J. G. Moore,

Astronomical Instrument.

No. 51,072. Patented Nov. 21, 1865.

Fig. 1.

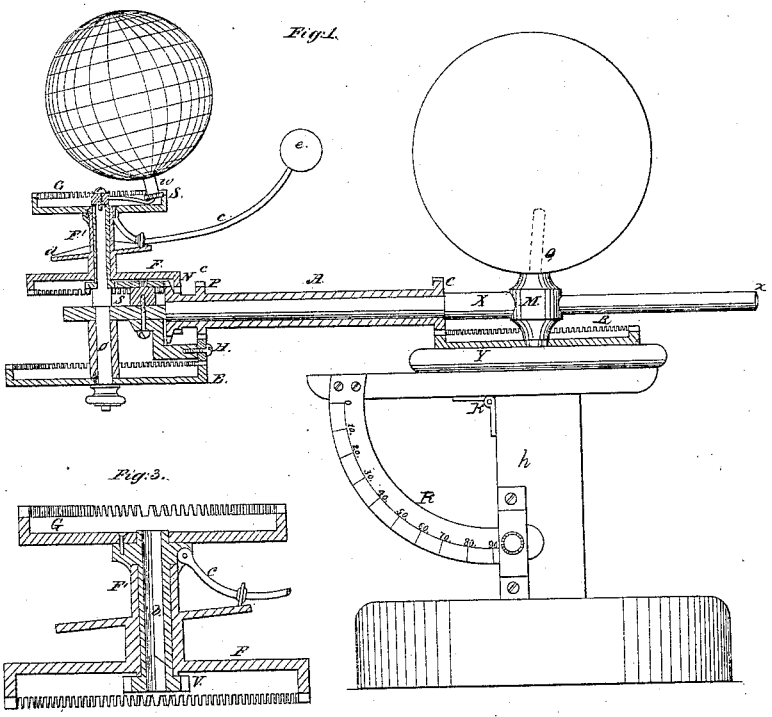
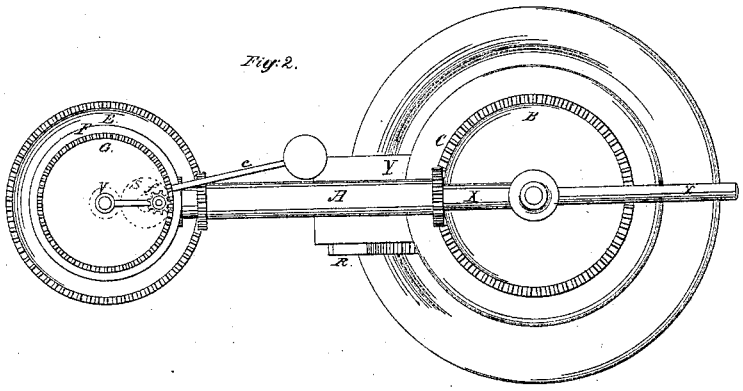


Fig. 3.

Fig. 2.



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UNITED STATES PATENT OFFICE.

JOHN G. MOORE, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN ORRERIES.

Specification forming part of Letters Patent No. **51,072**, dated November 21, 1865.

To all whom it may concern:

Be it known that I, JOHN G. MOORE, of the city and county of Philadelphia, State of Pennsylvania, have made a new and useful Improved Orrery or Apparatus for Illustrating the Phenomena of the Solar System; and I do hereby declare the following to be a full, clear, and exact description of the nature, construction, and operation of the same, reference being had to the accompanying drawings, which made part of this specification, and in which—

Figure 1 is a side view, partly in elevation and partly in section. Fig. 2 is a plan, the spheres being removed. Fig. 3 is an enlarged sectional view, showing the parts more immediately involved in producing the rotation and revolution, respectively, of the spheres representing the earth and moon.

Similar letters in the different figures represent corresponding parts.

The object of my invention is indicated by its title, being an apparatus for illustrating the phenomena of the solar system; and the invention consists in the arrangement of parts producing the appropriate motions.

To enable one skilled in the art to which my invention appertains to construct and use the same, I will proceed to describe it in detail.

Z is a stand upon the table Y, on which is a permanent wheel, B, with cogs on its upper edge. On a pin, Q, occupying a central position on the table, is mounted on a sphere representing the sun, and as it will prevent tautology and add to the perspicuity of the description to call these representative spheres by the names of the bodies whose positions and motions they are designed to illustrate, I shall take the liberty of calling them "sun," "earth," and "moon," respectively.

