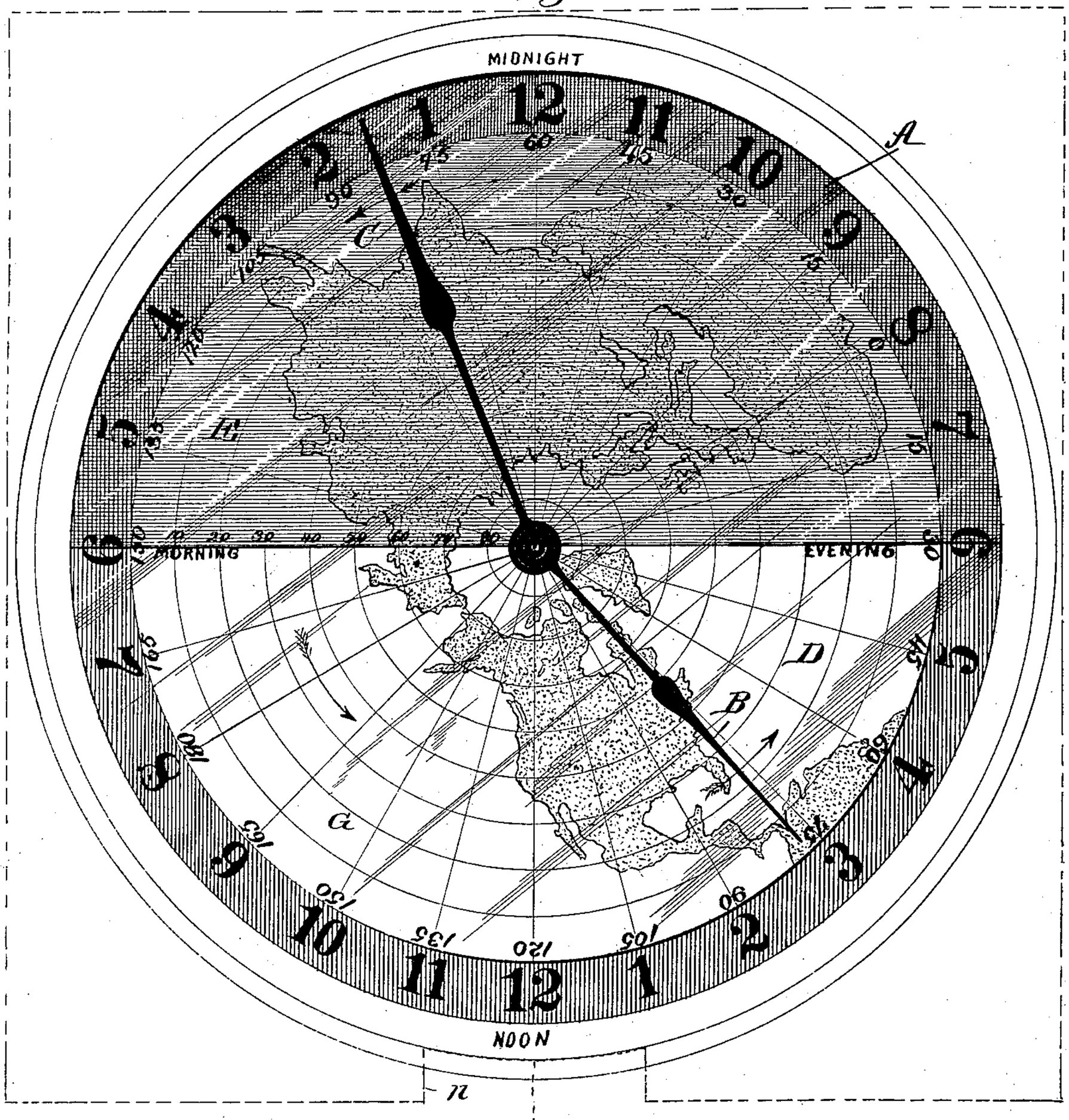
(No Model.) 3 Sheets—Sheet 1.

D. W. THOMPSON.

GEOGRAPHICAL CLOCK DIAL.

No. 557,173. Patented Mar. 31, 1896.

Fig. 1.



WITNESSES:

Fred J. Dieterich

Edw. W. Byrn

INVENTOR

D. W. Thompson.

BY Munn & Co

ATTORNEYS.

(No Model.) 3 Sheets—Sheet 2.

