Aug. 30, 1932. H. W. GEROMANOS 1,874,279

EDUCATIONAL APPLIANCE

Filed Feb. 14, 1929

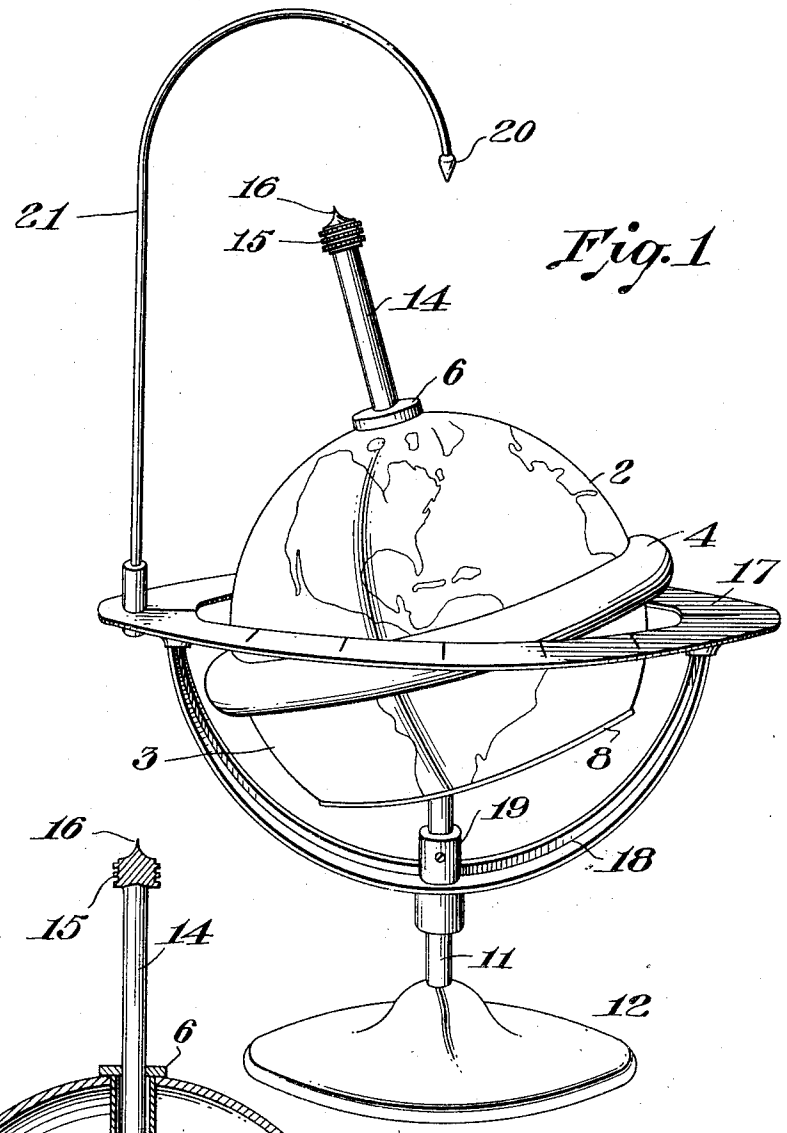


Fig. 1

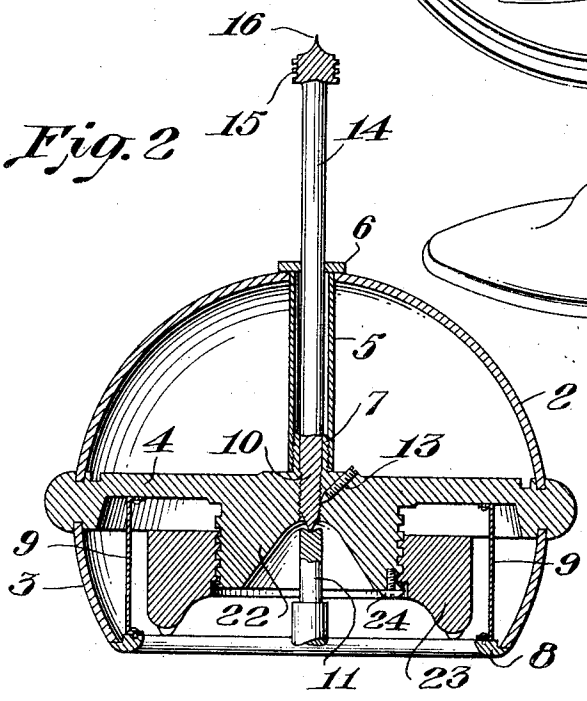


Fig. 2

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EDUCATIONAL APPLIANCE

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This invention relates to that class of educational appliances designed more especially for use in the teaching of astronomy.

