

N^o. 5528



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COMPLETE SPECIFICATION.

An Improved Calculator.

I, WILLIAM HENRY FOWLER, 53 New Bailey Street, Manchester, Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

5 Circular or watch forms of slide rule suitable for carrying in the waistcoat pocket and with which arithmetical calculations are effected by the rotation of pointers and graduated discs, have been in use for many years, but the gearing and other arrangements for operating such instruments have been complicated, expensive to construct and liable to be easily deranged and inaccurate in their
10 readings. For example it is difficult to maintain the fixed and rotating pointers which are usually adopted in these instruments, rigid, when held at one end only and at the same time keep the pointers fine, so as to secure accurate readings on a finely graduated disc. The difficulty of securing accurate reading is further increased owing to the necessity of allowing considerable space between
15 the pointers to avoid fouling when they pass each other.

In the gearing which has been used in some forms of circular slide rule to secure the independent rotation of a graduated disc and of a pointer passing over it, trouble has been experienced in consequence of the movement of one of the gears affecting the movement of the other.

20 This invention relates to certain improvements whereby the construction of such instruments is simplified, the risk of derangement or fouling of the gearing or pointers reduced and greater accuracy of calculation secured.

This is accomplished by rotating a disc by means of a small crown wheel or pinion and a toothed wheel secured to the disc and by effecting the rotation
25 of a radial pointer directly by means of a shaft and milled knob placed at right angles to the shaft operating the crown wheel or pinion so that there is no possibility of the movement of one shaft affecting the movement of the other. Further in order to bring the rotating radial pointer and fixed radial pointer as close to the graduated disc as possible the fixed radial pointer is secured at
30 each end and held taut. This enables it to be brought very close to the graduated disc and thus enables the rotating radial pointer to be also brought closer to the said disc. To secure the radial shaft operating the disc through the medium of the crown pinion a spring bow with projections is employed, these projections bearing against a collar on the said shaft and so holding it securely
35 in position.

The general construction and arrangement of an instrument embodying the improvements is shown in Figures 1 and 2, Figure 1 being a front view partly in section and Figure 2 a sectional side view. The instrument consists of a
40 circular case A having a cross bar B carrying a central boss C on which runs a flat toothed wheel D carrying a circular dial E of cardboard or metal having one or more graduated scales on its face. The wheel and dial are united by rivets, cement or other means and are rotated by a small crown wheel or pinion F mounted on a shaft I one end of which runs in a bearing in the boss C while the other end is fitted with a milled head H which fits the end of the neck K.
45 By turning the milled head H the pinion, wheel and dial are rotated.

[Price 8d.]



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The shaft I is held in position axially by a projection on one or both ends of the swivel bow J, the said projections bearing against a collar G on the shaft I.

The pressure between the teeth of the pinion and the wheel is regulated by a spiral spring L threaded on the shaft I and bearing against the back of the pinion F. 5

To hold the dial and wheel in position a washer X is mounted on a circular shoulder formed on the central boss, the washer being joined to the boss by screws, pins or other suitable means. To the edge of this washer is attached one end of a fine filament W which is stretched in a truly radial direction across the face of the dial and attached at the other end to the circular case. This filament which acts as a finger to read the graduated scales is arranged to lie very close to the face of the dial to avoid parallax and enable very accurate readings to be taken either on each scale individually or relatively between one scale and another in a radial direction. The filament W can be attached to the central washer and circular case in one of several ways. In the example shown the attachment to the washer is made by making a hole Y through the washer X near the edge and then making a fine hole Z through the plane of the washer to communicate with the hole Y. Through the hole Z the filament W is threaded and secured by a knot or other convenient means, see Figure 3. 10 15 20

Another alternative method of attachment would be to form a radial groove in the face of the washer next the dial and secure the filament in this groove in some convenient way.

The attachment of the filament to the circular case may be made and regulated as regards the closeness of the filament to the dial by forming a groove in the rim of the case to a determined depth and securing the filament at the bottom of this groove in any convenient way. 25

Upon a ledge round the circumference of the dial formed inside the circular case, the said ledge being slightly thicker than the dial, a split ring P is placed of such a breadth that it slightly overlaps the edge of the graduated dial E. This secures to the dial perfect freedom of movement and at the same time prevents the edge of the dial from coming into contact with the filament W. 30

Another circular ledge is formed inside the case for the reception of the circular glass or other transparent face Q of the instrument. As usually constructed the faces of such instruments are fixed in separate circular bezels which are sprung onto the circular case. In this invention separate bezels are dispensed with. Both faces of the instrument are held in position by spinning the metal edge of the case over the bevelled edge of the transparent face after the face has been placed in the circular recess formed in the case. 35

Through the centre of the boss C a hole is formed in which runs a shaft M. This shaft carries at one end the radial pointer N and at the other end a washer O to which a second graduated dial R is secured. This shaft M is operated by turning the milled knob S which is fixed on to the end of the shaft M. The rotation of the knob S causes the pointer N and the dial R to rotate simultaneously and a radial line on the face T enables the scales on the dial R to be read independently or relatively to each other in a radial direction. The shaft M is secured in an axial direction by a collar U at one end and a spring V which bears against the back of the boss C and the washer O at the other end. This enables a definite amount of friction to be imposed on the rotation of the shaft and so holds the pointer N and dial R in any position to which they may be turned. 40 45 50

It will be evident from the aforesaid description that the movements of the shaft I which operates dial E and the movement of the shaft M which operates the dial R and the pointer N are absolutely independent of each other and that there is no risk of any movement of one shaft affecting the movement of the other. Further it is possible to bring the stretched filament W closer to the dial than it would be to bring a finger attached at one end only. The pointer N 55

Fowler's Improved Calculator.

can also be brought closer to the filament W and the graduated dial E without risk of fouling and in this way derangement and errors of reading arising from parallax are reduced.

