

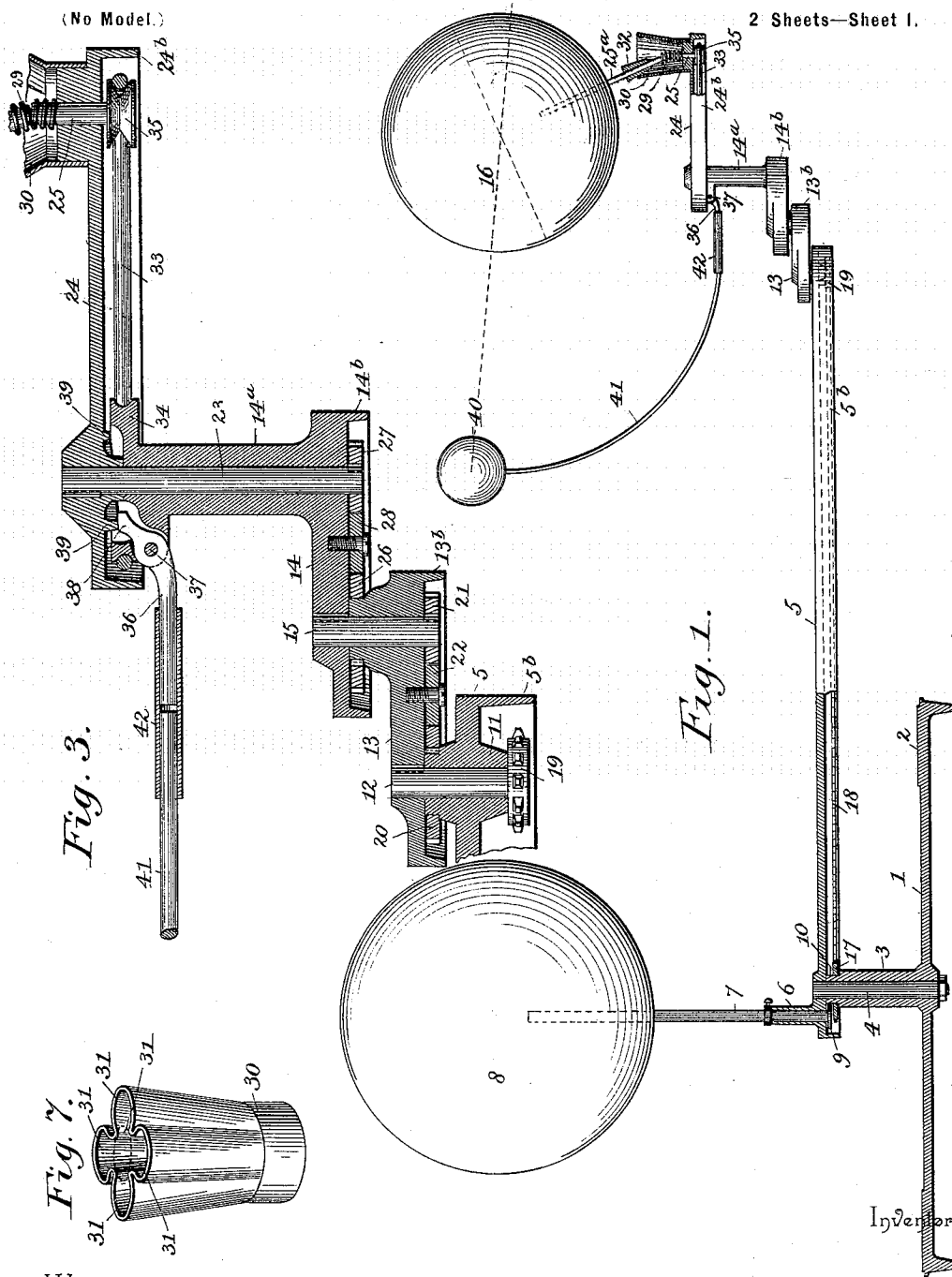
No. 610,317.

Patented Sept. 6, 1898.

A. M. BAKER.
TELLURIAN.

(Application filed July 8, 1897.)

2 Sheets—Sheet 1.



Witnesses

Chas. H. Ourand
W. B. Boyle

By his Attorneys,

Albert M. Baker
Cashow & Co.

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(No Model.)

Fig. 6.

