

(No Model.)

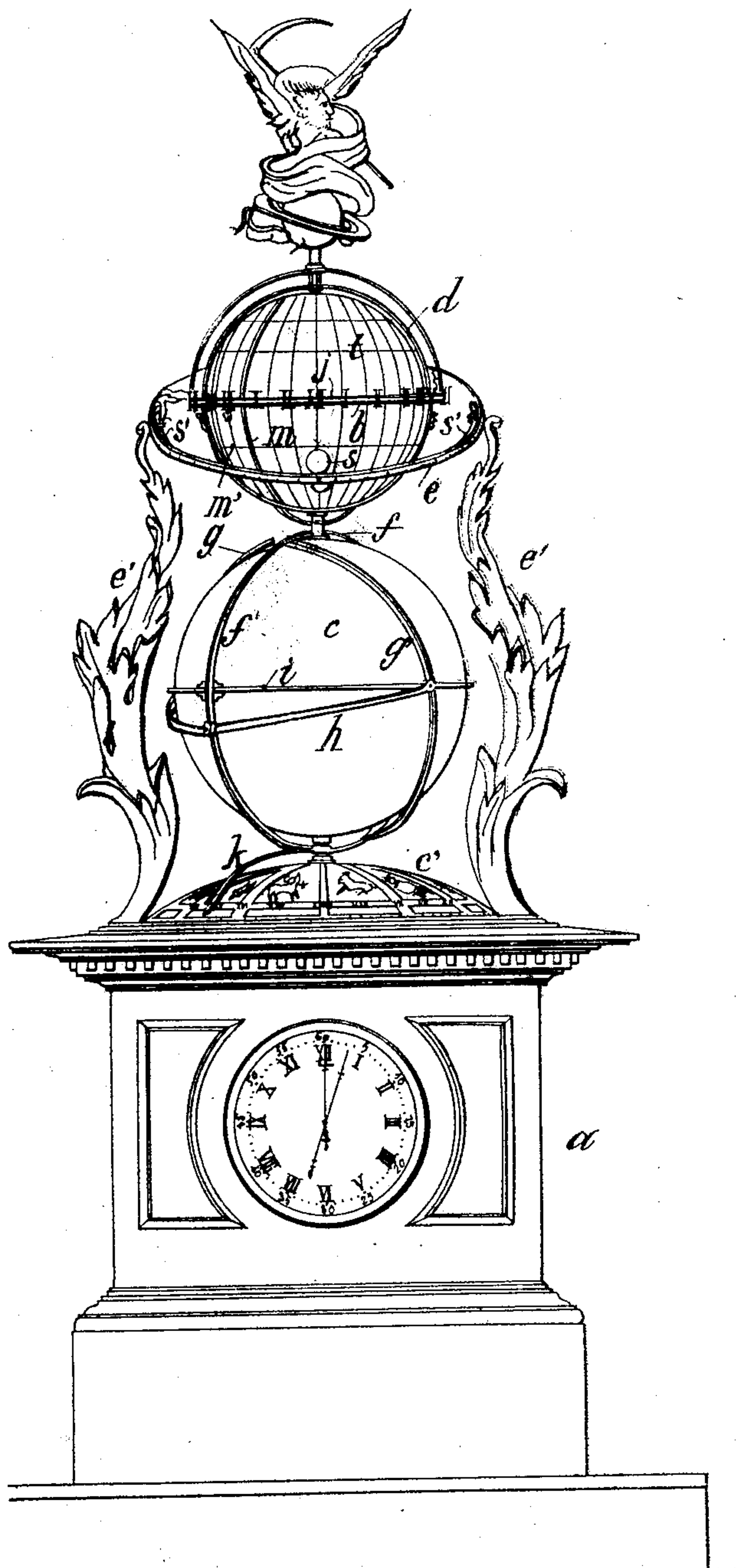
2 Sheets—Sheet 1.

A. G. JOURDAN.
GEOGRAPHICAL CLOCK.

No. 500,659.

