Feb. 19, 1924. 1,484,174

J. J. DIVO

DEVICE FOR INDICATING THE RELATIVE MOVEMENTS OF THE EARTH, SUN, AND MOON

Filed Sept. 14, 1922 2 Sheets-Sheet 1

Fig 1

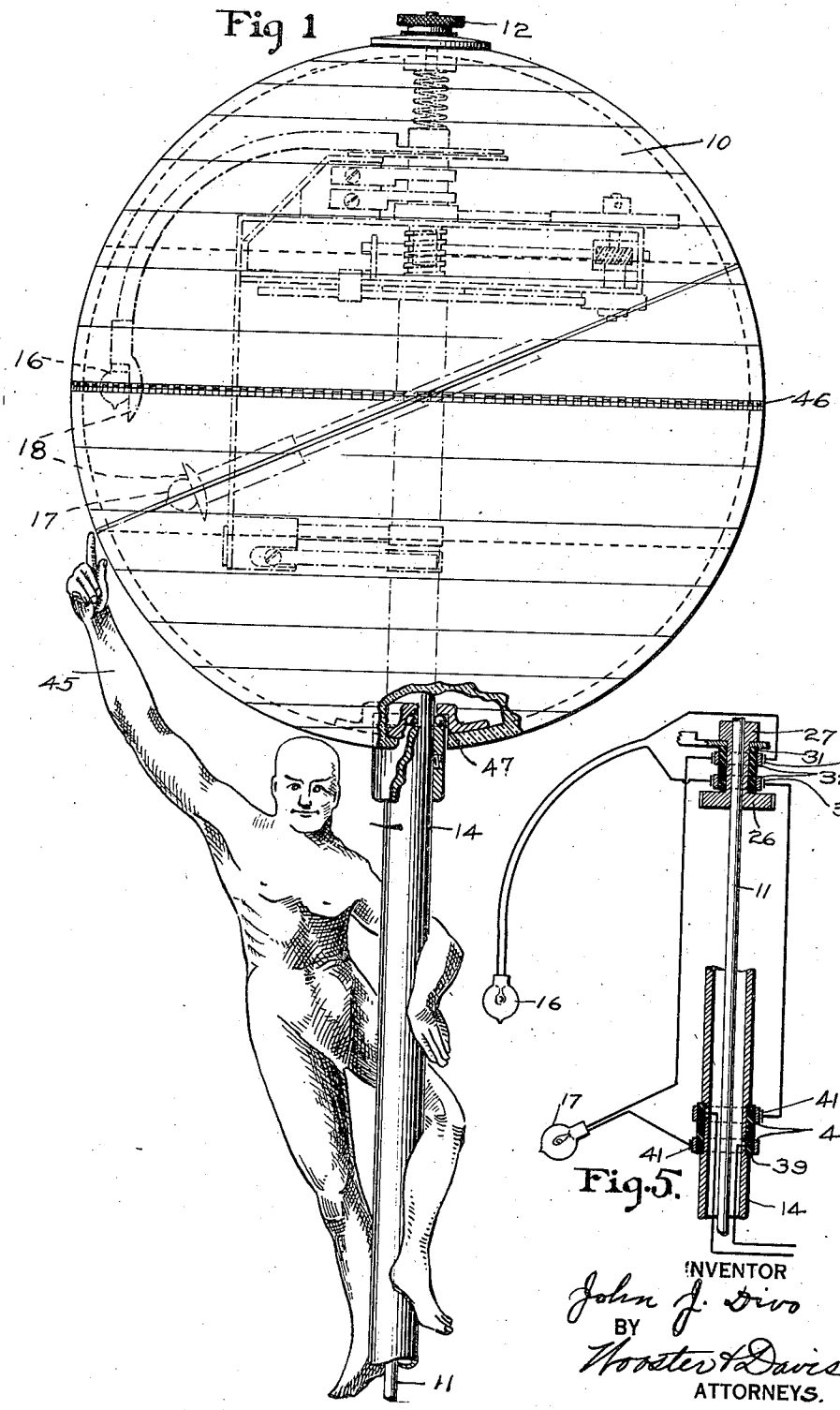


Fig.5.