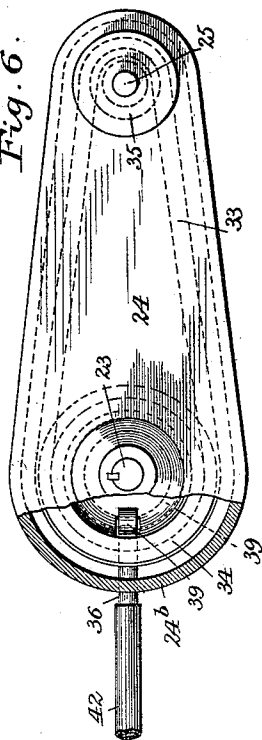


Fig. 5.

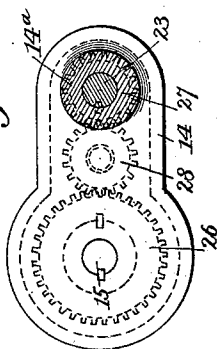


Fig. 4.

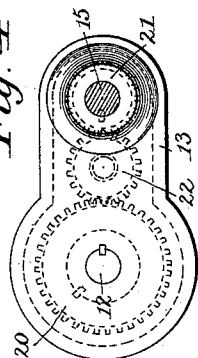
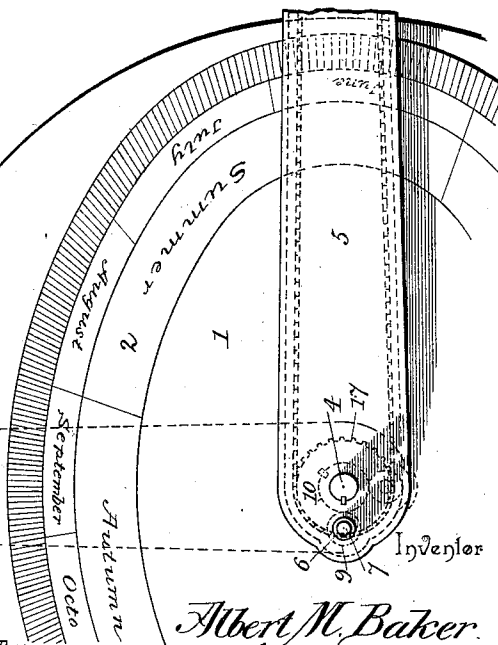
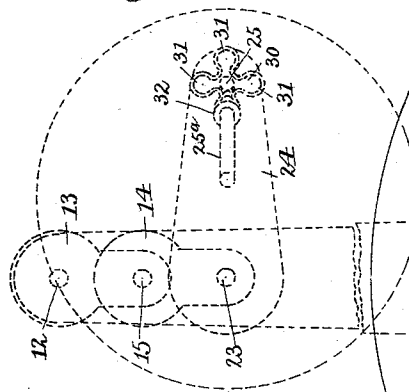
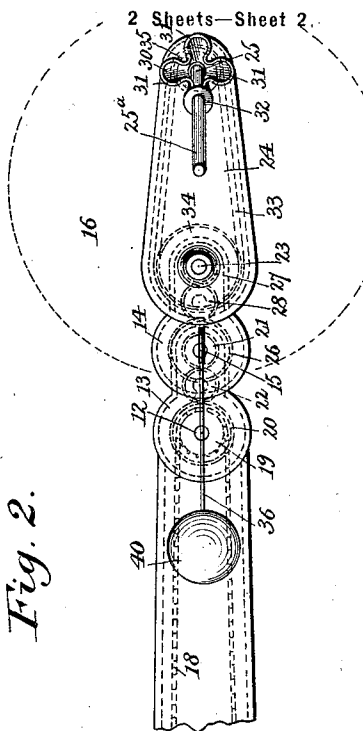


Fig. 2.



Witnesses

Chas. H. Curand
J. E. Kaye

By his Attorneys,

Albert M. Baker.

Cashnow & Co.

UNITED STATES PATENT OFFICE.

ALBERT M. BAKER, OF LEXINGTON, KENTUCKY.

TELLURIAN.

SPECIFICATION forming part of Letters Patent No. 610,317, dated September 6, 1898.

Application filed July 8, 1897. Serial No. 643,885. (No model.)

To all whom it may concern:

Be it known that I, ALBERT M. BAKER, a citizen of the United States, residing at Lexington, in the county of Fayette and State of Kentucky, have invented a new and useful Tellurian, of which the following is a specification.