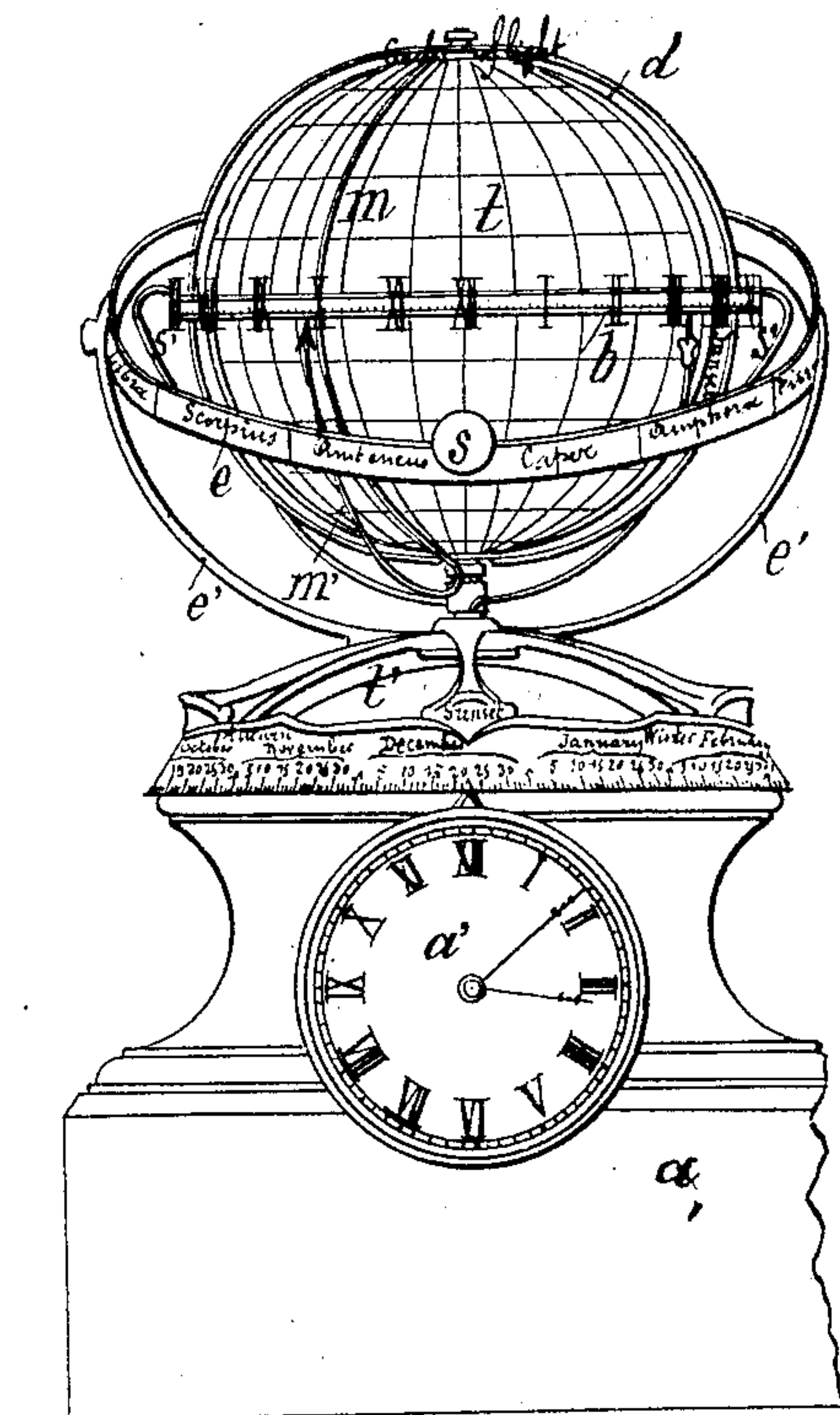
Patented July 4, 1893.

FIG. 1.



Witnesses.
R. C. Mitchell.
H. E. Gouding

FIG. 2.



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(No Model.)

