(No Model.)

E. E. FITZ.

GLOBE.

No. 263,886. Patented Sept. 5, 1882.

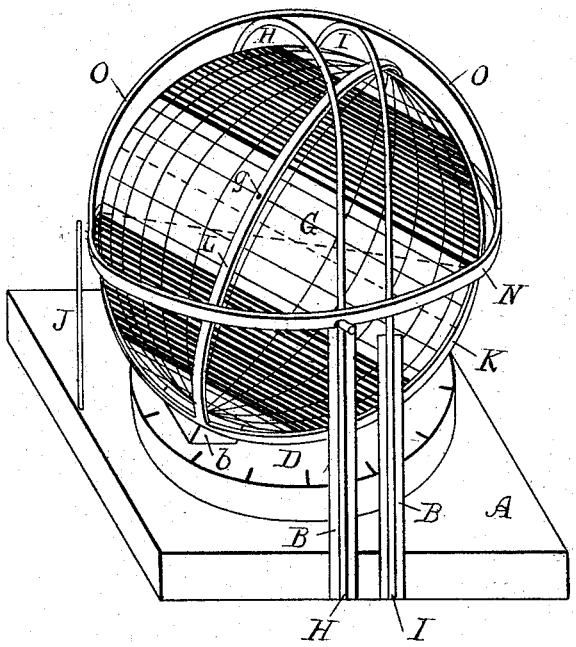
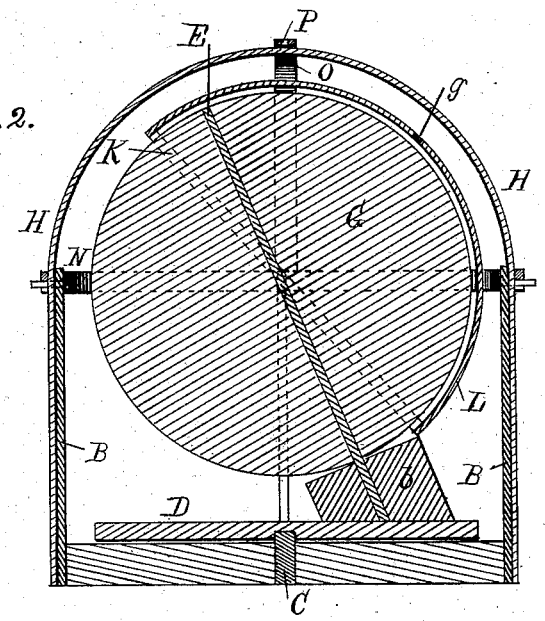


Fig. 1.

Fig. 2.



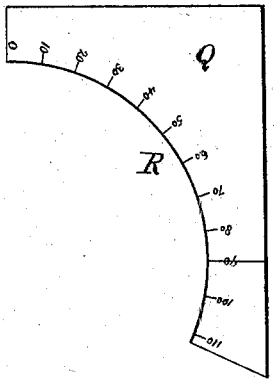


Fig. 3.

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ELLEN E. FITZ, OF SOMERVILLE, MASSACHUSETTS.

GLOBE.

SPECIFICATION forming part of Letters Patent No. 263,886, dated September 5, 1882.

Application filed November 5, 1881. (No model.)

To all whom it may concern:

Be it known that I, ELLEN E. FITZ, a citizen of the United States, residing at Somerville, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Globes; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

My present improvements are based upon a class of globes shown and described in Letters Patent of the United States issued to myself on the 12th day of January, 1875, and reissued on the 8th day of February, 1881. The primary purpose of my globe as above patented is to illustrate and explain the manner in which the earth, in accordance with its diurnal and annual motions, presents its surface to the sun's rays, especially to ascertain the various durations of day, night, and twilight throughout the year at any given terrestial locality, and also to ascertain the points of rising, setting, and culmination of the sun and the course it pursues in its relation to different latitudes. In my present globe I propose, in addition to the above, to illustrate the aspects of the constellations at varying times of the year, together with the shifting position of the stars above any given horizon, thus ascertaining their amplitude, azimuth, &c. In this globe I retain from my patented globe the sun-point, the movable horizon-ring, the smaller arched standard or twilight-circle independent of the horizon, together with the larger arched standard representing the dividing-line between light and darkness, and the disk placed below and rotating with the globe, and having inscribed upon its upper surface the twelve months of the year with minor subdivisions.

My present improvements consist, first, in a globe provided with an outer and inner horizon-ring and their respective semicircular bands, one ring and its band being adapted to give terrestial indications, while the other ring and band give celestial indications, both being capable of use at the same time; secondly, of a globe provided with an arched standard, in combination with an outer horizon-ring, which oscillates on studs attached to the supports of said standard; thirdly, of a globe or ball divided on its surface into contrasting belts, in combination with an inner horizon-ring and an outer horizon-ring, all substantially as hereinafter set forth.