My invention relates to tellurians, and has for its object to provide a simple and efficient construction and arrangement of parts for illustrating the movement of the sun in its orbit and its axial rotation, to illustrate the diurnal rotation of the earth and its movement around the sun in its elliptical orbit, to illustrate the normal inclination of the earth's axis to the plane of the ecliptic, to illustrate the axial rotation of the moon and its movement around the earth and sun, to illustrate the angular position of the plane of the moon's orbit with respect to the axis of the earth, and to illustrate the position of the sun in the northern focus of the earth's orbit.

Further objects and advantages of this invention will appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a side view, partly in section, of a tellurian constructed in accordance with my invention. Fig. 2 is a plan view of the same, showing in dotted lines the positions of the parts when the supporting-arm has made a quarter-revolution from the position illustrated in full lines. Fig. 3 is a detail sectional view of the compensating disks and carrying-plate. Fig. 4 is a plan view of the inner or lower compensating disk. Fig. 5 is a similar view of the outer or upper compensating disk. Fig. 6 is a similar view, partly broken away, of the carrying-arm. Fig. 7 is a detail view of the cup by which the earth-globe axis is held in the desired position with relation to the plane of the ecliptic.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

1 designates a base having a raised elliptical scale 2, upon which are graduations indicating periods of time, such as the seasons, the months, and days, and rising from the center of the base is a tubular standard or

bearing 3, in which is mounted the spindle 4 of a horizontal supporting-arm 5. This supporting-arm is extended beyond its axis or fulcrum, formed by the spindle 4, and is fitted with a socket 6, in which is arranged the spindle 7 of the sun-globe 8, the lower end of said spindle being preferably provided with a friction-disk 9, arranged in contact with a circular friction-surface 10, formed by the contiguous portion of the tubular standard or bearing 3, whereby as the supporting-arm 5 is rotated the friction-disk 9 by contact with said friction-surface communicates rotary motion to the sun-globe spindle. It will be understood that said means for communicating independent rotation to the sun-globe spindle may be omitted when the axial rotation of the sun at a greater speed than once for each complete orbital revolution of the earth is deemed unnecessary.

It will be understood that as the arm 5 moves around its fulcrum 4, assuming that the multiplying-gear, consisting of the disks 9 and 10, has been omitted, the sun-globe will turn at an angular velocity equal to that of the arm to always present the same point of its surface toward an object, such as an earth-globe, supported at any other point on the arm 5. Hence for each complete revolution of the arm 5 the sun-globe will make one complete revolution upon its own axis. If the sun-globe were to be held from rotation, an object supported by the arm 5 would successively come opposite all points in an equatorial line of the sun-globe. Therefore by applying a friction-gear 9 to the spindle of the sun-globe for coöperation with a fixed friction-gear 10, concentric with the fulcrum of the arm 5, the sun-globe will receive a rotary movement which is in excess of that which it must receive by reason of being carried by the arm 5. If the friction-gears 9 and 10 are of equal sizes, the angular velocity of the sun-globe about the axis 4 as a center will be double that of the arm 5, this being the relative arrangement of parts illustrated in the drawings.

In a bearing 11, formed in the supporting-arm near its free extremity, is mounted the eccentric spindle 12 of one of a pair of compensating disks 13 and 14, the lower disk 13, of which the spindle 12 forms a part, being

provided with a bearing in which is mounted the spindle 15 of the disk 14. The upper or outermost compensating disk 14 carries the earth-globe 16, and it is by means of suitable operating devices actuated by the rotation of the supporting-arm 5 around its axis that the earth-globe receives its elliptical orbital movement.

In the construction illustrated a fixed gear, as a chain-wheel 17, is arranged upon the standard 3 and is connected, as by means of a chain 18, with a gear, as a chain-wheel 19, which is fixed to the spindle 12 of the lower or innermost compensating disk 13, the relative sizes of the gears 17 and 19 being such that the spindle 12, and hence the disk 13, receives rotary motion at an angular speed which is twice that of the arm 5. In other words, the disk 13 makes two revolutions for each complete revolution of the arm 5 around its axis, and the rotation of the disk 13 is in the opposite or reverse direction to that of the arm 5.

