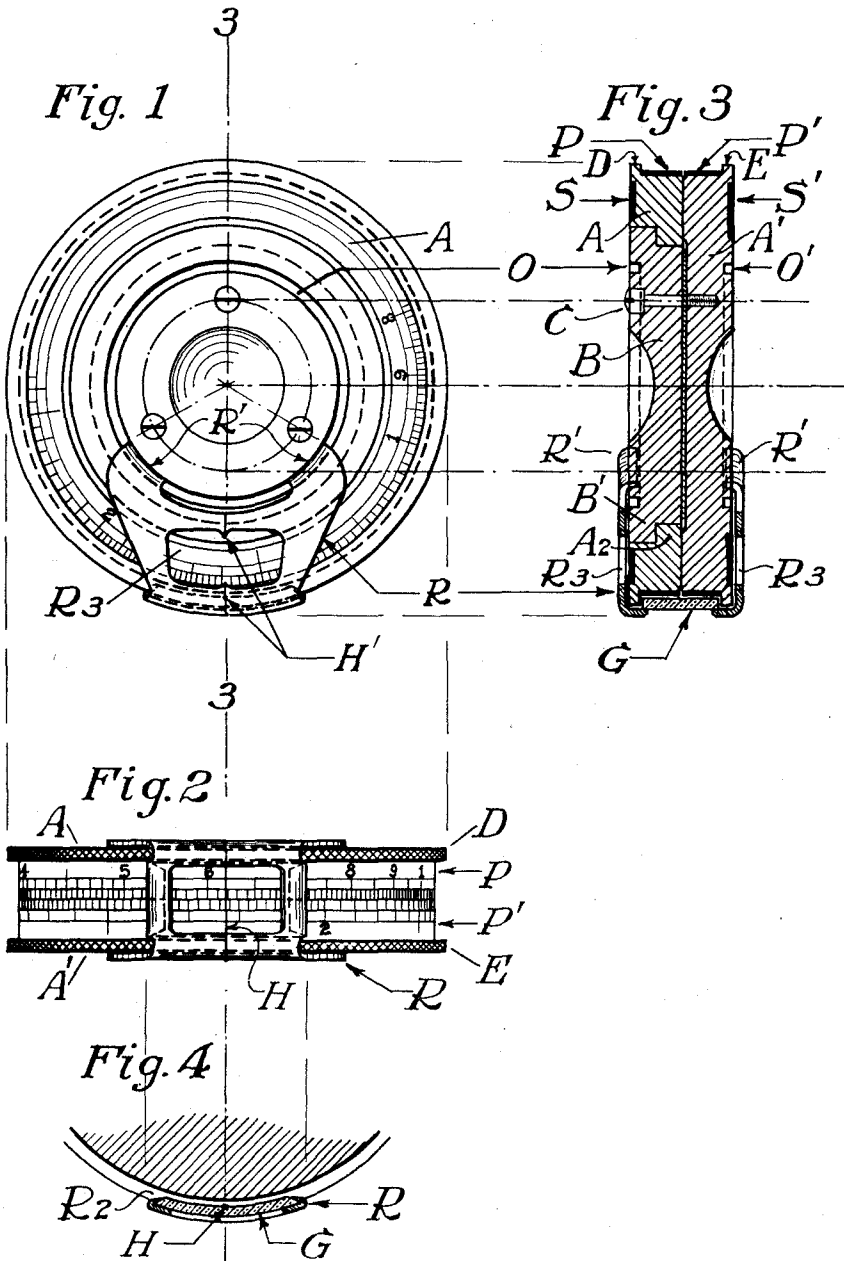


1,255,939.

Patented Feb. 12, 1918



Witnesses
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UNITED STATES PATENT OFFICE.

GILBERT SMALL, OF WALTHAM, MASSACHUSETTS.

POCKET-CALCULATOR.

1,255,939.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, GILBERT SMALL, a citizen of the United States, and resident of Waltham, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Pocket-Calculators, of which the following is a specification.