It is well known that there is a slow westward movement or "precession" of the equinoxes along the plane of the ecliptic, and an accompanying slow rotation of the axis of the earth and the celestial poles around the poles of the ecliptic. In teaching this subject it is found that the average high school and college student finds considerable difficulty in visualizing these movements and in understanding the effects of them. The present invention deals especially with this problem and it aims to devise an apparatus with which the precession of the equinoxes can be clearly demonstrated.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawing, and the novel features will be particularly pointed out in the appended claims.

In the drawing,

Figure 1 is a side view of a precession demonstrator embodying this invention; and

Fig. 2 is a vertical sectional view of the terrestrial globe which forms a part of the apparatus shown in Fig. 1.

The apparatus shown in the drawing includes a terrestrial globe which comprises a northern hemispherical section 2 and a southern hemispherical section 3, the lower part of the latter section, however, being cut away. These sections are carried by a wheel 4 preferably made of metal and therefore having considerable mass. The wheel forms part of the globe structure and both the upper and lower margins of the wheel are grooved to receive the edges of the hemispherical sections 2 and 3, these sections being somewhat reduced at the equatorial region in order to accommodate the wheel. The upper section 2 is clamped to the wheel by a tube 5 having a flattened head 6 which bears on the section 2 at the polar region, while its lower end is threaded on a boss 7 that projects upwardly from the central portion of the wheel. The southern hemispherical section 3 is held in place by a ring 8 on which the lower edge of said section bears, and this ring is secured in place by posts 9 which extend downwardly from and are fastened to the wheel 4.

In order to support the globe for rotary motion a pivot stud 10 is threaded through the central part of the wheel 4, and it is provided with a hardened point at its lower end. This point normally rests in a hardened socket formed in the upper end of an upright post 11 which is mounted in a base 12. It will be observed that this arrangement not only permits the globe to revolve about its own axis, but also permits said axes to swing through a considerable arc.

The threaded mounting of the pivot stud 10 in the wheel 4 permits the axial adjustment of the stud relatively to the wheel, and the stud may be locked in its adjusted position by a set screw 13. The upper end of this stud is secured fast in the lower end of a tube or hollow post 14 which fits closely in the tube 5 and projects for a considerable distance beyond the north polar region of the globe so that it serves to represent the north pole. This post 14 is capped by a grooved or knurled knob 15 having a pointed extremity 16 lying in the axis of rotation of the globe.

Encircling the globe is an annular plate 17 which is supported on a yoke 18 slidably mounted on the post 11 and the yoke is normally locked in a stationary position by a set screw 19. This annular plate represents the plane of the ecliptic. The position of the north pole of the ecliptic is indicated by a pointer 20 which is supported immediately above the globe and is supported on the end of a curved rod 21 mounted rigidly in the plate 17.

In order to produce the desired precessional motion provision is made for adjusting the relationship between the center of gravity of the globe and the parts rotating therewith and the point of the pivot 10. While this can be done by adjusting the pivot 10, it is preferable to provide some additional, more easily operable means for accomplishing this result. For this purpose the wheel 4 has a large boss 22 formed on its lower side and externally screw threaded. A large inter-

nally threaded nut 23 is mounted on this boss so that it can be adjusted axially of the wheel to raise or lower the center of gravity of the entire rotating mass.

In using the apparatus the pivot 10 is usually so adjusted that its point lies substantially in the center of gravity of the globe, it being borne in mind that the wheel forms a part of the globe. The weight of the parts are so proportioned that when the nut 23 is at the upper limit of its range of adjustment the center of gravity of the globe and the parts revolving therewith is slightly below the point of the pivot 10. If now the globe is revolved by twirling the knob 15, the axis of the globes being inclined at approximately the proper angle, the globe will have, in addtion to its rotary motion about its own axis, a slow gyratory motion in which the point 16 will revolve around the pointer 20. At the same time the imaginary points of intersection of the plane of the wheel 4 with the plane of the annular plate 17 will slowly travel around the plate, thus illustrating the precession of the equinoxes. The rate of this precessional motion can be increased by lowering the weight 23. The ring 17 preferably is divided by shallow radial grooves into twelve segments corresponding to the twelve months of the year. This marking or division of the ring thus affords points of reference for the study of the precessional motion and also illustrates the effect of this motion in bringing the equinoxes into different months of the year.

The apparatus thus demonstrates to the student the precession of the equinoxes and the slow rotation of the earth's axis around the poles of the ecliptic.

This apparatus also may conveniently be used to illustrate nutation. That is, the slight irregularity in motion or wabbling which the earth has and which naturally is most readily observed at the poles. In the present apparatus this motion can be illustrated by giving the globe a slight wabbling movement when it is spun or set into rotation. The axial extension 16 then will not only revolve about the pole of the ecliptic but will also gyrate in a small orbit of its own while revolving around the pole. This small secondary rotation or wabble illustrates very well the motion which is referred to as "nutation."