Having now particularly described and ascertained the nature of my said
5 invention, and in what manner the same is to be performed, I declare that
what I claim is:—

1. A circular calculator comprising a stretched radial filament to serve the purpose of a fixed pointer for reading the graduated scales as shown and described in the accompanying drawings and specification.
- 10 2. A circular calculator comprising two shafts and gearing as in the accompanying specification and drawings whereby absolute independence of movement is secured to the two shafts, and the rotating pieces connected to them, in the manner shown in the accompanying drawings for the purpose specified.
- 15 3. A circular calculator comprising swivel bow, the ends of which have projections upon them which act as stops to prevent axial movement of a shaft as described in the accompanying specification and drawings.

Dated the Fourth day of March, 1910.

WILLIAM HENRY FOWLER.

[This Drawing is a reproduction of the Original on a reduced scale.]

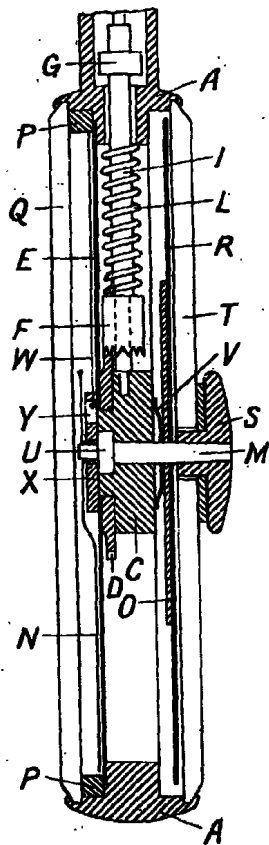


FIG. 2.

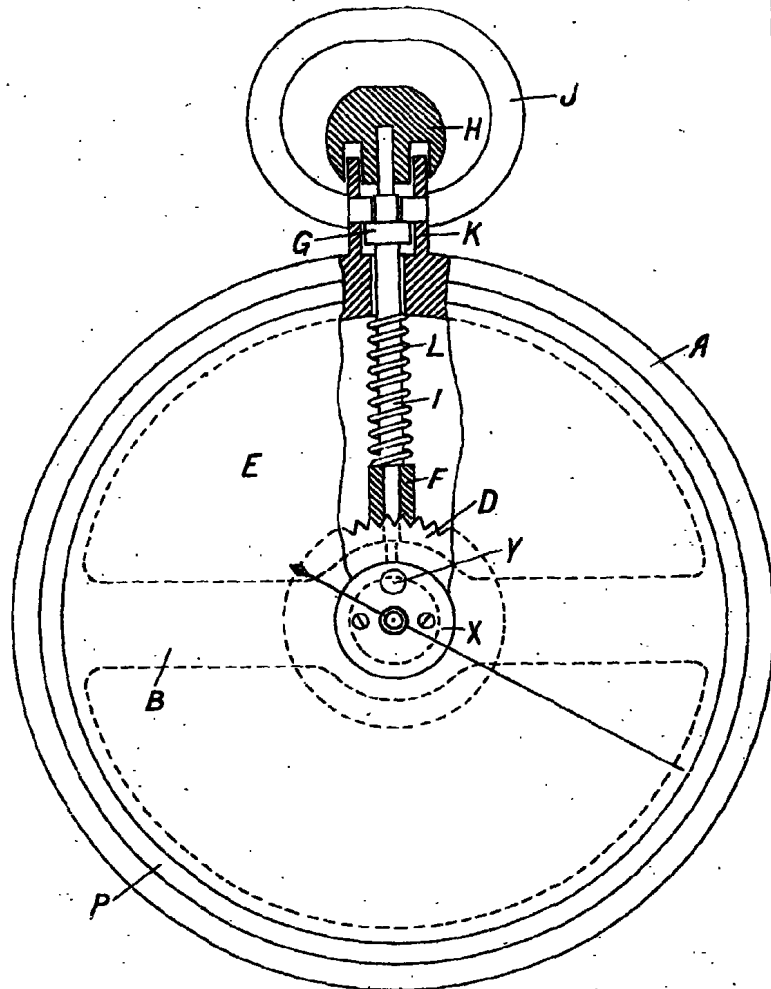


FIG. 1.

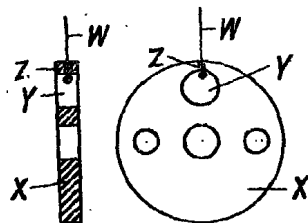


FIG. 3.

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