Fixed to the arm 5, concentric with the spindle 12, is a gear 20 for communicating rotary motion to a gear 21 on the spindle 15 of the outermost compensating disk 14, an idle-gear 22 being interposed between the gears 20 and 21 to reverse the motion of the latter, whereby as the disk 13 rotates in a direction opposite to that of the arm 5 the disk 14 rotates in the same direction as the arm 5, and hence in the opposite direction to the disk 13. The relative sizes of the gears 20 and 21 are such that the disk 14 turns forward through two complete revolutions with reference to the supporting-arm 5, while the disk 13 turns through two complete revolutions in a reverse or backward direction with reference to said arm 5. In other words, the disk 14 is geared to make two revolutions for each one of the disks 13. The result of this relative arrangement of parts is that when the arm 5 has made a quarter-revolution the disk 13 has made one-half a revolution with relation to the arm 5, while the disk 14 has made a complete revolution with relation to the disk 13 and one-half a revolution with relation to the arm 5. Hence with the disks in the extended position illustrated in Fig. 2 in full lines the movement of the arm 5 to the dotted position shown in said figure will cause a relative movement of the disks 13 and 14, which will extend them inwardly toward the axis of the arm 5 instead of outwardly. At the end of the next quarter-revolution the disks are extended as in full lines, but in the opposite direction.

Carried by the disk 14 is an earth-globe carrying spindle 23, forming one member of the connections between the earth-globe and the disk 14, and the axis of the spindle 23 is at the same distance from the axis of the spindle 15 that the axis of the spindle 15 is from the axis of the spindle 12. In other words, the spindles 12, 15, and 23 are spaced at equal distances, and the relative movements of the

parts are such that the spindle 23 moves always upon lines radiating from the axis of the arm 5 or in a path in alinement with said arm 5. In other words, as the arm 5 is rotated the spindle 23 is moved alternately toward and from the spindle 4, but always in a path in alinement with the arm 5, and this movement of the spindle 23, which carries the earth-globe, imparts to said earth-globe its movement in an elliptical path around the spindle 4. This motion is accomplished by the means described in the following manner: As the arm 5 swings in a direction which will carry it by a quarter-revolution from the position indicated in full lines to that indicated in dotted lines in Fig. 2 the chain 18, which extends around the fixed chain-wheel 17, is strained at its rear side, or at that side from which said arm is rotated. This draft upon the rear side of the chain turns the chain-wheel 19, and by reason of said wheel 19 being of one-half the diameter of the chain-wheel 17 the former will be turned in the opposite direction to the arm 5 at an angular velocity which is equal to twice that of the arm 5. Inasmuch as the disk 13 is fixed to the spindle 12, as is the chain-wheel 19, said disk will be turned in a direction opposite to the arm 5 or rearwardly at an angular velocity which is twice that of said arm. Simultaneously with this movement the gear 21 is receiving rotary motion, for the reason that the gear 20 is fixed to the arm 5, and hence any movement of the disk 13 around its center 12 will cause an independent rotation of the gear 21 and also of the disk 14. Interposed between the gears 20 and 21, however, is an idler 22, and hence the gear 21, instead of rotating in the same direction as the disk 13, is reversed and rotates in the same direction as the arm 5. Hence while the disk 13 is turning backwardly, or in a direction opposite to the arm 5, at an angular velocity which is twice that of the arm 5 the disk 14 is turning in the same direction as the arm 5 and also at an angular velocity which is twice that of said arm. Hence as the movement of the arm 5 proceeds the disk 13 swings rearwardly at a certain speed, the disk 14 swings forwardly at the same speed, and therefore as the disks 13 and 14 are of the same length (or, more accurately, as the distance between the spindle 12 and the spindle 15 is equal to the distance between the spindle 15 and the spindle 23) the spindle 15, instead of moving more or less rapidly than the arm 5, will remain permanently in alinement with said arm. The cooperating gears 20, 21, and 22 so compensate for the rearward-swinging movement of the disk 13 that the spindle 23 cannot move out of a path in alinement with the arm 5. This relative arrangement of parts thus provides for moving the disks 13 and 14 from an outwardly-extended position in alinement, as shown in full lines in Fig. 2, to an inwardly-extended position in alinement, as shown in dotted lines in Fig. 2, when

the arm 5 has moved through an angular path of ninety degrees. The continuation of the movement just described will at the end of the second quarter-revolution again extend the disks 13 and 14 outwardly in alinement, and so on throughout the operation of the mechanism.