If for any reason it should be desired to reverse the direction of the precession this can be done by lowering the pivot point 10 so that the center of gravity of the rotating mass will be above the point of the pivot.

While I have herein shown and described a preferred embodiment of my invention, it will be understood that the invention may be embodied in other forms without departing from the spirit or scope thereof.

Having thus described my invention, what I desire to claim as new is:

1. In an apparatus of the character described, the combination of a terrestrial globe, means supporting said globe for rotation on its axis and also for gyratory motion of said globe and axis, and means adjustable to change the relationship between the center of gravity of said globe and the parts revolving therewith and the point about which the globe gyrates.

2. In an apparatus of the character described, the combination of a terrestrial globe, means supporting said globe for rotation on its axis and also for gyratory motion of said globe and axis, and parts associated with said globe for indicating the plane and one pole of the ecliptic.

3. In an apparatus of the character described, the combination of a terrestrial globe, means supporting said globe for rotation on its axis and also for gyratory motion of said globe and axis, an annular plate encircling said globe, means for supporting said plate in position to represent the plane of the ecliptic, and a pointer mounted above the globe and indicating the position of one pole of the ecliptic.

4. In an apparatus of the character described, the combination of a terrestrial globe having considerable mass, means supporting said globe for rotation, said means including a pivot point and a socket therefor both located in the globe and permitting the globe to revolve on its axis and also permitting said axis to gyrate, and means adjustable to raise or lower the center of gravity of the globe and the parts revolving therewith relatively to said pivotal support.

5. In an apparatus of the character described, the combination of a terrestrial globe including a wheel of considerable mass located in the equatorial region, a pivot carried by said wheel, a post projecting into the lower end of said globe, and a socket for said pivot located in the upper end of said post.

6. In an apparatus of the character described, the combination of a terrestrial globe including a wheel of considerable mass located in the equatorial region, a pivot carried by said wheel, a post projecting into the lower end of said globe, a socket for said pivot located in the upper end of said post, and means adjustable to vary the relationship between said pivot and the center of gravity of said globe and the parts revolving therewith.

7. In an apparatus of the character described, the combination of a terrestrial globe including a wheel of considerable mass located in the equatorial region, a pivot carried by said wheel, a post projecting into the lower end of said globe, a socket for said pivot located in the upper end of said post, and a post projecting from the north polar region

of the globe and having a knob at its upper end.

8. In an apparatus of the character described, the combination of a terrestrial globe including a wheel of considerable mass located in the equatorial region, a pivot carried by said wheel, a post projecting into the lower end of said globe, and a socket for said pivot located in the upper end of said post, said pivot being adjustable in said wheel longitudinally of said axis.

9. In an apparatus of the character described, the combination of a terrestrial globe including a wheel of considerable mass located in the equatorial region, a pivot carried by said wheel, a post projecting into the lower end of said globe, a socket for said pivot located in the upper end of said post, and a weight carried by said wheel and adjustable axially of the wheel.

10. In an apparatus of the character described, the combination of a terrestrial globe including a wheel of considerable mass located in the equatorial region, a pivot carried by said wheel, a post projecting into the lower end of said globe, a socket for said pivot located in the upper end of said post, said wheel having an externally threaded central boss thereon, and a weight threaded on said boss and adjustable axially with reference to the wheel.

11. In an apparatus of the character described, the combination of a terrestrial globe including a wheel of considerable mass located in the equatorial region, a pivot carried by said wheel, a post projecting into the lower end of said globe, a socket for said pivot located in the upper end of said post, a circular member encircling said globe and serving to indicate the plane of the ecliptic, a pointer located above the globe and indicating the position of one pole of the ecliptic, and a post projecting from the north polar region of said globe and having a point to cooperate with said pointer.

12. In an apparatus of the character described, the combination of a terrestrial globe including a wheel of considerable mass located in the equatorial region, a pivot carried by said wheel, a post projecting into the lower end of said globe, a socket for said pivot located in the upper end of said post, a stationary annular member encircling said globe and serving to indicate the plane of the ecliptic, a stationary pointer mounted above said globe and indicating the position of one of the poles of the ecliptic, and a post projecting from the north polar region of said globe.

13. In an apparatus of the character described, the combination of a terrestrial globe, and means supporting said globe both for rotation about its axis and also for the gyratory movement of said axis, said means including parts extending into said globe and supporting it internally.

14. In an apparatus of the character described, the combination of a terrestrial globe, and means supporting said globe both for rotation about its axis and also for the gyratory movement of said axis, said means including a pivot point and a socket therefor both located inside the globe.

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