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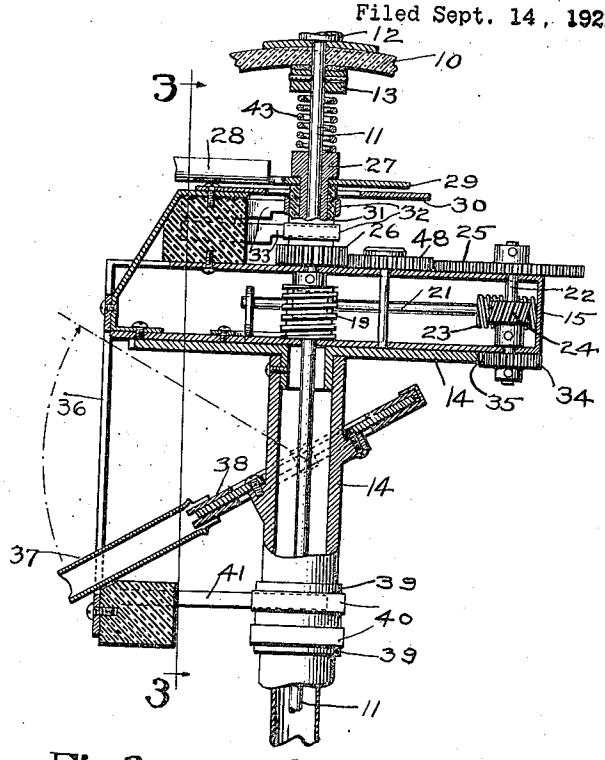


Fig. 2.

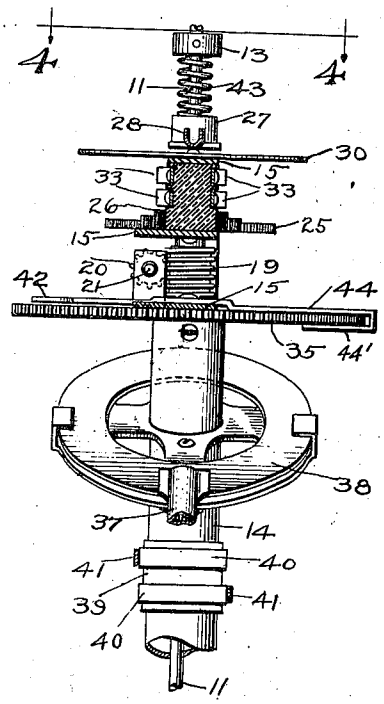
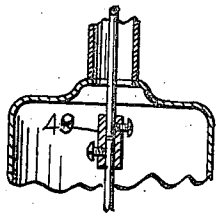


Fig. 3.



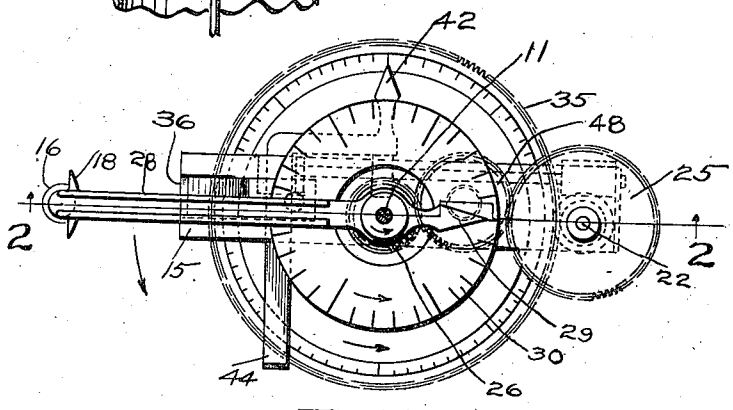


Fig. 4.

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UNITED STATES PATENT OFFICE.

JOHN J. DIVO, OF BROOKLYN, NEW YORK.

DEVICE FOR INDICATING THE RELATIVE MOVEMENTS OF THE EARTH, SUN, AND MOON.

Application filed September 14, 1922. Serial No. 588,175.

To all whom it may concern:

Be it known that I, JOHN J. DIVO, a citizen of Syria, governed by the Republic of France, residing at Brooklyn, county of Kings, State of New York, have invented an Improvement in Devices for Indicating the Relative Movements of the Earth, Sun, and Moon, of which the following is a specification.

My invention relates to educational appliances of the type used to illustrate relative movement or phase relation between the earth, sun, and moon. The object of my invention is to provide an improved device of the above class which shall be simple and compact in construction, and easily oriented to agree with the particular time of year and to indicate the approximate time of day.

To these and other ends my invention consists in certain combinations and arrangement of parts which will be pointed out with greater particularity in the claims appended to this specification.

Referring to the drawings:

Figure 1 is an assembly or exterior view of my invention.

Figure 2 shows the operating mechanism with the sphere removed and is a section on the line 2—2 of Figure 4.