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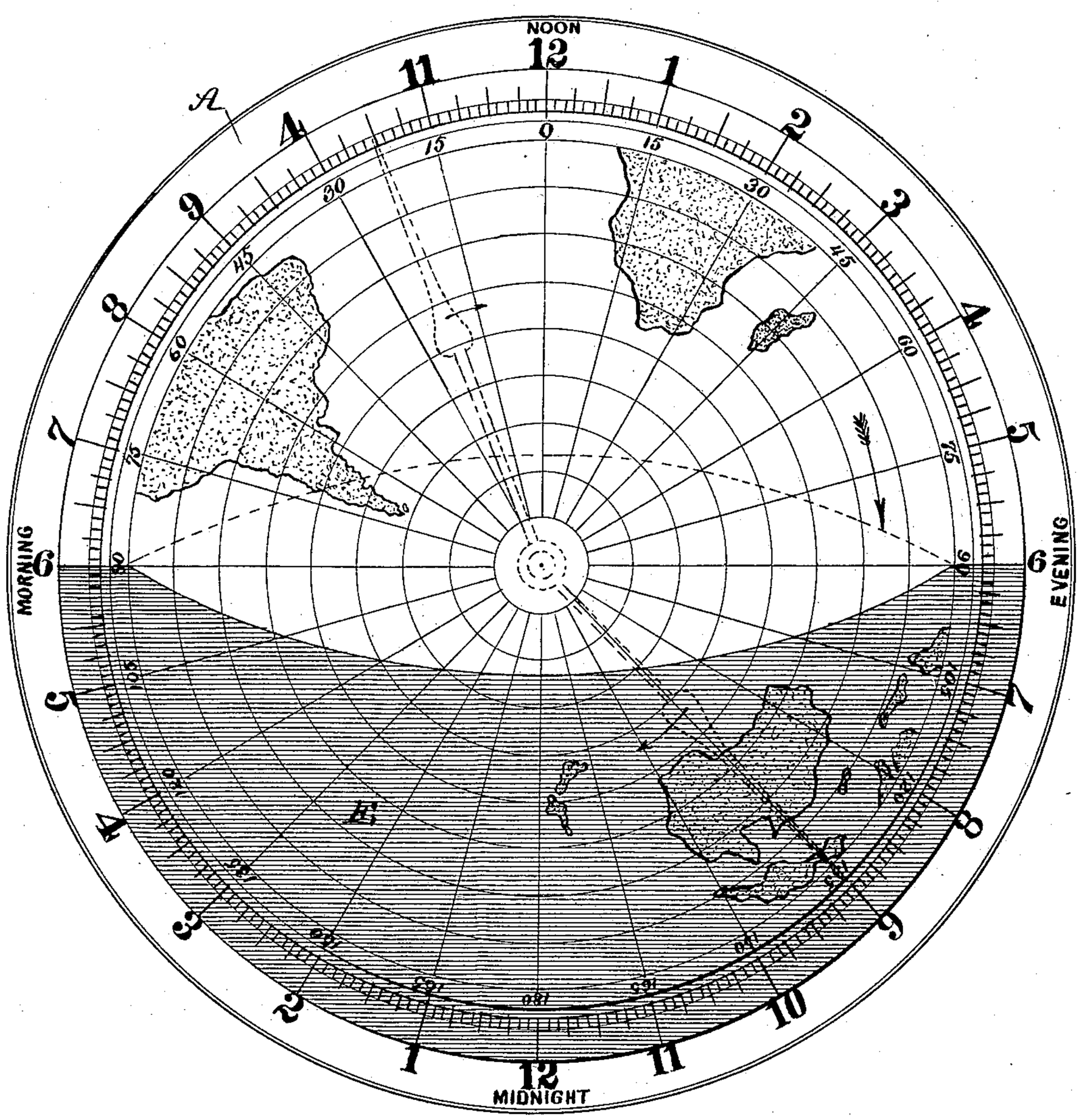
Fig. 2.



WITNESSES:
Fred G. Dieterich
Edw. W. Byrn

INVENTOR
D. W. Thompson.
BY Munn & Co
ATTORNEYS.

ANDREW B. GRAHAM, PHOTO-LITHO. WASHINGTON, D.C.