This invention relates to calculators in the nature of cylindrical or circular slide rules in which there are complementary scales mounted upon the peripheral or outer cylindrical surfaces of two circular or cylindrical bodies which are connected together with capability of relative rotary movement about their common axis. The objects of my invention are: first, to provide a runner or index associated with such members so as to be constrained to move about the common axis thereof in proximity to the cylindrical scales thereon, to be used as an index in connection with such scales; second, to provide in connection with a calculator of the character indicated, one or more additional computing scales on one or both of the end faces of the calculator, such scales being provided with radial graduations; third, to construct the runner or index member with a pointer or pointers or other index marks arranged in proximity to such additional scale or scales and having a definite relation with each other and with the index which cooperates with the cylindrical scales to the end that the additional or end face scales may be used in conjunction with the cylindrical or peripheral face scales; and fourth, to make the runner or index member of such shape and construction that it embraces the ends of the calculator and is so shaped and guided in respect to its motion, that it shall not interfere with the thumb and fingers of the user when holding and operating the calculator.

The foregoing and other objects are carried into effect by the device illustrated in the accompanying drawings and described in detail in the following specification, which device embodies that form of my invention which at the present time I prefer to other possible forms.

In the drawings,

Figure 1 is a plan view of the cylindrical calculator with the runner or index member attached.

Fig. 2 is a front elevation of the same as viewed from the under side of Fig. 1.

Fig. 3 is a cross section on the center line 3-3 of Fig. 1.

Fig. 4 is a detail section on a plane perpendicular to the axis through the runner and a part of the calculator.

The same reference characters indicate the same or similar parts in all the figures.

Referring to the drawings A and A' represent the relatively movable elements or members of the calculator, the member A' being a disk and the member A an annulus which is connected to the member A' by a coupling disk B. The latter is connected to the disk A' by any convenient means such as screws or the like C and has a peripheral flange B' overlapping a lip A² of the member A, thereby providing a bearing on which the member A may turn and a lock to hold the member A close to the member A' and provide sufficient friction so that such members will not turn too freely relatively to one another. Preferably the members A and A' are provided with knurled ribs or lips D and E, respectively, to assist in manipulation.

On the peripheries, that is, the adjacent cylindrical external faces or surfaces of the members A and A' are scales P and P', respectively, such surfaces and scales being of the same diameter so that the adjacent edges of the scales meet and their graduations may be set in registry. Said scales are graduated in any desired values, conveniently in some such manner as the well known slide rules commonly used.

As thus far described, my calculator is not essentially different from others which have already been produced, specifically that shown in the patent to Roger W. Conant, No. 657,915 dated September 18, 1900, and I make no claim to any of the features hereinbefore described.

The first feature of my invention relates to a rider or runner R, which is mounted upon the calculator so as to cross the peripheral or cylindrical face thereof and travel near the scales P and P' about the axis of the calculator, which is the same axis about which the members A and A' relatively rotate. This rider or runner also embrace the ends or end faces of the calculator as shown, and is provided with arms, on the ends of which are inwardly turned flanges R' which enter grooves O and O', concentric with the axis of the calculator, in the hub or bearing disk B and the member A', respectively. The design of my calculator has been

changed from that of the calculator shown in the patent above noted by making the central hub or bearing disk B sufficiently large to provide room for the groove O and to
 5 have such groove located so far from the axis of the calculator that the runner may rotate freely without interfering with the thumb or fingers of the user, when grasping the calculator near the axis.

10 The portion of the rider or runner which extends across the scales P and P' is provided with an index H which may be made of any practicable character, but is preferably a scratch or line on the inner face of a
 15 transparent window or pane G carried by the rider. In the construction illustrated that part of the rider which crosses the periphery of the calculator has an opening, and a piece of transparent material, such as
 20 celluloid or glass, is placed across that opening and is secured by lugs R² formed on the rider and bent over the ends of the transparent piece G, as shown best in Fig. 4. Preferably the transparent piece is placed
 25 between the rider and the scales, and the index mark is applied to the face of the transparent piece nearest to the scales, so as to be close to the scales and avoid errors due to parallax when reading the scale with respect
 30 to the index. This index mark is also parallel to the axis of the calculator.