The earth-globe-carrying spindle 23 carries a supporting-plate 24, in which is mounted the earth-globe spindle 25, and rotary motion is communicated to the spindle 23 by means of a fixed gear 26 on the disk 13, a pinion 27 on said spindle, and an idle-pinion 28, interposed between the gear 26 and the pinion 27. This gearing causes a backward or reverse rotation of the supporting-plate with relation to the arm 5, the speed of rotation of said plate 24 being such that it makes one complete revolution for each complete rotation of the arm 5, and thereby maintains the axis of the earth-globe at the same inclination throughout said movement. In other words, the axis of the earth-globe is arranged at an inclination to the plane of the ecliptic, said inclination being toward the north at its upper end, and as this inclination is permanent I have adopted the gearing hereinbefore described to cause the supporting-plate to move in the opposite direction to the disk 14 and at a speed in the ratio of three to two therewith.

It will be seen that in the above description I have made a distinction between the "earth-globe-carrying spindle" 23 and the "earth-globe spindle" 25, for the reason that while the former carries the earth-globe and by its linear movement determines the orbital movement of the earth-globe the latter constitutes the axial support of the earth-globe and controls the axial movement and position thereof. The free end of the compensating disk 14 travels in a path corresponding with the orbit of the earth-globe, but by the use of a spindle 23, located upon the free end of this disk 14, I am enabled to employ suitable mechanism for maintaining the earth-globe spindle 25 at a uniform inclination irrespective of the point in its orbit at which the earth-globe may be located.

The inclination of the axis of the earth-globe and the desirability of providing means whereby the inclination thereof may be changed to illustrate the effect which a change in the inclination of the axis of the earth would have upon the seasons have made it necessary to construct said earth-globe axis of sections, of which the upper is secured to the earth-globe and is shown at 25^a, while the lower forms the spindle 25, said sections being connected by a flexible union, such as a coiled spring 29. In connection with this sectional earth-globe spindle I also employ a cup 30, carried by the supporting-plate 24 concentric with the lower or vertical portion 25 of the spindle and having a plurality of seats 31 for the reception of a thimble 32, which is fitted to slide upon the upper section

25^a of said spindle. This thimble is of conical or tapered shape and is adapted to be engaged with either of the seats 31 when the spindle-section 25^a is arranged axially in a seat, and while this construction holds the upper spindle-section at an inclination in the desired direction it does not interfere with the rotation of the spindle.

In the construction illustrated the cup is shown as provided with four seats arranged in a series concentric with the axis of the lower spindle-section 25 and a central seat, which is axially alined with said lower spindle-section, whereby the upper spindle-section may be inclined either toward the north, south, east, or west or may be arranged in alinement with the lower spindle-section 25 to illustrate the different points upon the earth's surface at which the sun's rays would strike if the axis of the earth were arranged in the several positions mentioned, and hence the changes in the seasons and climates at different points upon the earth's surface which would result from a difference in the position of the earth's axis with relation to the plane of the ecliptic.

Various means may be employed for imparting diurnal rotation to the earth-globe, that which I have illustrated consisting of a belt 33, traversing the belt-pulleys 34 and 35, arranged, respectively, upon the disk 14 and the lower spindle-section 25, said disk 14 being provided with an extended or tubular bearing 14^a for the reception of the spindle 23, and the pulley 34 being preferably formed integral with said extension 14^a. A moon-globe-carrying arm 36 is also pivotally mounted, as at 37, upon the extension 14^a of the disk 14 and is provided with a heel 38 in the path of a cam 39, carried by the supporting-plate 24, concentric with the spindle 23, said cam consisting of a rib which depends from the supporting-plate and is irregular in contour, the north side depending to a greater distance than the south. The moon-globe 40 is provided with a stem 41, terminating in a sleeve 42, which is adapted to be removably fitted upon the moon-globe-carrying arm.