Figure 3 is a section on the line 3—3 of Figure 2.

Figure 4 is a section on the line 4—4 of Figure 3.

Figure 5 represents the wiring diagram of the lighting circuits.

In the drawing the numeral 10 indicates a hollow sphere or globe preferably of translucent material provided on the outside thereof with marks to indicate the surface of the earth and also the meridians of longitude and latitude. The sphere may be mounted on ball bearings 47 and is fixed to the driving or actuating shaft 11 by means of the clamp screw 12 which presses the top of the sphere against the collar 13 fixed to the shaft 11. Located within the sphere is a stationary support 14 on which is rotarily mounted the frame 15 which carries lamps 16 and 17 juxtaposed to the surface of the sphere and provided with reflectors 18. Fixed to the shaft 11 is the worm 19 which cooperates with the wheel 20 mounted on the shaft 21 which is journaled in the frame 15. The shaft 21 drives the shaft 22, also journaled in the frame 15, by means of the worm 23 and the wheel 24. Motion from the shaft 22 is transmitted by means of gears 25 and 48 to pinion 26 which is fixed to the sleeve 27 and rotatable on the shaft 11. Gear 25 may, for example, have two hundred teeth, gear 48, one hundred teeth and the pinion 26, fifty-nine teeth. The arm 28 supporting the lamp 16 is fixed to the sleeve 27 and if desired the opposite end thereof may be provided with a pointer or index 29 adapted to co-operate with graduations on the plate 30 secured to the frame 15. As shown in Figure 5 an insulating sleeve 31 is fixed over the sleeve 27 and provided thereon with a plurality of collector rings 32 with which contact the brushes 33 for carrying the current supplying the lamps 16 and 17. On the lower end of the shaft 22 is another gear 34 in engagement with teeth 35 on the periphery of the fixed support 14, whereby rotation of the gear 34 produces rotation of the entire frame 15. With the above mentioned sizes for the gears 25 and 48 and pinion 26, the wheels 20 and 24 may each be made with ten teeth, the gear 34 may be made with four hundred teeth and the fixed support provided with fourteen hundred and sixty-one teeth on its periphery. As the globe and the light 17 are so geared together as to rotate in the same direction then the globe must be rotated three hundred and sixty-six and one quarter days in a year. This is because the light 17 representing the sun makes one revolution in one year or three hundred sixty-five and one quarter days. But for each revolution of the globe the sun moves ahead a fraction of its revolution represented by one over three hundred sixty-five and one quarter. Or in one year the sun gains on the globe an amount equal to its movement for one revolution of the globe and therefore in order that the globe should make 365.25 revolutions with respect to the sun, that is light 17, it must actually make 366.25 revolutions with respect to the stand 50. With ten teeth on each of gears 20 and 24 as mentioned above ten pitch for the worms 19 and 23, the shaft 11 will rotate one hundred times during one revolution of shaft 22. Thus apparently shaft 22 and gear 34 should make 3.6625 revolutions per year or for one revolution of

light 17. But as this gear and shaft move in an orbit about the axis of the globe they really gain on the globe an amount equal to their movement for one revolution of the globe, or one one-hundredth of a revolution of the shaft and gear, so that actually the shaft 22 and gear 34 make only 3.6525 revolutions per year relative to the frame 15. Thus gear 14 will have 3.6525 multiplied by 400, the number of teeth on gear 34, or 1461 teeth. Frame 15 is provided with a vertically disposed slot 36 in which is guided the supporting arm 37 carrying the lamp 17. The inner end of the arm 37 co-operates with the angularly disposed fixed plate 38 so that as the frame 15 rotates, the lamp 18 is caused to move up and down in the slot 36. Secured on the lower end of the fixed support 14 is another insulating sleeve 39 provided with collector rings 40 with which co-operate the brushes 41 which are also part of the wiring circuit as shown in Figure 5. In order to firmly secure the frame 15 on the fixed support 14 the arm 44 may be arranged with a downturned flange 44' to engage the underside of the fixed support 14. If desired the support may be provided with graduations adjacent its periphery, and an arm or pointer 42 provided for co-operation with these graduations. The spring 43 shown near the top of shaft 11 co-operates with collar 13 to keep the pinion 26 in engagement with its driving gear. The shaft 11 may be driven in any appropriate manner, preferably by means of clock work which is adapted to rotate the shaft once in twenty-three hours and approximately 56 minutes, or twenty-three hours, fifty-six minutes and approximately three seconds to be more exact. This is because in twenty-four hours the light 17 advances a distance equal to the distance a point on the globe would move in approximately four minutes or three minutes and fifty-seven seconds. However, this point and the light 17 would have to come together after twenty-four hours in order that the globe and light 17 should be in proper relation to each other, and therefore the globe 10 must be speeded up by this amount and it takes only twenty-three hours and approximately fifty-six minutes to make one complete revolution on its support. The shaft 11 may be made in two parts and provided with an adjustable connection 49, illustrated in Figure 2, whereby the upper portion of said shaft may be rotatively adjusted relative to the lower portion and its driving clockwork, not shown, for properly adjusting the position of the lamps according to the time of day. The clock work is enclosed within a suitable casing 50 which will of course be provided with a suitable door not shown, to give access to the clock mechanism and the adjustable connection 49. The arm 28 carrying the lamp 16 is adapted to rotate substantially once in twenty-nine and one-half days, while the frame 15 and lamp 17 rotates once in three hundred and sixty-five and one-quarter days.

