

G. LANGE.  
CALCULATING DEVICE.  
APPLICATION FILED JUNE 24, 1908.

1,012,660.

Patented Dec. 26, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

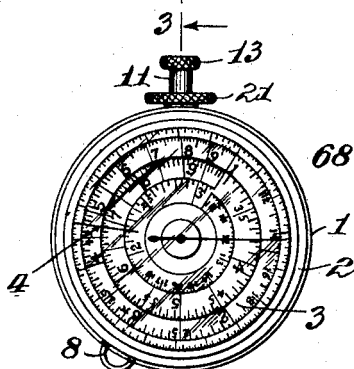
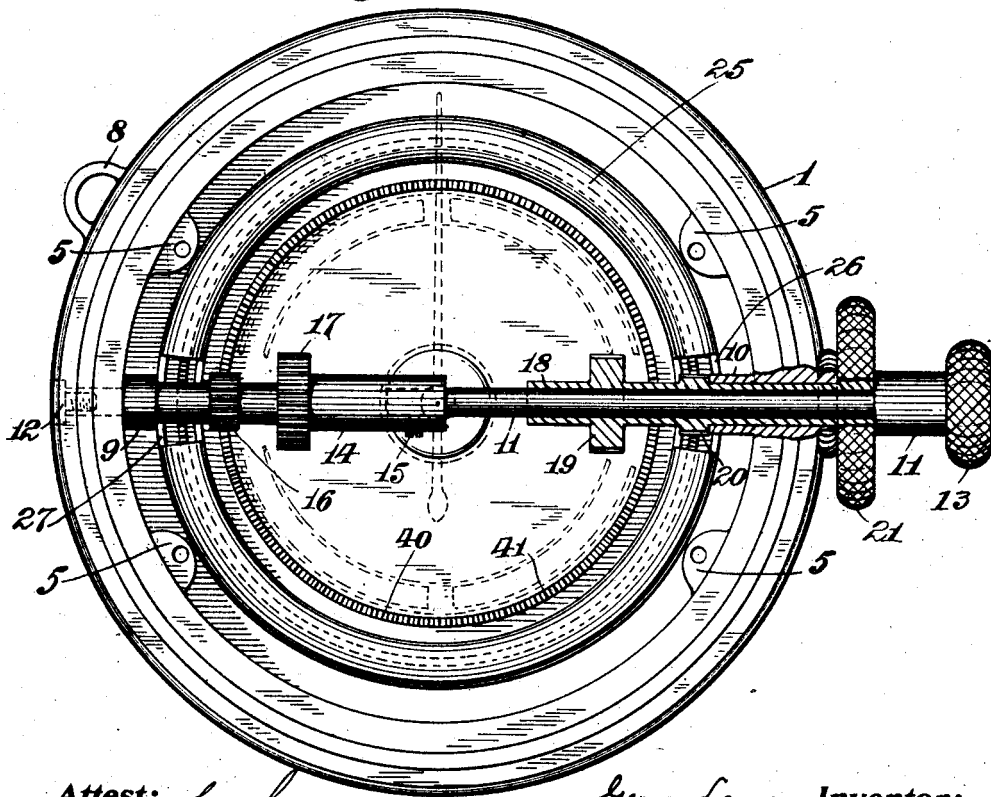


Fig. 2.