On the side or end face of the member A is a scale S and on the face of the member A', which is the opposite end face of the
 35 calculator, is a scale S' these scales being provided with radial graduations representing any selected mathematical values, one of them being partially shown in Fig. 1. Those parts of the rider which extend over scales S
 40 and S' are provided with openings R³ through which the scales may be observed, and at the edges of these openings are pointers or index elements H'. In the embodiment of the invention shown I have made
 45 these index elements as pointed projections, but I do not intend to limit the invention to index elements of this particular character, as I contemplate forming index elements for cooperating with the scales S and S' in the
 50 same manner that the index mark H is made, that is, as a scratch or line on a transparent piece overlying the opening R³. The graduations of the scales S, S', P and P' bear a definite relation to one another, and so do
 55 the index elements H and H' of the rider, this relation being such that the index marks may be used in reading from the scales P and P' to the scales S and S' or the reverse, and from the scale S over to the
 60 scale S'. That is, the index marks are so arranged that the graduations upon the several scales adjacent to such marks in any position of the rider represent intelligible values.

I have already indicated that it is important that the rider shall be so mounted

as to leave clear the space for the thumb and fingers of the user by which the calculator is held at its center, and I have shown how this important effect is secured. It is also important that there be the right
 70 amount of friction between the rider and the main member A' of the instrument, and sufficient clearance between the rider and the annular member A, so that when
 75 such annular member is rotated, the runner will remain for the time being a part of the larger main member, and so also that the rider will not slide around the instrument except when pushed by the fingers of
 80 the operator. The ends of the rider are in contact with the member A' and the hub B, which are in effect one piece, and by so constructing the rider that it clears the annular member A, the desired effects above indicated are secured. The desired friction
 85 may be obtained by making the rider of one piece of sheet metal, as shown, and depending upon the spring of the metal to grasp the opposite sides of the instrument with sufficient pressure, but it is within my con-
 90 templation to provide additional frictional devices. So far as I am aware no calculating device has heretofore been devised in which there are continuous scales in combination with an index member capable of
 95 being completely rotated without interference with the fingers by which the calculator is grasped, or in which there is an index member capable of being used for reading from a cylindrical peripheral scale
 100 to a circular scale on the end face of the instrument or an index member embracing the periphery for reading from a scale on one end face to a scale on the opposite end face of the instrument. My invention supplies
 105 the features lacking in previous calculating devices and furnishes an attachment by which great gains are made in accuracy of reading the instrument and in ease and convenience of its use.

What I claim and desire to secure by Letters Patent is:

1. A calculator comprising complementary cylindrical members pivoted side by side on the same axis, each having a cylindri-
 115 cally arranged scale on its periphery, and a circularly arranged scale on its face, and an index member connected to said calculator in a manner permitting relative movement about the center of said calculator and
 120 having related indices adjacent to the respective scales and relatively arranged to point at the same time to corresponding values on the two scales.

2. A substantially cylindrical calculator 125 having scales on its opposite end faces and on its cylindrical face, and an index member supported upon said calculator to embrace the end and cylindrical faces thereof with capability of traveling concentrically 130

about the axis of the calculator and having correlated indices adjacent to the respective scales.

5 3. A substantially cylindrical calculator comprising two coaxial members having contiguous scales on their peripheries, and one of said members having a scale on its end, and a rider connected with said calculator and constrained thereby to move in a
10 circular path concentric with the calculator, said rider having openings over the several scales provided with index elements and so related as to permit reading from one scale to another, one of such index elements being
15 a transparent pane extending across one of such openings and provided with a line.

4. A calculator comprising two coaxially arranged contiguous relatively rotatable cylindrical members, equal in diameter, having
20 scales on their peripheral faces, and also having plane faces perpendicular to their common axis and scales on said plane faces, and an index crossing said scales and being mounted to rotate about the axis of the cal-

culator, the index also extending over both
25 end faces and the scales thereof of the calculator and bearing frictionally against the same.

5. A calculator comprising two substantially cylindrical members mounted coaxially
30 with provision for rotation of one relatively to the other and being of the same external diameter, said members having contiguous scales on their peripheries, and one of them having a scale on its end face,
35 and a rider or runner connected with said calculator and constrained to move in a circular path concentric with the calculator, said rider having openings over the several
40 scales provided with index elements so related as to permit reading correlated values from one of the scales to another.

In testimony whereof I have affixed my signature, in presence of two witnesses.

GILBERT SMALL.

Witnesses:

ARTHUR H. BROWN,
P. W. PEZZETTI.