Rotating upon the pin Q, under the pressure of the hand at *x*, is a shaft, X, near whose outer end is an upright shaft, *o*, on which the various horizontally-moving wheels, with one exception, *s*, are journaled directly or indirectly, and on which is attached the crank-arm *a*, whose wrist *w* forms the pintle on which the earth revolves, as the said shaft *o* is rotated by the gear-wheel E, which engages, by means of an intermediate pinion, H, with the wheel P, near the outer end of the sleeve A, whose inner end carries a cog-wheel, C, which meshes into the crown-wheel B, before mentioned.

It will thus be seen that the rotation of the shaft X upon its axis Q rotates the sleeve A upon the shaft X by the engagement of the wheel C with the crown-wheel B, and the wheel P communicates revolution to the crown-wheel E through the pinion H rotating the vertical shaft *o*, which, although it revolves, yet it retains nearly the same direction in reference to a given line in space. The object of this part of the arrangement is to give the true position of the earth's axis W, which is retained sufficiently near to parallelism with a given line to represent day, night, and the seasons, and at the same time makes a slow revolution, showing the precession of the equinoxes and its effects. The small wheel H aids in obtaining these motions by reversing the direction of rotation of the wheel E.

The number of the teeth of wheel E is proportioned relatively to those of the wheels which actuate it, and for apparatus of moderate size the wheels P and C may have one-fourth as many teeth as B has, while E has one tooth less than B to obtain a slow rotation of the wheel E relatively to the sun, as above mentioned.

At the outer end of the sleeve A, beyond the wheel P, formerly mentioned, are two wheels, N and O, the former of which gears into the spur-wheel F on the outer sleeve F′, which rotates upon and independently of the inner sleeve, *b*, to which the moon-carrier *c* is attached.

On the sleeve F′ is an oblique circular plane, *d*, forming a track for the roller on the moon-carrier *c*. The oblique plane *d*, the sleeve F′, and the wheel F revolve together and preserve (by their rate of rotation and the obliquity of *d*) the moon's orbit in its true position in reference to the orbit of the earth. The proportion of the number of teeth in the wheels N and F is such that F makes about one-fifteenth of a revolution in the period representing one year, and thus shows the recession of the moon's nodes and regulates the phenomena of solar and lunar eclipses.

The crown-wheel G is attached to the upper end of the inner sleeve, *b*, and is revolved with it by means of the gearing-wheel O on the end of the sleeve A, which wheel meshes into the horizontal wheel S, the latter engaging with the pinion V on the sleeve *b*. The

wheel G rotates about twelve times while the whole revolving system completes one revolution about the axis M. It carries the moon *e* around the earth by means of the hinged carrier *c*, and at the same time rotates the earth upon its axis by means of the engagement of the pinion *f* on the earth's axis with the teeth of the wheel G, which are presented thereto.

The object of the interposition of the wheel S is to reverse the motion of G, so as to revolve the moon and rotate the earth from west to east, while the annual motion or revolution of the earth is from west to east. These motions are most easily obtained by giving the wheels O and S the same number of teeth and the wheel V one-third of that number.

The table Y may be inclined at pleasure, being hinged to the standard at K, the graduated arc R indicating the angle. By this inclination I can illustrate the various phenomena of the planets, either with the plane of their orbits parallel to the horizon or inclined to it. The elbows W, as has been stated, are inclined to correspond to the inclination of the axes of the planets to the planes of their orbits. I can thus retain the ecliptic parallel to the horizon, or make the equinoctial of each planet parallel to the horizon, or I can direct the axes of the planets to the proper point in the heavens, as the earth's axis toward the pole-star.

The inclination of the axis of the earth is shown by the position of the pintle W, and may be varied to suit other planetary bodies which may be substituted, or which the sphere may be supposed to represent.

The central sun may be removed and a lamp substituted to illustrate by its incident rays the effect of the sun's rays upon the earth at the solstitial and equinoctial points.

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

1. The combination of the stationary crown-wheel B with the sleeve A, the latter carrying gear-wheels which utilize the horizontal motion of the shaft X in the rotation of the train of wheels which act upon the planet and its satellite.

2. Hinging the table to the standard, in combination with the graduated arc and set-screw, as and for the purpose set forth.

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