Attest:  
*May Hughes*  
*Alvah C. McSonnell.*

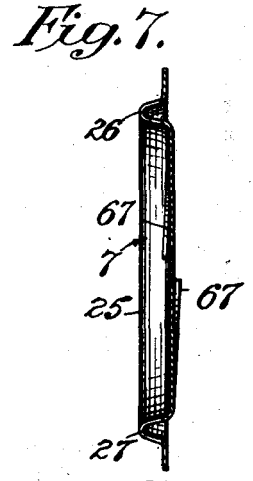
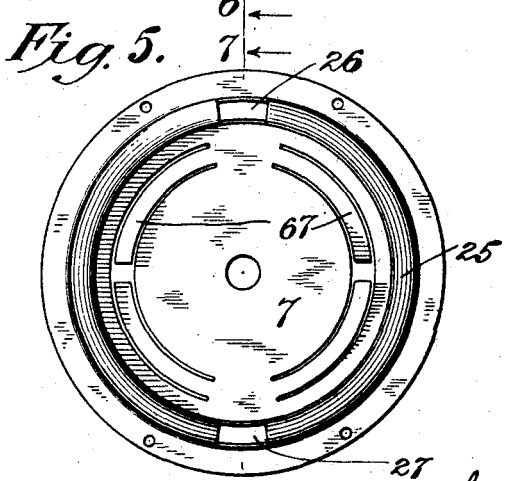
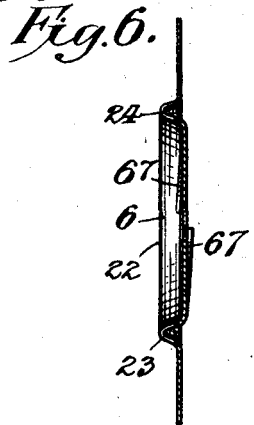
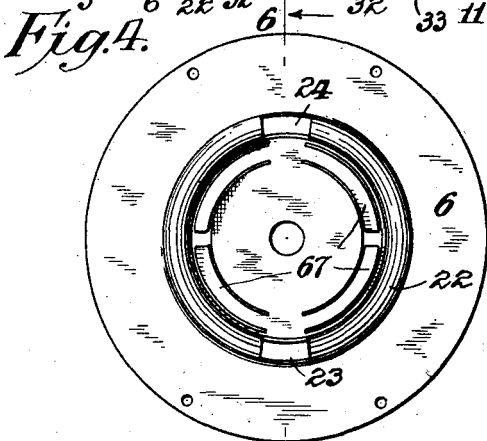
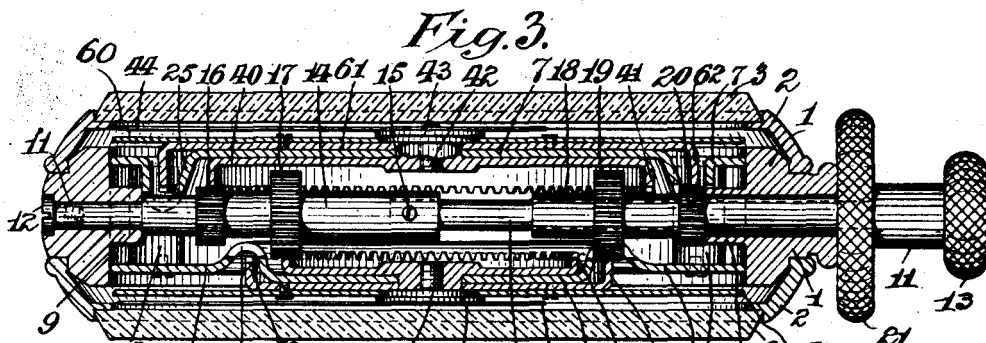
*George Lange, Inventor:*  
*by William R. Baird*  
*his Atty.*

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2 SHEETS—SHEET 2.



Attest:  
*May Hughes*  
*Alfred C. McDonnell*

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 by *William R. Baird*  
 his Atty.

# UNITED STATES PATENT OFFICE.

GEORGE LANGE, OF HOBOKEN, NEW JERSEY, ASSIGNOR TO THE KEUFFEL & ESSER COMPANY, OF HOBOKEN, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## CALCULATING DEVICE.

1,012,660.

Specification of Letters Patent.

Patented Dec. 26, 1911.

Application filed June 24, 1908. Serial No. 440,061.

*To all whom it may concern:*

Be it known that I, GEORGE LANGE, a citizen of the United States, and resident of Hoboken, Hudson county, New Jersey, have  
5 invented certain new and useful Improvements in Calculating Devices, of which the following is a specification.