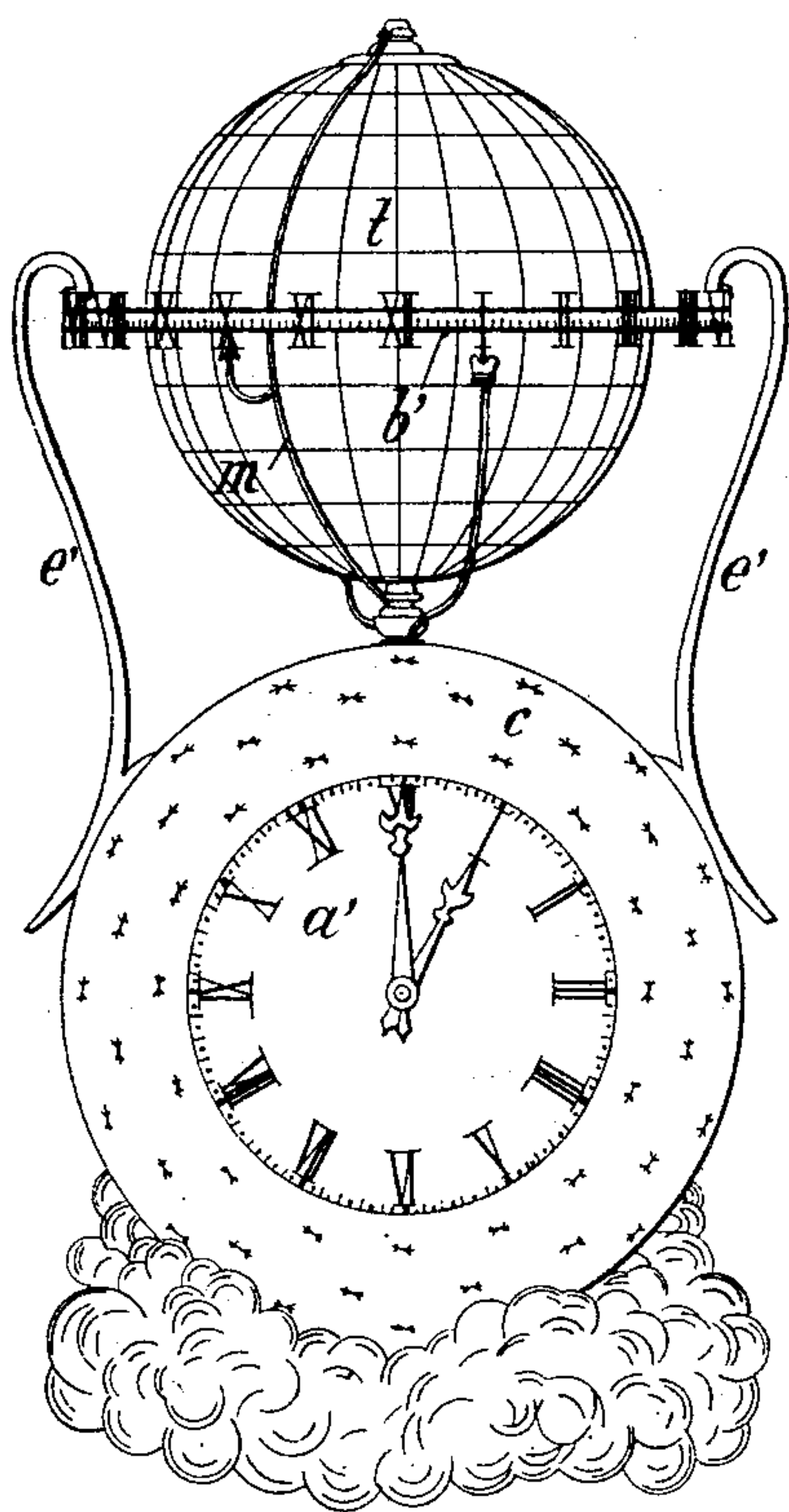
2 Sheets—Sheet 2.

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FIG. 3.



Witnesses.
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H. E. Sinding.

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UNITED STATES PATENT OFFICE.

ARMAND GEORGES JOURDAN, OF PARIS, FRANCE, ASSIGNOR TO HIMSELF
AND SALOMON SYLVAIN LÉVY, OF SAME PLACE.

GEOGRAPHICAL CLOCK.

SPECIFICATION forming part of Letters Patent No. 500,659, dated July 4, 1893.

Application filed January 28, 1891. Serial No. 379,395. (No model.) Patented in France May 14, 1890, No. 205,680.

To all whom it may concern:

Be it known that I, ARMAND GEORGES JOURDAN, of the city of Paris, France, have invented a Universal Astronomical Clock, (for which I have obtained Letters Patent in France for fifteen years, dated May 14, 1890, No. 205,680,) of which the following is a full, clear, and exact description.

My invention relates to a universal astronomical clock indicating at once and without calculation the time of day in all parts of the world, which may be used at any point of the globe, and may furnish either the whole or some of the following additional indications, viz: the day of the month, month and year; longitude and latitude of all parts of the world; the sun's position in the signs of the zodiac, on the celestial globe in time and in degrees, its north and south declination; the solstices and equinoxes and consequently the inversely variable seasons, for the two hemispheres, the position of the great circle of light on the terrestrial globe, and the mean duration of day and night for all latitudes; the position of all stellar sphere with regard to the earth; the celestial meridian corresponding to any point of the terrestrial globe; the celestial horizon of this point, its zenith, its nadir, and eastern and western meridians, and also its sidereal time, or celestial longitude in time and also in degrees.

