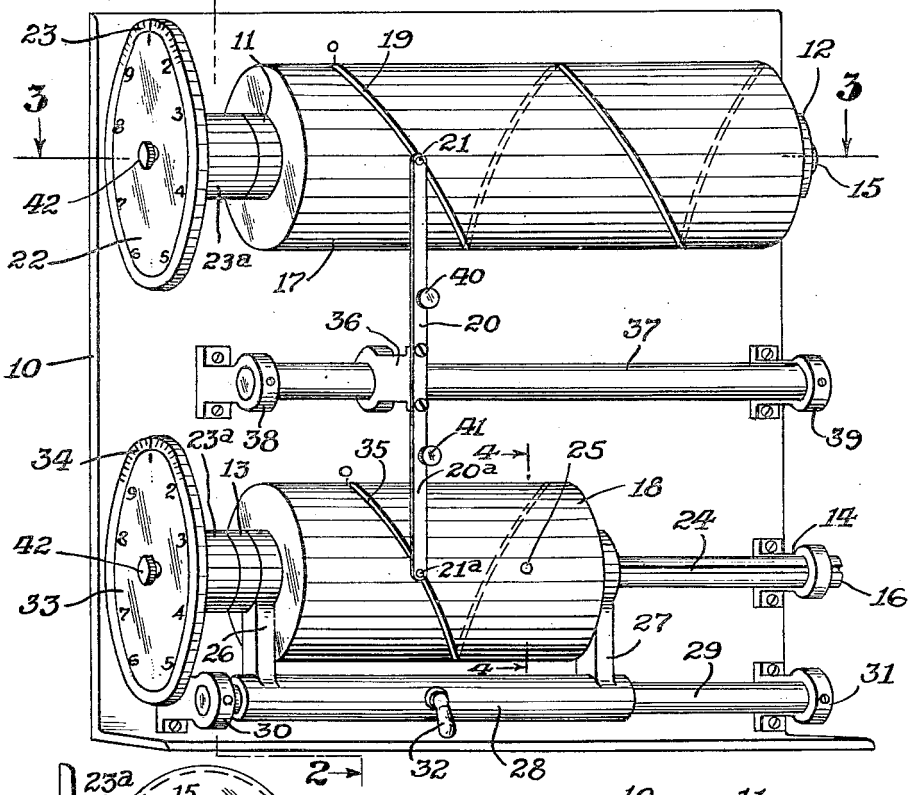
Aug. 7, 1945. J. FRIEDLANDER 2,381,660

CALCULATING MACHINE

Filed Oct. 30, 1941

Fig. 1.



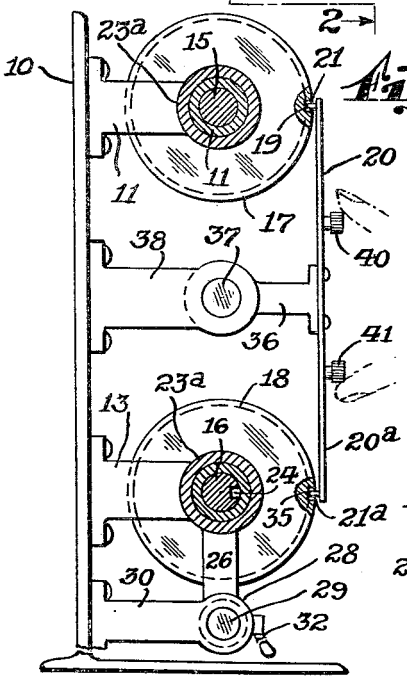


Fig. 2.

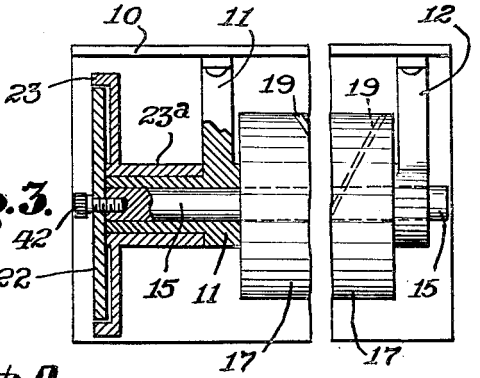


Fig. 3.

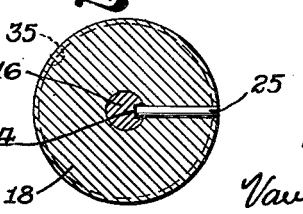


Fig. 4.

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CALCULATING MACHINE

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1 Claim. (Cl. 235—61)

This invention relates to calculating machines and has for its object the provision of a simple machine of few parts that can be used for mathematical calculations of the kind usually performed using slide rules and other scales requiring special knowledge and training for their correct use.

Another object is to provide a machine of the class described wherein the scale drums carry means for solving mathematical problems by logarithmic proportions, indicating the desired solution on a dial or dials which may be provided with verniers for close reading.

Other objects and advantages of the invention will be apparent from the following specification and drawing wherein, by way of illustration, a preferred embodiment of the invention is disclosed. It will be understood that many modifications can be made from this specific embodiment once the inventive concept is understood, without, however, departing from the scope of the appended claim.

In the accompanying drawing:

Figure 1 is a perspective view of a machine embodying the invention.

Figure 2 is a view partly in section on the line 2—2, Figure 1.

Figure 3 is a sectional view through one of the dials approximately on the line 3—3, Figure 1.

Figure 4 is a sectional view on the line 4—4, Figure 1.