My invention relates to calculating devices involving logarithmic notations in the  
10 general nature of a slide rule and specifically is an improvement upon a device of that character which forms the subject matter of Letters Patent of the United States No. 773,235, issued Oct. 25th, 1904 to Elmer A.  
15 Sperry. Experience with the manufacture and use of the device, which forms the subject matter of that patent, has demonstrated that it is somewhat costly to make, and at times is difficult to use in practice. The latter feature especially arises on account of the  
20 numerous spur and bevel gears which form part of the actuating mechanism. The back lash which arises is considerable and is apt to cause a sluggishness in the relative movements of the dials, the pointers and indicators which must be allowed for by the operator or an inaccurate result will occur.

The object of my invention is to simplify the construction of the parts of the apparatus and this I do in the manner hereinafter stated, securing as a result a device in which practically there is no back lash and which is very inexpensive to make and simple in construction and mode of operation.  
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In the drawings, Figure 1 is a miniature plan view of the device showing one of its dials and the operating knob; Fig. 2 is an enlarged inner plan view of one-half of the device, the operating sleeve being shown in section; Fig. 3 is a transverse central section, the operating shaft, sleeve and knobs with the hand disks and hands being shown in edge elevation; Figs. 4 and 5 are transverse central sections of the protecting plates and Figs. 6 and 7 are edge views of the same.  
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The casing of the device consists of a ring 1 recessed on each face to receive a round bezel 2 frictionally held against the ring and adapted to encircle and support a crystal 3 on the surface of which at a convenient point is scratched, etched or painted an index line 4. The bezels and crystals may be revoluble or fixed as may be desired. In  
50 effect they are the same as similar watch

bezels and crystals and form no part of my invention.

Spaced at appropriate places around the inner periphery of the casing 1 are spacing and supporting posts 5 secured to or made  
60 integral with the casing. They are intended to receive and support the protecting disk 6 and 7, presently to be described. The ring 1 is also provided with a projecting ring 8 to which a chain may be attached.  
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Arranged at diametrically opposite points in the casing 1 are inwardly projecting cylindrical bearings 9 and 10, in which is adapted to rotate a diametrical shaft 11 which passes into the casing and is held at one end  
70 by a screw 12 and which at its opposite end has an accessibly-arranged operating element, being here shown as passing through the casing and provided with a knurled turning knob 13. A sleeve 14 is adjustably secured on this shaft 11 by a set screw 15, or other suitable means, and is provided with spur gears 16 and 17. A second shaft 18 here shown as hollow and placed over the shaft 11 is provided with two spur gears  
80 19 and 20 and has an accessibly-arranged actuating element 21 separate from the actuating element 13 of the shaft 11, and in proximity to the latter. This sleeve or second shaft 18 moves independently of and  
85 rotates about the shaft 11 and its actuating element, which is shown as a knurled turning knob 21 is of a character which readily differentiates it from the knob 13 by the touch, being here shown as larger than the knob 13. It is obvious from the above that the rotation of the shaft 11 by the knob 13 will rotate the gears 16 and 17 and the rotation of the sleeve 18 by the knob 21 will rotate the gears 19 and 20.  
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Secured to the posts 5, as above stated, are the protecting disks 6 and 7. These are flat plates of brass or similar suitable material and are each made substantially alike.  
100 The disk 6 has an inwardly projecting tubular flange 22 interrupted at 23 and 24 to allow the spur gear 19 access to its cooperating rim gear. The disk 7 has a similar inwardly projecting tubular flange 25 interrupted at 26 and 27 to allow the spur  
105 gear 20 access to its cooperating rim gear. The disk 6 supports an inner plate 30 which has a right angled toothed annular flange 31 forming in effect a rim gear cooperating with the gear 17. This plate is rigidly se-  
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cured by means of a small shaft 32 to a disk 33 which carries a hand 34, so that rotation of the plate 30 through the gear 17 will rotate the hand or pointer 34. In a similar manner the disk 7 supports an inner plate 40 which has a right angled toothed annular flange 41 forming a rim gear cooperating with the spur gear 16 and rigidly secured by means of a small shaft 42 to an outer disk 43 which carries a hand 44, so that rotation of the plate 40 through the gear 16 will rotate the hand or pointer 44. As the spur gears 16 and 17 are on the same shaft and are both simultaneously rotated from the outer knob 13, it results that the rotation of this knob rotates both of the hands or pointers simultaneously over their respective dials but at different rates of speed, because the gear 17 is larger than the gear 16 and the diameter of the rim gear 30 is less than that of the rim gear 40.