The drawings accompanying this specification represent in Figure 1 a perspective view of a globe embodying my present improvements, while Fig. 2 is a vertical cross-section through the day-circle, and Fig. 3 is a plan of the quadrant-plate.

Reference being had to the above-named drawings, it will be seen that A represents a flat tablet of proper material—usually wood—upon the top of which I erect centrally an upright post, C, which constitutes an axis of revolution for a horizontal disk, D, which is disposed upon such tablet A, and is capable of turning freely about such post. Upon the top of the rotary disk D, and to one side of its center, I erect a second post or rod, E, which slopes inward toward and beyond the center of said disk at an angle of twenty-three and one-half degrees with such top, such post constituting the support and axis of revolution of the ball G, and being formed preferably with a shoulder, *b*, upon which the ball rests and by which it is raised somewhat above the disk.

H I in the accompanying drawings represent two parallel arched standards, which span the ball G, the feet of which are erected upon opposite sides of such ball and upon the top of the tablet A. These standards H I serve to separate the two hemispheres which denote day and night upon the earth's surface, the former, H, representing the circle of illumination or day-circle and the latter the circle which divides the section of the earth's surface within total night from that in twilight, the former phrase, total night, being shown to the right of the standard I, and that in twilight between the two standards. As the standards H I cannot, owing to the passage of the post E, completely encircle the globe, the

day and twilight circles are necessarily incomplete or broken around the south pole; but this defect is unimportant. By means of these standards H I and the sun-point or wire J, (to be explained,) in combination with the ball, I can illustrate the seasons, define twilight in its various phases, compute the length of day and night, mark clock-time, &c.

Upon the upper surface of the disk D, and immediately about its periphery, I inscribe a scale, which divides the said disk into twelve equal intervals, representing the months of the year, these again being subdivided into minor intervals, representing days.

In order to represent the passage of the sun through the signs of the ecliptic and its vertical passage to and fro across the torrid zone during the year, I employ a vertical wire, J, erected upon the tablet A in close proximity to the disk D, which operates in connection with the scale of divisions upon such disk, while the top or point of the said wire serves to denote the parallel illuminated vertically by the sun, and is also midway of that hemisphere of the ball G which denotes the illuminated half of the earth's surface, the half which is in night being shown upon the opposite hemisphere of the ball.

The movable horizon or ring defining any required horizon, (see patented globe,) as shown in the present drawings, is composed of a ring, K, of thin metal, which closely fits the greatest diameter of the ball G, but is not, like the ring in my said patent, provided with a scale of divisions upon its outer surface. Spanning the ring K, (also as in my said patent,) and at right angles to its plane, I employ a semicircular band, L, also of thin metal, this band being intended to represent a semi-meridian at any point upon the ball with which a central perforation or peep-hole, *g*, in such band may be brought into coincidence.

When the globe is to be revolved into a given time of year it is to be moved bodily by and with the disk D, which latter is rotated upon its axis C. When the globe is to be revolved for the purpose of describing the daily course of the sun it is to be rotated upon its axis E, the disk D remaining stationary. It requires one diurnal revolution of the earth to complete a vertical illumination, to which allusion has previously been made in this specification, and whenever a circle upon the earth's surface is said to be thus illuminated it should be borne in mind that but one position within this circle is illuminated vertically at any one instant.

The ball G is, as before stated, destitute of the usual map, the want of this being supplied by an independent atlas-map, of either the heavens or the earth, which is to accompany each apparatus; but the said ball is divided into five parallel belts, which present a marked contrast to each other, and which, as before premised, represent the imaginary zones of the earth's surface, and by means of which the alternate passages of the sun across the torrid zone—north for six months and south for six months—as well as the alternate passages of the frigid zones into day and night, each during a like period of time, can readily be seen at some distance from the globe. The ball G is further provided with the ordinary lines of latitude and longitude, the equator or equinoctial, and the ecliptic, all of which are plainly visible at some distance.

In addition to the primary movable horizon-ring K, before explained, and shown in my patented globe, I employ a second of like construction, of which the circular band or ring is shown at N and its semicircular addition or meridian at O, both being, like the primary ring, without inscription or figures. The ring N has notches in its lower edges, upon opposite sides, to fit upon horizontal studs projecting from the upper part of each post B B, such notches and studs permitting the auxiliary horizon-ring to be turned in a circular path (of which the studs are the centers) about the ball G and outside of the primary ring and the arched standards, the band N having at its center a peep-hole, P.

In working the globe terrestrially the outer or auxiliary horizon-ring is preferably removed, as giving better access to the inner one. In working the globe celestially the pointer-wire J is also preferably removed, though it may be allowed to remain, provided a sufficient space exists between it and the ball for passage of said auxiliary ring.