Reference is to be had to the accompanying drawings, forming part of this specification, which illustrate several more or less complete arrangements of the universal astronomical clock.

Figure 1 is an elevation of my improved astronomical clock, comprising terrestrial and celestial globes, a clock train, an independent movable meridian, which is one of the main features of my invention, and other parts hereinafter described. Fig. 2 is an elevation of my improved clock with only the terrestrial globe, and showing the movable meridian; and Fig. 3 is an elevation of a modified form of Fig. 2.

In said drawings *a* represents a base, on which is placed a clock dial *a'* indicating local civil time, and within which is arranged a clock mechanism or motor of any desired construction; *c* a celestial globe, and *t* a terres-

trial globe, and a universal dial *b*; *s* represents the sun, *d* the great circle of light, *e* the ecliptic circle, *f f'* celestial meridians, *g g'* meridians of orientation of the celestial horizon *h*; *i* represents the celestial equator and *j* the terrestrial equator, the terrestrial globe being provided with fixed meridians. A pointer or indicator is also represented at *k*, Fig. 1.

The celestial globe *c* is mounted on a movable plate or dome *c'*, as shown in Fig. 1, which may bear the signs of the zodiac, the planets and their systems or other useful information. This plate or dome *c* is divided into equal divisions representing exactly the number of days in which the earth revolves around the sun; also a corresponding division into three hundred and sixty degrees and that of twenty-four consecutive or sidereal hours. These several divisions are generally found on celestial globes, but it is preferred to place them in the position specified on the plate or dome as it facilitates comprehension. The plate or dome *c'* is movable normally about a hollow shaft traversing and carrying the terrestrial globe *t*, and which hollow shaft rotates about a rigid stationary rod or shaft which is within the hollow shaft and passes vertically up through the entire apparatus, and adapted to carry on its upper end any desired ornamental symbol or device. This rod also supports in any suitable manner the universal dial *b*.

From the plate or dome extend upward suitable supports *e'*, which carry the ecliptic circle *e*, and in partaking of the movement of the plate or dome, the ecliptic performs one revolution about its axis in three hundred and sixty-five days (365.242 in apparatus of precision) in the inverse direction to the movement of rotation of the earth. This ecliptic circle *e* is inclined at an angle of twenty-three degrees twenty-seven minutes to the plane of the equator, the axial bearings passing through the equinoctial points parallel to said plane, and the line joining said equinoctial points of the ecliptic circle remaining constantly parallel to the planes of the two equators. It may be observed that these planes are in nature reduced to one, as in reality the celestial sphere envelops the

terrestrial sphere and the movement of translation of the latter in space may be considered as nothing. The same line joining the equinoctial points of the ecliptic circle is perpendicular or normal to the axis of the two spheres, the point of the vernal equinox on the ecliptic corresponding exactly to the normal point situate on the celestial globe in the constellation Aries. It is not necessary to take into consideration the variation of this point on the celestial globe due to the precession of the equinoxes, owing to its slowness of movement, there being but one revolution in 25.765 years. The form of the ecliptic is determined by the contour of an oblique plane section through a right cylinder and making an angle of twenty-three degrees twenty-seven minutes with its base; the normal to the axis of the section has consequently the same inclination as to the axis of the cylinder. This ecliptic ring *e* may bear any suitable indications, according to the objects to be attained: the most important would be, for example, the twelve signs of the zodiac and the declinations of the sun, north ascensions and descensions, and south ascensions and descensions from no degrees to twenty-three degrees twenty-seven minutes, these declinations being indicated in degrees and fractions.

The terrestrial globe *t* may be like those now made and used but preferably with many of the surface lines removed as unnecessary in my improved clock. This terrestrial globe is carried by a hollow shaft incasing a fixed vertical rod, or shaft, and adapted to turn or rotate thereon. If this globe be operated by clock work, one complete revolution on its shaft should be completed in exactly twenty-four hours time and its rotation should be from west to east.