From the above description it will be seen that during the movement of the supporting-arm 5 around its fulcrum in the direction indicated by the arrow in Fig. 2 the spindle 23, which supports the earth-globe, receives a radial movement which causes the earth-globe to traverse an ecliptic path, while at the same time the spindle which is coincidental with the axis of the earth-globe maintains a uniform inclination toward the northern point of the heavens. The rotary motion of the compensating disk 14 carries the moon-globe around the earth-globe, while at the same time a reciprocatory movement is imparted to the moon-globe by reason of the cam 39 engaging the heel 38 of the moon-globe-carrying arm, and hence when the moon-globe is north of the earth-globe it is above the plane of the ecliptic, whereas when

said moon-globe is south of the earth-globe it is below the plane of the ecliptic, the inclination of the plane of the orbit of the moon-globe to the plane of the orbit of the earth being five or six degrees. Furthermore, it will be seen by reference to the drawings that the center of the earth-globe is not in alinement with the earth-globe-supporting spindle 23, but is located outside of or south of said spindle when the parts are in the position illustrated in Fig. 1 and in full lines in Fig. 2, but as the supporting-plate 24 maintains its position, extending southward at all adjustments of the mechanism, it is obvious that the center of the earth-globe will remain permanently south of the earth-globe-supporting spindle. Hence when the earth-globe is north of the fulcrum of the supporting-arm 5 or north of the sun it will be closer to the sun than when south of the sun by double the distance between the line of the supporting-spindle 23 and the center of the earth. Hence for the purpose of illustration it may be assumed that the spindle 4 is in the northern focus of the earth's orbit. It is north of the longitudinal center, whereby when the earth is at the northern point of its orbit it is closer to the sun than when in the southern portion of its orbit.

The supporting-arm 5, the compensating disks 13 and 14, and the supporting-plate 24 are provided, respectively, with depending flanges 5^b, 13^b, 14^b, and 24^b to cover the mechanism whereby the various parts are operated and conceal the same from the observers.

Various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

Having described my invention, what I claim is—

1. A tellurian having a pivotal supporting-arm, eccentrically-connected compensating disks, one of which is mounted for rotary movement upon the supporting-arm and the other of which carries earth-globe-supporting devices, and operating connections whereby rotary motion in opposite directions is imparted to said compensating disks, to cause the earth-globe to reciprocate in alinement with the vertical plane of the supporting-arm during the rotation of the latter, substantially as specified.

2. A tellurian having a pivotal supporting-arm, pivotally-connected compensating disks, one of which is pivotally mounted upon the supporting-arm, an earth-globe-supporting spindle mounted upon the other or outer compensating disk, and connections between a fixed point contiguous to the fulcrum of the supporting-arm and said compensating disks, whereby the earth-globe-supporting spindle receives a reciprocatory movement in alinement with the supporting-arm, substantially as specified.

3. A tellurian having a pivotal supporting-

arm, eccentrically-connected inner and outer compensating disks, the former of which is mounted upon the supporting-arm, connections between a fixed gear concentric with the fulcrum of the supporting-arm and a gear on the spindle of the inner compensating disk, an earth-globe-supporting spindle mounted upon the outer compensating disk, a fixed gear on the supporting-arm concentric with the spindle of the innermost compensating disk, and connections between said fixed gear and the spindle of the outer compensating disk, whereby the earth-globe-supporting spindle receives a reciprocatory movement in alinement with the supporting-arm during the pivotal movement of the latter, substantially as specified.

4. A tellurian having a pivotal supporting-arm, eccentrically-connected inner and outer compensating disks, of which the former is mounted upon the supporting-arm and has its spindle operatively connected with a fixed gear concentric with the pivotal point of the supporting-arm, whereby reverse rotary movement is imparted to said inner compensating disk at an angular speed which is double that of the supporting-arm, operating connections for the outer compensating disk whereby it receives rotary motion in a forward direction at a speed which is double that of the supporting-arm, and an earth-globe-supporting spindle mounted upon the outer compensating disk and having a reciprocatory movement toward and from the fulcrum of the supporting-arm and in alinement therewith, substantially as specified.

5. A tellurian having a pivotal supporting-arm, eccentrically-connected compensating disks of which the former is pivotally mounted upon the supporting-arm with its spindle operatively connected with a fixed gear concentric with the fulcrum of said arm, whereby the inner compensating disk receives a reverse rotation at a speed which is double that of the supporting-arm, operating connections for the outer compensating disk whereby it receives a forward rotation at a speed double that of the supporting-arm, an earth-globe-supporting spindle mounted upon the outer compensating disk and adapted to be reciprocated in the plane of the supporting-arm toward and from the fulcrum thereof, and operating connections for said spindle whereby it receives a reverse rotation at a speed which is equal with that of the supporting-arm, substantially as specified.