Q in the drawings represents a flat, thin, rigid sheet of metal or other durable material, having upon one side a circular depression, R, of a quadrant or larger arc of a circle of the radius of the outer or auxiliary horizon-ring. This graduated plate or quadrant when applied to either of the horizon-rings or the larger arched standard (the smaller arched standard never requiring graduation) practically graduates them, thereby dispensing with any divisions or scales upon them, and greatly lessening the cost of the instrument, both as regards labor and material, for the standards in this case can be made simply of round wire.

In using this instrument to illustrate the aspects of the constellations at various times, the shifting position of the stars above the horizon, their amplitude, azimuth, &c.—in other words, as a celestial globe—the division of June 20 on the disk D must be brought into juxtaposition with the sun-wire J, thereby bringing the meridian or semicircular band of the outer or auxiliary horizon-ring, N, coincident with a meridian of the ball G. Said ring is then adjusted by moving its semicircular band or meridian up and down—that is, north and south—the said ball until the peep-hole P in such meridian coincides with the latitude of the desired place.

The inner or primary horizon-ring is adjusted to any required position, when using the globe terrestrially, by placing its peep-hole

(shown in the drawings at *g*) over the latitude of the given place, with its meridian L extending north and south, or in the direction of a meridian of the ball.

When the inner horizon-ring is used to locate any given star, which is done by placing its peep-hole over the position of the star as found upon a map of the heavens, it is unimportant what direction the meridian of such ring takes; but instead of using the ring for this purpose a few important stars may be located on the surface of the ball G by means of figures or other characters, the key to which may be furnished in a manual accompanying the apparatus.

The operator being provided with a map of the heavens and the earth, the positions of stars, cities, &c., are easily located on the ball G by means of their latitude and longitude.

To illustrate the manner of operating with my present apparatus, I append a few problems.

First. To show the course of the sun at Boston on June 20, bring June 20 on the revolving disk below the ball to the sun-wire. Find the latitude of Boston on atlas-map and adjust the inner horizon to this latitude on the ball. Bring the eastern edge of inner horizon to the top of sun-wire, or point representing the sun, for sunrise. Revolve the globe eastward till the western edge of horizon is brought to sun-point for sunset. Noon was shown when the point was opposite the meridian of the ring.

Second. To illustrate the change of the seasons, bring March 20 on revolving disk to sun-wire for beginning of spring. Observe top of said wire opposite the equator of ball, midway of torrid zone, the position of the sun at the vernal equinox. Revolve disk three months forward in the year, and observe sun-point crossing the northern half of the torrid zone and resting at the Tropic of Cancer on June 20, the beginning of summer and time of the summer solstice. Revolve disk forward three months for each succeeding season, and observe the corresponding passages of sun-point.

Third. To find the right ascension and declination of a star. Find position of star on atlas-map of the heavens and place peep-hole of inner horizon over this position on the ball. Revolve ball on axis to bring peep-hole to meridian of outer horizon. To this meridian apply the quadrant with the division marked O over the equinoctial of ball, and the degree of quadrant over the inner peep-hole will be the required declination. The number of degrees on equinoctial between the quadrant or outer meridian and first point of Aries will be the required right ascension.

Fourth. To find the amplitude of any star, its oblique ascension and descension, and its diurnal arc for any given day: Adjust the peep-hole of inner horizon over the position of star as found on atlas-map. Adjust outer horizon to latitude of place. Revolve globe on axis to bring inner peep-hole to eastern edge of outer horizon, and its distance from the east point of this horizon (measured by the quadrant) is the rising amplitude of the star, its oblique ascension the number of degrees between the east point of the horizon and the first point of Aries. Revolve globe on axis to carry inner peep-hole to the western edge of outer horizon for the star's diurnal arc. The distance of peep-hole in this position from the west point of said horizon is the setting amplitude of the star, and its oblique descension the number of degrees between the west point and the first point of Aries.

Fifth. The day being given, to find at what hour a given star comes to the meridian adjust inner peep-hole to position of star, bring sun's place in the ecliptic to outer meridian, turn globe westward till inner peep-hole comes to outer meridian, and the hours passed in turning (intervals of longitude) will be the time from noon when the star culminates or comes to the meridian.

The contrast of the zones is indicated in the drawings by belts alternately blank and provided with shade-lines. Of course on the globe itself the same result may be attained by contrasted colors.

I claim—

1. A globe provided with an outer and an inner horizon-ring and their semicircular bands, one ring and its band being adapted to give terrestrial indications, while the other ring and band give celestial indications, both being capable of use at the same time.

2. The combination, with a globe, of arched standard H and outer horizon-ring, N, which oscillates on studs attached to the supports of said standard.

3. A globe or ball divided on its surface into contrasting belts, in combination with an inner horizon-ring and an outer horizon-ring, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

ELLEN E. FITZ.

Witnesses:
CHARLES BROTHERS,
F. CURTIS.