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Fig. 3

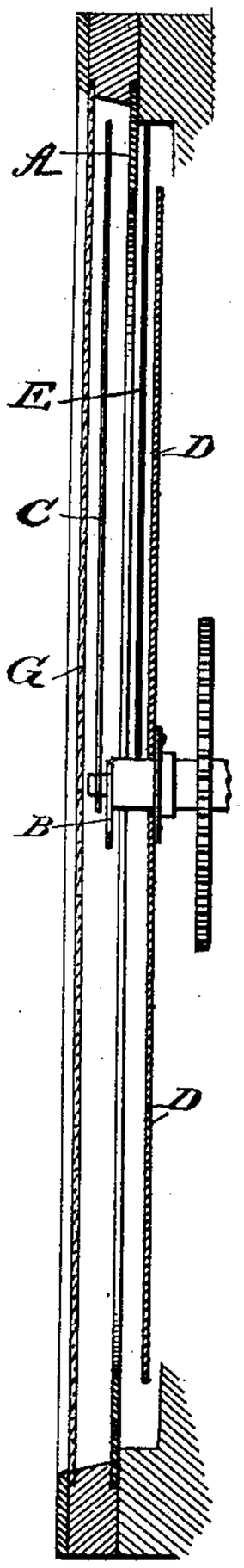
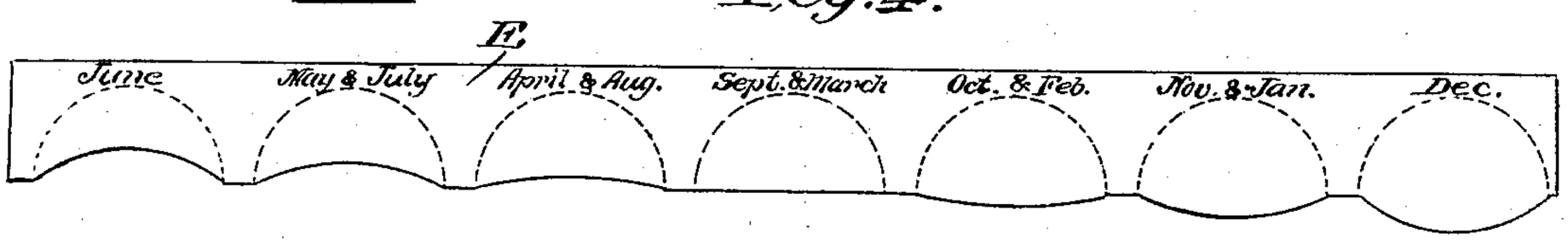


Fig. 5.

Fig. 4.



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Fred G. Dieterich

Edw. W. Byrn.

INVENTOR

D. W. Thompson.

BY Munn & Co

ATTORNEYS.

ANDREW B. GRAHAM, PHOTO-LITHO. WASHINGTON, D.C.

UNITED STATES PATENT OFFICE.

DAVID W. THOMPSON, OF ENGLEWOOD, ILLINOIS.

GEOGRAPHICAL-CLOCK DIAL.

SPECIFICATION forming part of Letters Patent No. 557,173, dated March 31, 1896.

Application filed February 18, 1893. Renewed August 28, 1895. Serial No. 560,820. (No model.)

To all whom it may concern:

Be it known that I, DAVID W. THOMPSON, of Englewood, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Universal Diurnal and Geographical Clocks, of which the following is a specification.

The object of my invention is to provide for the use of educational institutions a clock that will indicate to the eye, in addition to the local time of the place, the time of day or night in all parts of the world, the portion of the earth's surface where daylight prevails and the portion where night prevails, and capable of adjustment to illustrate the same for all seasons of the year and all latitudes, and which shall also illustrate to the eye the rising and setting of the sun in all latitudes and seasons of the year, showing where, when, and why six months' day and six months' night prevail near the poles, the summer and winter solstices, the autumnal and vernal equinoxes, and, in fact, all terrestrial phenomena dependent upon the inclination of the earth's axis to the ecliptic and the revolution of the earth.

To these ends my invention consists of an artificial shadow or screen, the form of which can be changed or adjusted to correspond to the shape of the shadow at all seasons of the year, in combination with a map of the circumpolar hemisphere divided into hours of longitude and connected to rotate with the hour-hand of a twenty-four-hour clock whose dial is numbered in two consecutive series of figures from "1" to "12," to represent the twelve hours of day and twelve hours of night, all as hereinafter more fully described.

Figure 1 is a face view of a clock constructed in accordance with my invention equipped for the northern hemisphere and arranged for rotation reversely to the ordinary motion of a clock. Fig. 2 is a similar view of a clock-face equipped for the southern hemisphere with the hands arranged to rotate in the opposite direction or usual way. Fig. 3 is a section through line $x\,x$ of Fig. 1. Fig. 4 shows a series of the shadow-plates marked to indicate the month united as a continuous strip or ribbon, and Fig. 5 shows how these may be arranged in the clock upon rolls.

Referring to Fig. 1, A represents the dial of a twenty-four-hour clock, which is numbered in two series of figures from "1" to "12" following each other and progressing in direction reverse to that of the ordinary clock.

