, whereby various mathematical problems, such as division, multiplication, squaring, et cetera, may be expeditiously and accurately worked.

Other objects of the invention are to provide a mechanical calculator of the aforementioned character which will be comparatively simple in construction, strong, durable, highly efficient and reliable in use, compact, and which may be manufactured at low cost.

All of the foregoing, and still further objects and advantages of the invention will become apparent from a study of the following specification, taken in connection with the accompanying drawings wherein like characters of reference designate corresponding parts throughout the several views, and wherein:

Figure 1 is a view in front elevation of a calculator constructed in accordance with the present invention.

Figure 2 is a fragmentary view in rear elevation of the device.

Figure 3 is a vertical sectional view, taken substantially on the line 3—3 of Figure 1.

Figure 4 is a fragmentary view in section through the lower portion of the mechanism.

Figure 5 is a view in vertical section through the upper, or driven, gear assembly.

Referring now to the drawings in detail, it will be seen that the embodiment of the invention which has been illustrated comprises a circular case 1 which may be of any suitable dimensions and material. The front of the case 1 constitutes a dial 2 comprising a logarithm scale 3 for which a protective crystal 4 is provided.

Journaled in the dial 2 of the case 1 is a short tubular shaft 5. A comparatively long inner shaft 6 is journaled in the tubular shaft 5, said shafts extending through the front and the shaft 6 also extending through the rear 7 of the case 1. Pointers or hands 8 and 9 are fixed on the forward end portions of the shafts 5 and 6, respectively. Fixed on the inner end portion of the tubular shaft 5 is a gear 10. An operating knob 11 is fixed on the rear end portion of the shaft 6 in back of the case 1.

Collars 27 and 28 are fixed on the shaft 6. A sleeve 29 is slidably and rotatably mounted on the shaft 6. Fixed on the sleeve 29 are spaced gears 12, 13 and 14. It will be observed that the gears 10 and 12 are of the same diameter. A coil spring 15 encircles the shaft 6 and has one end engaged with the collar 28 and its other end engaged with the gear 14 for pressing the gear 12 against the collar 27. Thus, the gears 12, 13 and 14 are frictionally connected to the shaft 6 for actuating said shaft.

Mounted horizontally in the lower portion of the case 1 is a spindle 16 which projects rearwardly from the dial 2. A sleeve 17 is threadedly mounted for adjustment in the back 7 of the case 1 in alignment with the spindle 16. The sleeve 17 of the case 1 is provided with an operating head 18 on its outer end. Head 18 has a pointer 18a to show what gears are in mesh with each other.

Journaled in the sleeve 17 is a shaft 19 having an operating head 20 on its rear end. The forward end portion of the shaft 19 has formed therein a longitudinal socket 21 which receives the spindle 16 for rotatably mounting said shaft thereon. The shaft 19 is further provided, at an intermediate point, with a circumferential groove 22. The groove 22 rotatably accommodates a ring 23 in the inner end portion of the sleeve 17 for connecting the shaft 19 thereto for longitudinal actuation thereby.

Fixed on the shaft 19 are spaced gears 24, 25 and 26. The gear 24, it will be observed, is comparatively wide and is engageable with either or both of the gears 10 and 12. The gear 25 is engageable with gear 13, and gear 26 is engageable with the gear 14.

It is thought that the operation of the device will be readily apparent from a consideration of the following lines. Briefly, the sleeve 17 is adjusted to shift the shaft 19 longitudinally for engaging the gears of the desired ratios according to the calculation to be made, such as multiplication or squaring. For example, for squaring, the gear 25 is engaged with the gear 13 and the gear 24 drives the gear 10 only. For dividing or multiplying, the comparatively wide gear 24 is engaged with the gears 10 and 12, as seen in Figure 3 of the drawings. When this last adjustment is made, the gears 25 and 26 are out of engagement with the respective gears 13 and 14. When it is desired to adjust or set the pointer 9 only, the gear 24 is moved rearwardly out of engagement with the gear 10. The shaft 19 is held stationary through the medium of the knob 20 for retaining the gears 12, 13 and 14 against rotation. The shaft 6 is then turned through the medium of the knob 11 for adjusting the pointer 9 relative to the gears 12, 13 and 14.