50 and 60 are graduated dials. The dial 50 is placed between the disk 33 and the plate 6 and has secured to or made integral with it a second disk 51 having an inwardly turned annular toothed flange 52 adapted to move within the tubular annular flange 22 of the disk 6 and to be protected thereby except at the opening 23 where it is adapted to mesh with the spur gear 19. In a similar manner the dial 60 is placed between the disk 43 and the plate 7 and has secured to or made integral with it a second disk 61 having an inwardly turned annular tooth flange 62 adapted to move within the tubular flange 25 of the disk 7 and to be protected thereby except at the opening 26 where it is adapted to mesh with the spur gear 20. As the spur gears 19 and 20 are both on the sleeve 18 and are both turned by the knob 21, it results that the rotation of this knob rotates simultaneously the disks 61 and 51 and through them the dials 60 and 50, but at different rates of speed because the gear 19 is larger than the gear 20 and the diameter of the disk 61 is less than that of the disk 51.

The outer surface of each disk 6 and 7 is provided with circularly arranged leaf springs 67 which contact with the adjacent dial plates and hold them under tension to insure their steady and uniform movement when rotated. Each dial is provided with a multicircular scale 68 graduated according to the principles governing the graduation of slide rules and similar devices, but these graduations may be varied by those skilled in the art, and are matters of substitution or calculation and form no part of my invention.

It is obvious that by the omission of either one of the spur gears 19 and 20 from the sleeve 18, its corresponding dial is no longer rotatable but becomes stationary.

The method of placing the knobs 13 and

21 near to each, making them of different sizes and rotating them and their connected parts around a common center simplifies the device very much and renders it more convenient to use.

What I claim as new is:—

1. An instrument of the class described, comprising a casing, a plurality of dials and pointers therein, and means whereby all of said dials and pointers may be revolved simultaneously, the dials in direction opposite to that of the pointers.

2. An instrument of the class described, comprising a casing, a plurality of dials and pointers therein, and means whereby all of said dials and pointers may be revolved simultaneously at different rates of speed, the dials in direction opposite to that of the pointers.

3. An instrument of the class described, comprising a casing, a plurality of dials and pointers therein, and means whereby all of said dials and pointers may be revolved simultaneously at different rates of speed including operating elements arranged in proximity outside of the casing.

4. An instrument of the class described, comprising a casing, two revoluble dials, one on each face of the casing, a revoluble hand cooperating with each dial and means for revolving both dials simultaneously and both hands simultaneously comprising a shaft having connection with the dials and a shaft having connection with the hands, said shafts being approximately parallel with each other and having separate operating elements accessibly arranged and disposed in proximity one to the other.

5. An instrument of the class described comprising a casing, two revoluble dials one at each face of the casing, means for revolving the dials simultaneously comprising rim gears and means for separating the rim gear of one dial from the rim gear of the other including a protecting disk and means for regulating the movement of the dial, including springs interposed between the dial and its disk.

6. In an instrument of the class described, a casing, an indicating means at each side thereof, each comprising a relatively movable dial and hand, and means for moving the movable elements of the indicating means, comprising a pivotally mounted plate for each of the latter, each plate having teeth, and a common actuating shaft having a plurality of gears mounted directly upon it and respectively in mesh with the teeth of the plates.