A suitable framework on base 10 supports all of the other parts and upon this are mounted in any manner or formed integral therewith, the supports 11, 12, 13, 14, for the shafts 15, 16, supporting cylinders 17, 18.

Cylinder 17 is secured to shaft 15 and rotates with it in fixed position between bearing supports 11, 12. This cylinder has formed within or upon its outer surface a means such as the groove 19 which is laid out in the form of a simple logarithmic curve to control the transverse movements of arm 20, which, in the embodiment here shown has a pin 21, which rides in groove 19.

A dial 22 is rigidly secured to shaft 15 so as to turn therewith and is provided with an annular vernier dial 23 which is frictionally supported on the bearing 11 as shown at 23a, Figure 3, so that it remains stationary as 22 moves, yet can be adjusted about 22 as desired to take any desired vernier reading at any point thereon.

The cylinder 18 is slidably mounted on shaft 16 which has a spline or groove 24 therein engaged by a pin 25 in the cylinder, so that the cylinder, while free to slide along the shaft, cannot rotate thereon but can turn therewith.

The cylinder 18 is positioned between the arms 26, 27, of a sliding yoke 28 mounted to slide freely on a shaft 29, mounted in supports 30, 31. A clamp screw 32 in the yoke enables it to be clamped in any desired position on shaft 29.

A dial 33 is secured to the outer end of shaft 16 and rotates therewith. A vernier dial 34 is mounted adjacent dial 33. The arrangement of both dials and verniers on cylinders 17 and 18 is the same except, if desired, the graduations or markings on the dials may differ and be of any desired character.

The arm 20 extends downwards as shown at 20a and the lower pin 21a in same engages a groove 35, similar to or complementary to groove 19 in the cylinder 17. The arm 20 is supported on a slide 36 freely movable along the shaft 37 held in the supports 38, 39. The arm 20, 20a forms a connector between the cylinders 17 and 18 whereby one cylinder is moved by moving the other.

The machine having been assembled as just described, and assuming that the grooves 19, 35, are simple logarithmic curves, and that the numbers on dials 22, 33, are spaced 40 degrees apart and correspond so that any number on a dial will represent that 17 (or 18) has moved to a position which corresponds to that number from origin of curve 0, parallel to the axis of the cylinder—then the machine may be operated as follows:

To multiply ($3\times2=6$): Place dials with their numeral 1 on the beginning of their vernier scales as a reference or starting point: turn dial 22 to 3, which will move arm 20 over a logarithmic distance 3 via groove 19. Arm 20a will have moved cylinder 18 a similar distance along shaft 24, but dial 33 will remain at 1 and 20a will remain at beginning of groove 35. Lock cylinder 18 in position on shaft 16 by tightening clamp 32 on shaft 29.

Rotate dial 33 to 2. This rotates cylinder 18 as it can no longer slide along shaft 16, being held by yoke 28 on shaft 29. Cylinder 18 therefore will move the logarithmic distance equal to 2. This moves arm 20a—20 and thereby rotates cylinder 17 until the number 6 is at the vernier starting point on dial 22, thus obtaining the desired answer in three simple mechanical operations.

To divide ($6\div3=2$): Set dial 22 on number 6. Set dial 33 on number 3. Since arm 20a is held fixed because of the position of cylinder 17 and

arm 20, cylinder 18 is caused to rotate and slide and 20a will now be at logarithmic distance equal to 3 from origin of curve. Lock cylinder 18 by clamp 32 so that cylinder cannot slide but only rotate. Turn dial 33 back to number one (1), which movement will rotate drum 18 and move arm 20, 20a to the left, Figure 1. This movement of the arm will rotate drum 17 and dial 22 to number two (2), which is the desired answer.

In performing the foregoing it will be observed that the logarithmic distance of 3 has been subtracted from the logarithmic distance of 6 leaving logarithmic distance of 2.

Those skilled in the art will readily perceive how, by various modifications of scales and dial markings, the machine can be used for a large number of various calculations using any desired values and any desired configuration of the grooves 19—35. The curves can be repeated around the cylinders and the dials can be made of any desired diameter to obtain wide spacing and ease of vernier readings and micrometer verniers can be used if desired.

For square or cube root the curves 19 and 35 could be modified. Curve 35 would be one-half or one-third the axial length of curve 19. Then when pin 21 on arm 20 is at the position 2 on drum 17, the pin 21a will be at position 8 on drum 18 if a cube root curve is being used.

To facilitate the manipulation of the machine, the arms 20, 20a can be made flexible and provided with the knobs 40, 41, whereby they can be squeezed together by the fingers to lift the pins 21, 21a, out of the grooves so that the cylinders can be independently moved. Knobs 42 can be attached to the dials as shown to rotate them and their associated cylinders.

It will be understood that, when the word "cylinder" is used throughout this specification and in the claim, any rotatable member is meant thereby. For example, instead of the cylinders 17 and 18, cones could be used or flat discs. Such modifications are obvious and require but slight changes in the shape of the parts and none in the inventive concept herein disclosed.

What is claimed is:

In a calculating machine, a base, a rotatable cylinder, a second rotatable cylinder, shafts supporting said cylinders on said base, said second cylinder being bodily shiftable along its supporting shaft, means providing a shiftable mounting for said second cylinder on its shaft comprising means for preventing movement of said cylinder therealong, means for transmitting bodily movement to the second cylinder upon rotation of the first cylinder when said preventing means is ineffective, and for transmitting rotary movement to the first cylinder upon rotation of the second cylinder when said preventing means is effective, and separate indicating means including a dial connected to each cylinder and rotatable therewith whereby the relative positions of said cylinders may be visually determined.

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