B is the hour and C the minute hand of the clock, which are geared in the usual way, except that the hour-hand revolves but once (and not twice, as usual) in the twenty-four hours. To the hour-hand is attached concentrically to move with it a disk D, upon which is delineated the circumpolar hemisphere representing in Fig. 1 the northern half of the earth's surface. This map is divided by radial lines from the pole into divisions of longitude representing fifteen degrees each, which are numbered progressively both ways for east and west longitude from "0" on one side of the earth to "180°" on the opposite side, the numbers increasing by fifteen degrees. The spaces between these divisions of longitude are fifteen degrees, each of which represents in the revolution of the earth just one hour of time, so that these spaces or longitude-lines are correlated to the twenty-four hour subdivisions of the dial to couple the subdivisions of time with the various localities on the map.

E is a plate of semitransparent material, such as colored mica, horn, celluloid, or other similar substance which can be made to represent the shadow or shaded portion of the earth's surface to indicate night and still be sufficiently transparent to allow the localities on the map to be read through the same. This artificial or representative shadow is fixed to the face of the clock, so as to be stationary, and yet is made detachable, so as to permit other shapes of shadow to be substituted, for it will be understood that such shadow will only appear semicircular with a straight diameter at the two periods of the year, representing the vernal and autumnal equinoxes. At other times it will be greater or less than a semicircle, dependent upon the angle of the ecliptic and which end of the earth is turned toward the observer.

Referring to Fig. 1, it will be perceived that the side of the earth containing the western hemisphere is turned toward the sun, and over that area it is day, while upon the opposite side, covered by the screen or shadow, it is night. The junction of the line of light

and darkness is, as shown, a straight diametrical line, and with the earth turning in the direction of the arrow the line represents on the left "morning" where the earth is turning into the light, while upon the right, where the earth is turning out of the light and into the shadow, it is "evening" or twilight. Midway between these points on the light side it is "noon," and at a diametrical point on the shadow it is "midnight."

Now to know what time of day or night it is at any point on the earth's surface it is only necessary to extend radially the longitude-line of the place to the outer figures of the clock-dial, whether it be in the shadow or light, the apportionment of the longitude of the earth in hour subdivisions (fifteen degrees) to correspond with the twenty-four numbers permitting this to be instantly observed without calculation. To enable the eye to follow the radial position of the clock-dial figures inward across the surface of the earth, the glass face G of the clock should have radial lines engraved or etched thereon and converging from the several twenty-four marks inwardly to the pole.

When the day and night are equal, the line separating the light and dark side of the earth will be a straight diametrical line passing through the poles, as in Fig. 1, which occurs at the periods of vernal and autumnal equinox. At other times one pole will be a region of continual day and the other one of continual night for a period of six months. This is due to the angle of the earth's axis, or the ecliptic, which holds one pole toward the sun through the complete revolution of the earth and the other in the shadow for the same length of time. To illustrate this, I now refer to Fig. 2, which shows the southern hemisphere, in which the map revolves in the usual direction of the clock-hands and in which the shadow is shown in the position of summer and winter solstice. As shown, the south pole is wholly within the light and there is no night for six months. The dotted curved line shows the position of the shadow after six months have elapsed and the movement of the earth in its orbit has reversed the angle of the ecliptic, and which shows the south pole continually in the shadow for six months.

In the use of my invention I prefer to append the ordinary hour and minute hands; but it is obvious that these are not essential features of my invention, since the geographical location by radiating lines of longitude constitute so many pointers to the several twenty-four hours of the clock-dial as to be sufficient, and the hour and minute hands are only put on to enable the observer to note his local time by easy effort at a more or less remote point from the clock.

In Fig. 3 are shown the different planes which the several features of the clock-dial occupy. The shadow-plates are constructed as a continuous strip or ribbon, as in Fig. 4, which is arranged upon rolls, as in Fig. 5, to be fed successively across the face of the dial to illustrate the different phases of the shadow.

The dial may be used without an actuating-timepiece and without hands as an educational chart, and in such case it will be contained in a frame, as indicated in dotted lines in Fig. 1, and a notch *n* will allow access to the periphery of the map to rotate it, or any other means for rotating it may be used.

I am aware that it is not broadly new to apply a circumpolar map to a clock-dial having twenty-four hour subdivisions and that two shadow-plates have been applied to the opposite ends of a rectilinearly-moving Mercator's map, and I do not claim either of these arrangements. By applying the single shadow-plate to one-half of the circumpolar map a single plate is made to indicate a complete cycle of day and night in a very simple, practical, correct, and graphic way, and I am enabled also to indicate the different phases of the night-shadows along its edge.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

The combination with a circumpolar map made revoluble about a central axis; of a series of movable material representations of the shadowed portion of the earth's surface applied to one-half of said map, and made in the form of a continuous strip having along its edge different shapes corresponding to and indicating the different phases of the earth's shadow, and means for sustaining the same substantially as shown and described.

DAVID W. THOMPSON.

Witnesses:
EDWD. W. BYRN,
J. MIDDLETON.