7. In an instrument of the class described, a casing, dials on opposite sides thereof, hands movable over the dials and means for moving the hands simultaneously comprising a toothed plate fixedly connected with each of the same, an actuating shaft, and a

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plurality of gears mounted directly on the shaft and respectively in mesh with the teeth of the plates.

8. In an instrument of the class described, 5 a casing and indicating elements, including dials movably mounted on opposite sides of the casing, and means for moving the dials simultaneously, comprising a toothed plate fixedly connected with each of the same, an 10 actuating shaft, and a plurality of gears mounted directly on the shaft and respectively in mesh with the teeth of the plates.

9. In an instrument of the class described, a casing, a dial and a hand on one side thereof, a dial and a hand on the other side thereof, a pair of toothed plates connected with the dials, a shaft having a pair of gears mounted directly on it and respectively in mesh with the teeth of said plates, a pair of 20 toothed plates connected with the hands, a second shaft having a pair of gears mounted directly on it and respectively in mesh with the teeth of the latter plates, one of said shafts being hollow and mounted to turn 25 about the other, and accessibly arranged separate actuating elements for the shafts.

10. An instrument of the class described comprising a casing, two revoluble dials, one on each face of the casing, a hand for 30 each dial and means for revolving the dials simultaneously consisting of a pair of rim gears of different sizes secured to the dials respectively, and a common actuating shaft provided with a pair of gears fixedly secured 35 to it and respectively in mesh with the rim gears.

11. An instrument of the class described, comprising a casing, a dial on each face thereof, a revoluble hand for each dial and 40 means for revolving the hands simultaneously consisting of a pair of rim gears of different sizes fixedly connected with the hands respectively, and a common actuating shaft provided with a pair of gears fixedly secured 45 to it and respectively in mesh with the rim gears.

12. An instrument of the class described comprising a casing, indicating elements comprising a relatively movable dial and 50 hand on each face thereof, and means for moving the movable elements simultaneously comprising a pair of rim gears of different diameters, fixedly connected with the movable indicating elements respectively, a 55 shaft and a pair of gears fixed upon said shaft and in mesh with the rim gears respectively.

13. An instrument of the class described comprising a casing, indicating elements 60 comprising a relatively movable dial and hand on each face thereof, and means for moving the movable elements simultaneously, comprising a pair of rim gears of different diameters, fixedly connected with the movable 65 ble indicating elements respectively, a shaft

and a pair of gears fixed upon said shaft, said gears being of different diameters and in mesh with the rim gears respectively.

14. An instrument of the class described, comprising a casing, a revoluble dial on each 70 face thereof, a revoluble hand for each dial and operating means for the hands and dials, consisting of a pair of rim gears of different sizes fixedly connected with the hands respectively, a separate pair of rim gears of 75 different sizes fixedly connected with the dials respectively, a shaft having a pair of gears fixed upon it and disposed in mesh with the first mentioned pair of rim gears, respectively, a second shaft having a pair 80 of gears fixed upon it and disposed in mesh with the second pair of rim gears, respectively, and means for turning said shafts.

15. An instrument of the class described, comprising a casing, a revoluble dial on each 85 face thereof, a revoluble hand for each dial and operating means for the hands and dials, consisting of a pair of rim gears of different sizes fixedly connected with the hands respectively, a separate pair of rim 90 gears of different sizes fixedly connected with the dials respectively, a shaft having a pair of gears of different sizes fixed upon it and disposed in mesh with the first mentioned pair of rim gears, respectively, a second 95 shaft having a pair of gears of different sizes fixed upon it and disposed in mesh with the second pair of rim gears, respectively, and means for turning said shafts.

16. An instrument of the class described, 100 comprising a casing, a revoluble dial on each face thereof, a revoluble hand for each dial, and operating means for the dials and hands, consisting of rim gears of different 105 diameters fixedly connected to the dials and other rim gears of different diameters fixedly connected with the hands, a pair of separately movable shafts having independent accessibly arranged actuating elements, one of said shafts being hollow and 110 mounted to turn about the other, and a pair of spur gears fixedly connected to each shaft and in mesh with the rim gears, respectively.