As shown, the gearing is set for using the

device to multiply or divide. For example, to multiply 26 by 32, pointer 8 is set on the large or main numeral 1 of the dial and pointer 9 is set on 26 of the dial or on the small 6 between main numerals 2 and 3. Knob 11 is then turned until pointer 8 is on 32 or on the small 2 between main numerals 3 and 4. Due to the fact that gears 25 and 26 are disengaged from gears 13 and 14 and gear 24 is engaged with both of gears 10 and 12, the pointers will turn at the same speed and pointer 9 will stop on 832, which is the answer. The answer 832 is .2 of the way between the small 3 and 4 located between main numerals 8 and 9. In dividing, this operation is reversed.

For squaring, pointers 8 and 9 are both set on main numerals 1, and sleeve 17 is turned to the right of Figure 2 one-quarter of a turn so as to mesh gear 25 with gear 13 and disengage gear 24 from gear 12 while leaving gear 24 in mesh with gear 10 and gear 26 out of mesh with gear 14. If the square of 6 is wanted, knob 11 is turned to set pointer 8 on main numeral 6. This causes pointer 9 to make a complete revolution and then back to 36 or to the small 6 between main numerals 3 and 4. This results because the ratio of gears 13 and 25 is 3 to 2, the ratio of gears 25 and 24 is 2 to 1, and the ratio of gears 10 and 24 is 3 to 1. The square root is found in the same manner as squaring, except that pointer 9 is turned to main numeral 6 and the answer is read at pointer 8.

In cubing, sleeve 17 is given a quarter turn further so as to disengage gear 25 from gear 13, and engage gear 26 with gear 14, while allowing gear 24 to remain out of mesh with gear 12 and in mesh with gear 10. The ratio of gears 14 and 26 is 1 to 1 and that of gears 26 and 24 is 3 to 1. This operation is the same as in squaring, except that pointer 9 will go three times as far as to main numeral 6 or two complete revolutions and back to 216, the answer. This is .6 of the way between small 1 and 2 located between the main numerals 2 and 3. Cube root is obtained by the same operation as in cubing, except that the answer is read at pointer 8 when pointer 9 is stopped on main numeral 6.

It is believed that the many advantages of a calculator constructed in accordance with the present invention will be readily understood, and although a preferred embodiment of the device is as illustrated and described, it is to be understood that changes in the details of construction and in the combination and arrangement of parts may be resorted to which will fall within the scope of the invention as claimed.

What is claimed is:

1. A logarithmic calculator comprising a casing having a circular dial on the front thereof embodying a logarithmic scale, a hollow shaft extending through and journaled in the front of the casing centrally of the dial, a pointer on the outer end of said shaft, a gear on the inner end of said shaft, a second shaft extending through the casing and the hollow shaft and rotatable in the latter, a second pointer on the front end of the second shaft, one of said pointers being movable without moving the other pointer, said pointers having their outer ends movable on the scale, manually operable means to rotate said second shaft, and a manually operable change speed gearing, between said first-named shaft and said second-shaft, selectively conditionable to cause said pointers to move the same distance or to cause the second pointer to move either twice or three times as far as the first pointer when said second shaft is rotated.

2. A logarithmic calculator comprising a casing having a circular dial on the front thereof embodying a logarithmic scale, a hollow shaft extending through and journaled in the front of the casing centrally of the dial, a pointer on the outer end of said shaft, a gear on the inner end of said shaft, a second shaft extending through the casing and the hollow shaft and rotatable in the latter, a second pointer on the front end of the second-named shaft, one of said pointers being movable without moving the other pointer, said pointers having their outer ends movable along the scale, an operating knob on the rear end of said second-shaft, three gears of different predetermined diameters on the second shaft within the casing, friction driving connections between the second shaft and said three gears, the largest one of said three gears being of the same diameter as the gear on the hollow shaft, a third shaft parallel with the second shaft and rotatable and longitudinally slidable in the casing, three gears of predetermined different diameters secured on the third shaft, the smallest one of the last-named gears being wide enough to simultaneously mesh with the gear on the hollow shaft and that of similar diameter on the second shaft, and manually operable means to slide said third shaft longitudinally to selectively mesh the gears and cause the pointers to turn the same distance or cause the pointer of the second shaft to turn either twice or three times as far as the other pointer when said knob is rotated.

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