(No Model.) 2 Sheets—Sheet 1.

M. TURNBULL.

DYNAMICAL ARRANGED CELESTIAL SPHERE.

No. 506,084. Patented Oct. 3, 1893.

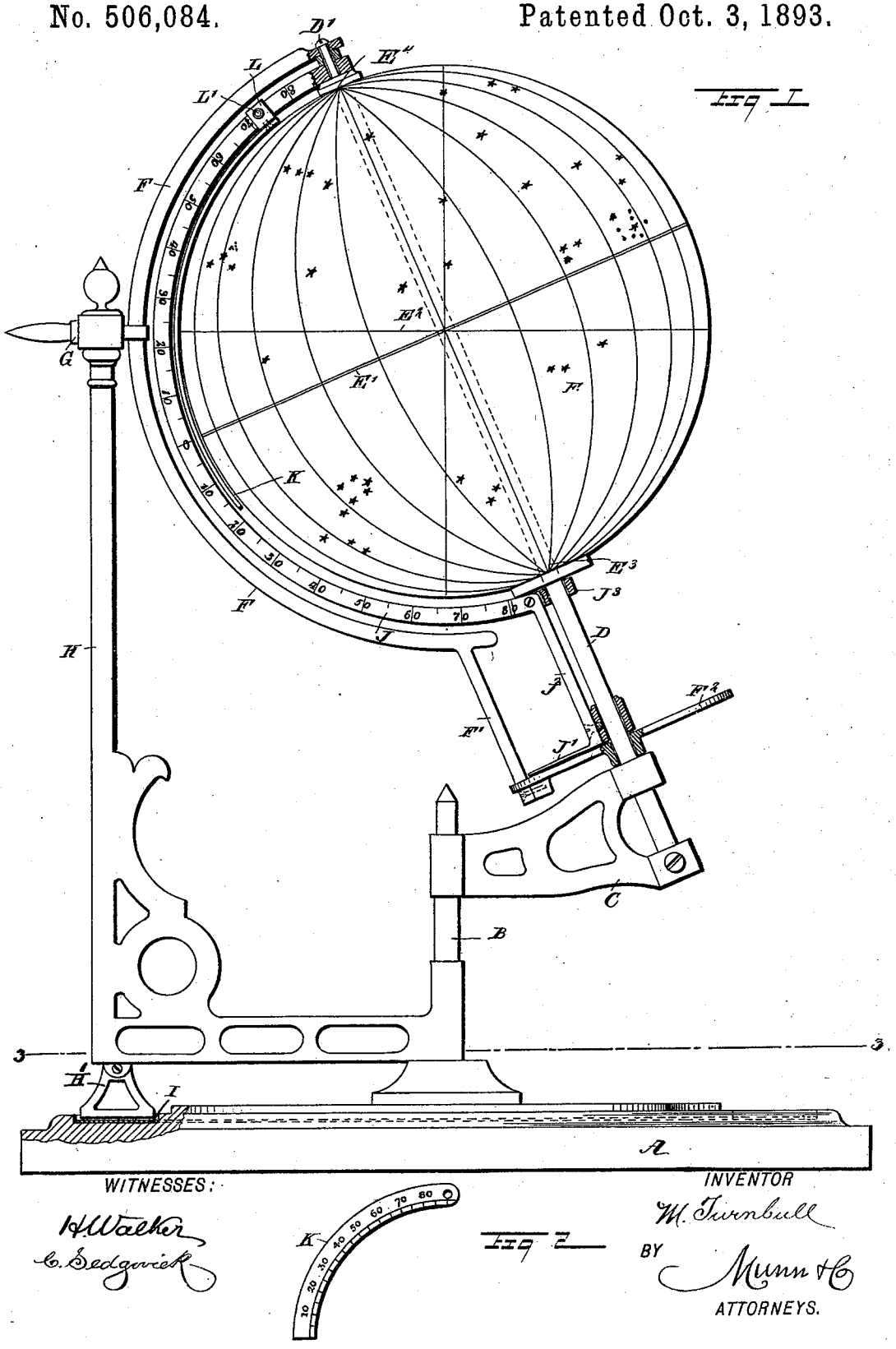

Fig. 1.

Fig. 2.