17. An instrument of the class described, 115 comprising a casing, a revoluble dial on each face thereof, a revoluble hand for each dial, and operating means for the dials and hands, consisting of rim gears fixedly connected to the dials, respectively, a pair of 120 separately movable shafts having independent accessibly arranged actuating elements, one of said shafts being hollow and mounted to turn about the other, a pair of 125 gears of different sizes fixedly mounted on one shaft and in mesh with the rim gears of the hands, respectively, and a second pair of gears of different sizes fixedly mounted on the other shaft and in mesh with the rim 130 gears of the dials, respectively.

18. An instrument of the class described, comprising a casing, a revoluble dial on each face thereof, a revoluble hand for each dial, and operating means for the dials and hands, consisting of rim gears of different sizes fixedly connected to the dials respectively, rim gears of different sizes fixedly connected to the hands respectively, a pair of separately movable shafts having independent accessibly arranged actuating elements, one of said shafts being hollow and mounted to turn about the other, a pair of gears of different sizes fixedly mounted on one shaft and in mesh with the rim gears of the hands, respectively, and a second pair of gears of different sizes fixedly mounted on the other shaft and in mesh with the rim gears of the dials, respectively.

19. An instrument of the class described, comprising a casing, a dial and a pointer therein, a transverse shaft mounted to rotate therein, a sleeve surrounding said shaft; and means whereby said dial and pointer may be simultaneously revolved in opposite direction, said means including crown gears secured to said dial and pointer and spur gears surrounding said shaft and sleeve and adapted to directly engage with said crown gears.

20. An instrument of the class described, comprising a casing, a dial and a pointer therein, a transverse shaft mounted to rotate therein, a sleeve surrounding said shaft, and means for simultaneously revolving said dial and pointer in opposite direction at different rates of speed, said means including crown gears of different sizes secured to said dial and pointer and spur gears on said shaft and sleeve adapted to directly engage with the crown gears of said dial and pointer.

21. An instrument of the class described comprising a casing, two revoluble dials one at each face of the casing, means for revolving the dials simultaneously comprising rim gears and means for separating the rim gear of one dial from the rim gear of the other including a protecting disk and means for regulating the movement of the

dial, including leaf springs mounted on the disk and adapted to press normally against the dial.

22. In a device of the kind described, dials and hands, a casing, a transverse shaft provided with a plurality of gears whereby by the hands are rotated, a rotatable sleeve surrounding said shaft throughout the entire length of the sleeve and provided with one or more gears whereby the dials may be rotated.

23. In a device of the kind described, dials and hands, a casing, a transverse shaft provided with a plurality of gears whereby the hands are rotated, a rotatable sleeve adapted to rotate around the shaft and provided with one or more gears whereby the dials may be rotated, the shaft and sleeve being rotated by independent means arranged outside of the casing.

24. In a device of the kind described, dials and hands, a casing, a transverse shaft, provided with a plurality of gears whereby the hands are rotated, a rotatable sleeve adapted to rotate around the shaft, and provided with one or more gears whereby the dials may be rotated, the shaft and sleeve being rotated by independent means arranged outside of the casing consisting of hand pieces different to the touch.

25. In a device of the kind described, dials and hands, a casing, a transverse shaft provided with a plurality of gears whereby the hands are rotated, a rotatable sleeve adapted to rotate around the shaft and provided with one or more gears whereby the dials may be rotated, the shaft and sleeve being rotated by independent means arranged outside of the casing consisting of hand pieces of different diameters whereby they can readily be distinguished by the touch.

Witness my hand this 20th day of June, 1908, at Hoboken, N. J.

GEORGE LANGE.

Witnesses:

HENRY LEIDHEISER,  
BOWDEWINE B. VAN SICKLE.