I will now describe the independent movable meridian which is one of the essential features of my invention. This movable meridian *m* is pivoted on the shaft above and below the terrestrial globe, and is in all cases arranged and adapted to be turned by hand at will for the purpose of ascertaining comparatively, with the time at any given place on the globe, the time at all other parts, and also generally for obtaining all other indications consequent upon its adjustability and independence. This movable meridian *m* may either be single or double, that is to say, formed of a flat half hoop or ring, or of an entire circle, graduated, or not, as preferred, in degrees, zones, &c., and upon which may be inscribed any suitable information. This movable meridian, either as a half ring or a whole ring, may extend only over the terrestrial globe, or it may be prolonged and extend over both the terrestrial and celestial globes, and may be provided with flat celestial and territorial equatorial rings, graduated or not, and with a circle of light, horizon circle, and orientation circles, and also with index hands or pointers *m'*. When the terrestrial and cele-

tial globes occupy their proper position in relation to each other a number of indications can be obtained, the most important of which have been heretofore enumerated.

The divisions on the movable meridian *m* enable the latitudes of all parts of the globe to be read off, the longitudes being read off from the graduations on the equatorial circle. The universal dial *b* is formed of a circular ring, preferably flat, and is divided into twenty-four hours, in two series of twelve hours each, one for the day, and the other for the night, the graduation or figures being made in the direction of the rotation of the earth from west to east. It is supported and held in position by braces or arms extending downward from the fixed central vertical about which the terrestrial globe revolves, as shown in Fig. 1, or it may be supported and held in position by any desired means. The plane of this universal dial is parallel to that of the equator, as, if it were not so, the division into hours and minutes would be unequal; this dial always remains stationary relatively to the terrestrial and celestial globes.

The figures or symbols representing the twenty-four hours on the universal dial may be painted one-half white, and the other half black in order to indicate the hours of day and night. The separation between the two parts may be made on the line XII—XII or on the line VI—VI, supposing sunrise to be at 6 a. m. and sunset at 6 p. m. These twenty-four divisions on the universal dial may, if desired, be made to correspond to the twenty-four meridian divisions, recently proposed, in order to unify the time; any point of the globe being considered as having the same time as the central meridian of the division in which it is situated, and the original meridian being that of Greenwich.

Upon the universal dial *b*, at two fixed points indicating 6 a. m. and 6 p. m. are arranged bearings or supports for gudgeons or pins to which is secured a metallic ring, constituting the great circle of light *l*. This ring, forming the great circle of light is made flat in section for the sake of greater precision and may also be inscribed with the words, Day, Night, Sunrise, Sunset, Twilight, Dawn, &c. The side facing the sun *s* is that of the day, and when the globe is set to the hour, the countries beneath this circle see the sun rising, and those to the east the sun setting: other indications will be understood without further description. Movable upon its gudgeons the great circle of light *l* also supports, by means of two lateral fixed arms *s' s'* extending out from the gudgeons, the sun *s* which rests freely upon the circle of the ecliptic *e*, which latter, in making one revolution in a year, causes the sun (which always remains normally situate at noon of the universal dial) to rise and fall with reference to the earth, and thus cause it to occupy all its successive positions of declination. As the sun is fixed normal to the center of the great

circle of light, it carries the latter with it in its movement, and causes it to assume exact position which it really occupies at the same moment.

5 When desired, for convenience or otherwise, the position of the spheres may be reversed by placing the celestial globe uppermost, the results indicated remaining so long as their respective movements remain corre-
10 lative, as before described.

The apparatus herein described may or may not be provided with a clock-work and comprise such only of the details as are required for the purposes for which they are intended,
15 whether for educational purposes or for public buildings, &c.

In certain cases, for convenience of construction, the terrestrial globe may be a fixture, and the universal dial be rotated to the
20 extent of one revolution in twenty-four civil hours, in the reverse direction to the real rotation of the earth, the results obtained being identical.

Having thus described my invention, what
25 I claim is—

1. In an astronomical clock the combination of a celestial globe, an ecliptic ring con-

nected to said celestial globe, a terrestrial globe, and independent universal dial ring surrounding said terrestrial globe, and an
30 independent movable meridian *m* adapted to be moved around said terrestrial globe, all said parts being adapted to operate and be operated substantially as described and for the purposes set forth.

2. In an astronomical clock the combination of a celestial globe, an ecliptic ring connected to said celestial globe, a terrestrial globe, an independent universal dial ringsur-
40 rounding said terrestrial globe, an independent movable meridian *m* adapted to be moved around said terrestrial globe, and a great circle of light *d* extending around said terrestrial globe, all said parts being adapted to operate and be operated substantially as de-
45 scribed and for the purposes set forth.

The foregoing specification of my universal astronomical clock signed by me this 2d day of December, 1890.

ARMAND GEORGES JOURDAN.

Witnesses:

ROBT M. HOOPER,
ALBERT MOREAU.