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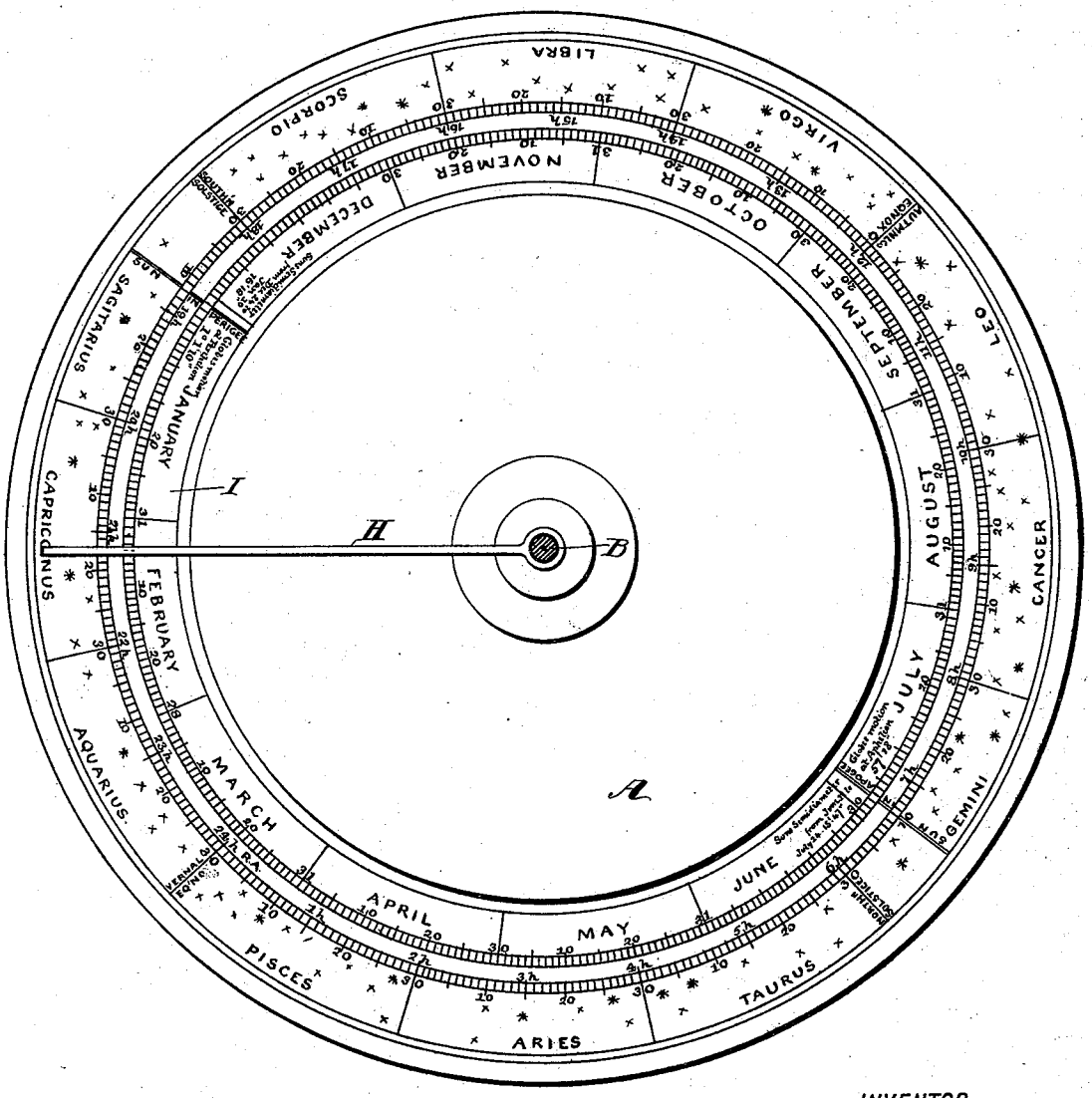
Fig 3



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UNITED STATES PATENT OFFICE.

MUNGO TURNBULL, OF TORONTO, CANADA.

DYNAMICAL-ARRANGED CELESTIAL SPHERE.

SPECIFICATION forming part of Letters Patent No. 506,084, dated October 3, 1893.

Application filed May 31, 1893. Serial No. 476,005. (No model.)

To all whom it may concern:

Be it known that I, MUNGO TURNBULL, of Toronto, in the Province of Ontario and Dominion of Canada, have invented a new and Improved Dynamical-Arranged Celestial Sphere, of which the following is a full, clear, and exact description.

The invention relates to educational appliances, and its object is to provide a new and improved celestial sphere, which is simple and durable in construction, and arranged to permit of conveniently reading the position of any object in the heavens, from pole to pole, on any parallel of latitude or right ascension, at any time during day or night throughout the year.

The invention consists of at least an eighteen inch diameter sphere, provided with a representation of the stars visible to the sixth magnitude on both hemispheres, and means for indicating the positions of the observer on the earth, relative to the sphere and time of observation, to obtain a true vision of the stars on the said sphere from the point of observation.

The invention also consists of certain parts and details, and combinations of the same, as will be hereinafter described and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of the improvement with parts in section. Fig. 2 is a face view of the zenith quadrant; and Fig. 3 is a sectional plan view of part of the improvement on the line 3—3 of Fig. 1.