6. A tellurian having a pivotal supporting-arm, eccentrically-connected compensating disks, the inner of which is mounted upon the supporting-arm, a spindle mounted upon the outer compensating disk, an earth-globe-supporting plate carried by said spindle, operating connections for the compensating disks and spindle, whereby the former receive reverse rotary movement to impart reciprocatory movement to said spindle, and whereby the latter receives rotary movement in a di-

rection reverse to and at a speed equal with that of the supporting-arm, an earth-globe having an inclined spindle, and operating connections for said spindle whereby the earth-globe receives diurnal rotation, substantially as specified.

7. A tellurian having a pivotal supporting-arm, eccentrically-connected compensating disks supported by said arm, operating connections for said disks whereby they receive rotary motion in opposite directions, an earth-globe-supporting plate mounted upon the outermost compensating disk and having operating connections whereby it receives a rotary movement in a reverse direction thereto, and a moon-globe-carrying arm mounted upon said outer compensating disk, substantially as specified.

8. A tellurian having a pivotal supporting-arm, eccentrically-connected compensating disks supported by said arm, operating connections for said disks whereby they receive rotary motion in opposite directions, an earth-globe-supporting plate mounted upon the outermost compensating disk and having operating connections whereby it receives rotary movement in a reverse direction thereto, and a moon-globe-carrying arm pivotally mounted upon said outer compensating disk for oscillatory movement, substantially as specified.

9. A tellurian having a pivotal supporting-arm, eccentrically-connected compensating disks supported by said arm, operating connections for said disks whereby they receive rotary motion in opposite directions, an earth-globe-supporting plate mounted upon the outermost compensating disk and having operating connections whereby it receives rotary movement in a reverse direction thereto, a moon-globe-carrying arm pivotally mounted upon the outer compensating disk, and means carried by the earth-globe-supporting plate for oscillating said arm, substantially as specified.

10. A tellurian having a pivotal supporting-arm, eccentrically-connected compensating disks supported by said arm, operating connections for said disks whereby they receive rotary motion in opposite directions, an earth-globe-supporting plate mounted upon the outermost compensating disk and having operating connections whereby it receives rotary movement in a reverse direction thereto, a moon-globe-carrying arm pivotally mounted upon the outer compensating disk, and a cam on the earth-globe-supporting plate for oscillating said carrying-arm, substantially as specified.

11. A tellurian having a pivotal supporting-

arm, eccentrically-connected compensating disks supported by said arm, operating connections for said disks whereby they receive rotary motion in opposite directions, an earth-globe-supporting plate mounted upon the outermost compensating disk and having operating connections whereby it receives rotary movement in a reverse direction thereto, a moon-globe-carrying arm mounted for oscillatory movement upon the outer compensating disk, a moon-globe having a stem terminating in a sleeve to receive said carrying-arm, and means for intermittently depressing the heel of said arm to impart oscillatory movement thereto, substantially as specified.

12. A tellurian having sun-globe and earth-globe supporting devices, of an earth-globe spindle universally mounted upon said supporting devices and capable of angular adjustment to vary the point on the surface of the earth-globe which is nearest to the sun-globe, and a plurality of rests for the spindle, substantially as specified.

13. A tellurian having a sun-globe, earth-globe-supporting devices, an earth-globe spindle of sectional construction, the upper section carrying an earth-globe and being connected with the lower section by a flexible union, whereby the inclination of the axis of the earth-globe may be varied, a plurality of fixed rests for said upper section of the spindle, and means for imparting rotary motion to the lower spindle-section to impart diurnal rotation to the earth-globe, substantially as specified.

14. A tellurian having a sun-globe, earth-globe-supporting devices, a flexible angularly-movable earth-globe spindle carried by said supporting devices, and a cup having a plurality of seats, either of which is adapted to receive the contiguous portion of the earth-globe spindle, substantially as specified.

15. A tellurian having a sun-globe, an earth-globe-supporting arm, a flexible earth-globe spindle carried by said supporting-arm and means for imparting rotary motion to the earth-globe spindle, a cup arranged concentrically with the spindle and provided with a central and a plurality of lateral seats, and a thimble fitted to slide upon the spindle and adapted to fit in either of said seats, substantially as specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

ALBERT M. BAKER.

Witnesses:

T. H. MERRITT,
BUCKNER McELROY.