By having the lamps disposed adjacent the surface of the sphere in the manner indicated, a small dot of light will be visible on the sphere which may indicate on the surface of the earth the position of a normal ray of light from the sun or moon, the lamp 16 indicating that from the moon, and the lamp 17 indicating a ray from the sun. By correctly and relatively positioning the two lamps with a given point on the surface of the earth, it will be possible to show on my device the position on the surface of the earth where a normal ray of light from the moon strikes, and at the same time show the location of a normal ray from the sun. If the globe or sphere is provided with meridians of longitude which may be spaced to represent either angular degrees or units of time, it will be possible with the device correctly oriented or the lamps in their correct position to tell the approximate time of day of a given point on the surface of the earth. The variation in angular displacement between the lamp 17 and the drive shaft or axis 11 may be used to represent the variation in position or declination of the sun. Although I have shown no such similar device for use with the other lamp 16 representing the moon, it will be apparent that such may be added if desired. In the wiring diagram shown in Figure 5, I have illustrated the lamps 16 and 17 as being connected in series, since these lamps are of relatively small voltage, but, of course, they may be connected in other ways desirable. For purposes of ornamentation a figure 45 may be used to indicate the latitude of some particular point on the surface of the earth, or may indicate the maximum declination of the sun at the time of the summer or winter solstice. In order to orient my device or move the sphere 10 relative to the shaft 11 or the lamps 16 and 17, the clamp 12 may be unscrewed, when the globe may be easily rotated to the desired position. The globe 10 may be conveniently made in cooperating the halves joined along the line 46, in which event by loosening the clamp 12 the upper half may be removed in order to rotate either the lamp 16 or 17 to its correct position relative to the other according to the time of the year.

Among the advantages of my device may be enumerated its compactness and the feature of being self-contained, whereby I am able to show the relative position on the surface of the earth of a normal ray of

light from the sun or the moon without the use of the more cumbersome devices which have been previously used for such indication and in which the sun or the moon is represented as being spaced at a considerable distance from the earth. By constructing a device in the manner above indicated it may be properly oriented or easily set to correctly indicate the season of the year and the time of day. My device is also capable of functioning as a time indicator or clock when the meridians of longitude are provided as suggested above.

I claim:

1. A hollow translucent globe having its surface outlined to represent the earth, means for rotating said globe once in approximately every twenty-four hours, a lamp within said globe, mechanism for rotating said lamp once in approximately twenty-nine and one-half days, a second lamp and a second mechanism for rotating said second lamp once in three hundred and sixty-five and one-quarter days.

2. The combination of claim 1, with means for simultaneously changing the angular displacement between the second lamp and the axis of said globe to correspond with changes in the declination of the sun.

3. A time indicator comprising the combination with a hollow translucent sphere having its surface outlined to represent the earth's crust and provided with meridians of longitude, of lamps within said sphere to indicate the relative position on the earth's surface of normal rays from the sun and moon, and means for rotating said sphere and said lamps to simulate the relative rotation between the earth, sun, and moon.

4. In a device of the class described, the combination with a hollow sphere, of an axial drive shaft for rotating the same, a stationary support within the sphere, a lamp juxtaposed to the suface of the sphere, a second lamp also located near the shell of said sphere, a worm and shaft for driving both of said lamps from said axial shaft, gears driven by said worm for rotating said lamps at different angular velocities, and means for varying the angular displacement between at least one of said lamps and said drive shaft.

In testimony whereof I affix my signature.

JOHN J. DIVO.