The improved celestial sphere is mounted on a suitably-constructed base A, supporting a post B, on which is fastened fast a bracket C, carrying the polar axis D, on which is fixed stationary the celestial sphere E, provided on its surface with a representation of all the stars and constellations visible from both hemispheres of the earth. The sphere E is also provided with a line E′ representing the equatorial plane on the sphere, and the circular line E^2 represents the ecliptic plane as plainly shown in Fig. 1.

On the upper end D′ of the axis D is fitted loosely the upper end of the outside celestial meridian F, attached to a horizontally-extending arm G, fastened to an L-shaped bracket H, mounted to turn loosely on the post B, as plainly shown in Fig. 1. On the lower end of the bracket H is secured an index pointer H′, adapted to indicate on a graduated circular band I, representing the zodiac and the days of the month, secured on the base A with its center in the center of the post B.

From the lower end of the celestial meridian F, extends an arm F′, parallel to the axis D, and screwed at its lower end to an eight inch hour circle F^2, is placed a pointer or index J′, projecting from an arm J^2, extending from the lower end of the terrestrial meridian J, placed between the surface of the sphere E and the celestial meridian F. The ends of this terrestrial meridian J are mounted to rotate loosely on the axis D at the poles E^3 and E^4 of the sphere E. The terrestrial meridian J is graduated from zero to 90° in opposite directions from the equatorial line E′ of the sphere E, as will be readily understood by reference to Fig. 1.

Between the terrestrial meridian J and the surface of the sphere E is arranged an altitude or zenith quadrant K, formed with a graduation of degrees as plainly illustrated in Fig. 2, the said quadrant being pivoted on a sleeve L held adjustable by means of a set screw L′ on the terrestrial meridian J. Thus, by adjusting the sleeve L on the said meridian J, the zenith quadrant K may be moved in any desired position to indicate the zenith place and altitude of a star on the sphere E. It will be observed that the terrestrial meridian J gives the zenith place on any parallel of latitude on the earth, where the observer stands, so that a correct view of the visible portion of the celestial sphere E is obtained, it being understood that this view represents the heavens to the observer the same as it will be in nature. The eight-inch hour circle F^2 revolves with the celestial meridian F, the position of which is indicated according to the day of the year by the foot index H′ on the zodiac lithographic band I fixed to the base A.

It is understood that in adjusting the apparatus for observation and use, the observer first places the index H′ over the lithographic

band I, representing the zodiac according to the day of the year, and then turns the terrestrial meridian J to the proper place on the hour circle where the right ascension is given, then finally adjusts the zenith quadrant K to indicate the zenith both of the observer and the celestial object as seen on the sphere E. Thus, any object of which the right ascension and latitude are given can be readily found on the sphere E by adjusting the various corresponding details accordingly. For example, and to illustrate from one of the finished instruments:—What is the position of the brilliant nautical star Regulus, its zenith arc, and distance from meridian at the city of New York, on February 4, at 9h , 15m., p. m.?

Rule: Bring the sun's center G on the ecliptic plane A to the day named, February 4. Next place the index on the hour circle F^2 at the time given, 9h., 15m. Then screw the zenith quadrant K at the latitude of New York, 40° 42′, and bring it over the star, when its zenith arc and altitude will be found.

Answer: The distance of Regulus from the zenith of New York, at the time noted, was 50° 12′, with an altitude above horizon of 39° 48′, and its distance from the meridian was 30° 12′ west.

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

1. The combination with the base provided with a zodiacal circle or band, a horizontally turning bracket or frame pivoted on the base concentric with the said band or circle and having a portion serving as a pointer therefor, and a stationary celestial sphere with its axis at an angle of twenty-three degrees twenty-eight minutes, of a celestial meridian engaging the said axis at its ends and supported between its ends on the upper end of the said frame or bracket, a terrestrial meridian loosely connected at its ends with the axis of the celestial sphere and carrying a pointer at its lower end, an hour circle on which the pointer works, and a zenith quadrant between the celestial meridian and said sphere and adjustably connected with said meridian, substantially as set forth.

2. A celestial sphere with a base having a lithographic band representing the zodiac, and a post provided with a bracket, a shaft secured in the bracket inclined at an angle of twenty-three degrees twenty-eight minutes, a sphere fixed on the said axis and having its center in the axis of the said post, a celestial meridian engaging the said axis and supported on a bracket to turn on the said axis round the sphere, a terrestrial meridian held on the said axis between the sphere and celestial meridian, the hour dial and pointer therefor a sleeve held adjustable on the said graduated terrestrial meridian, and a zenith quadrant pivoted to revolve round the said sleeve and adapted to indicate geometrically the true place of any star or visible phenomenon on the surface of the said sphere, substantially as shown and described.

MUNGO TURNBULL.

Witnesses:
A. W. LAW,
EDW. TROUT.