No. 881,875. PATENTED MAR. 10, 1908.

F. J. TRIPPENSEE.

PLANETARIUM.

APPLICATION FILED FEB. 16, 1907.

3 SHEETS—SHEET 1

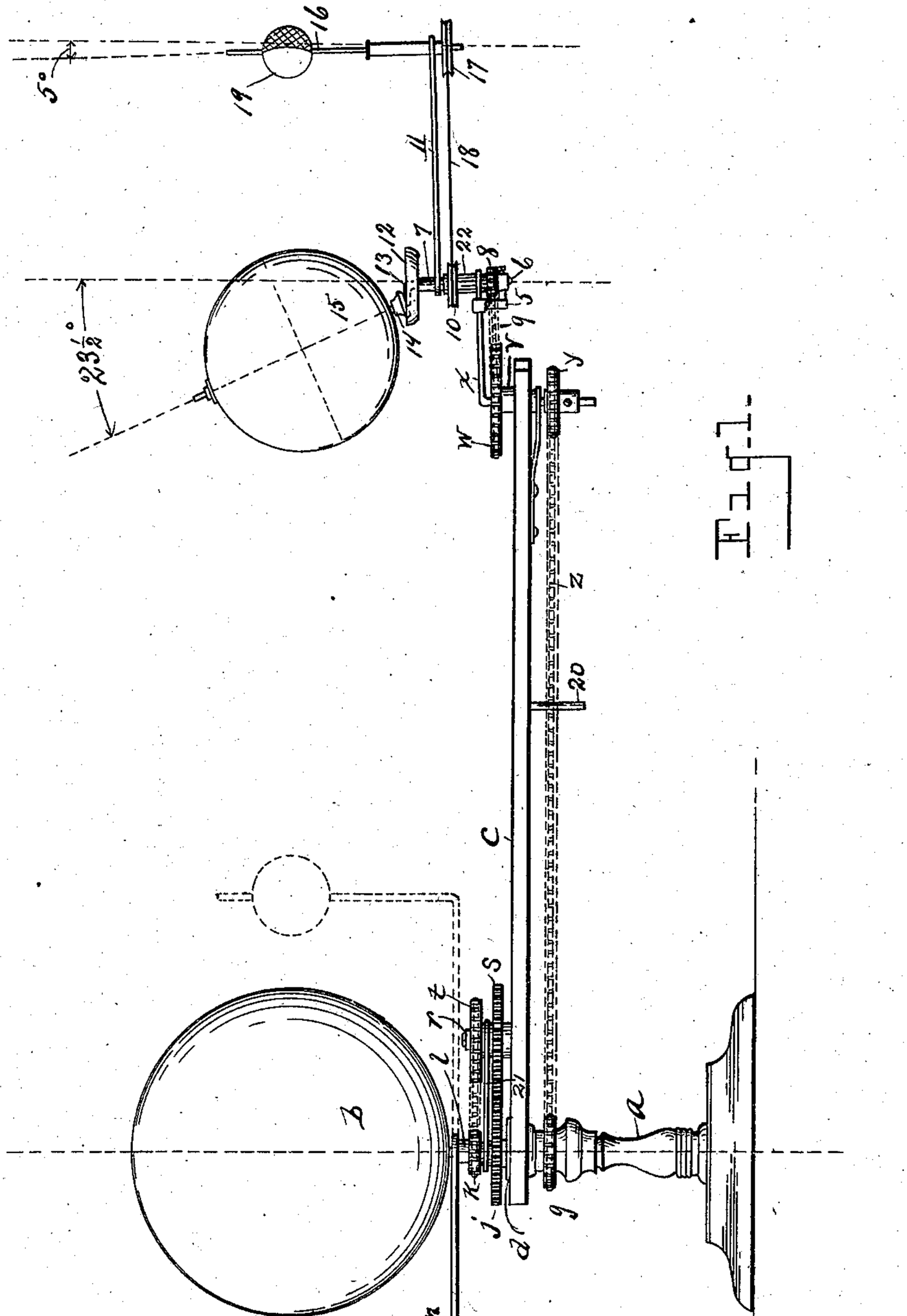


FIG. 1.

WITNESSES

O. B. Baenziger.

E. M. Spielberg.

INVENTOR

Frank J. Trippensee.

By Newell S. Wright.

his Attorney.

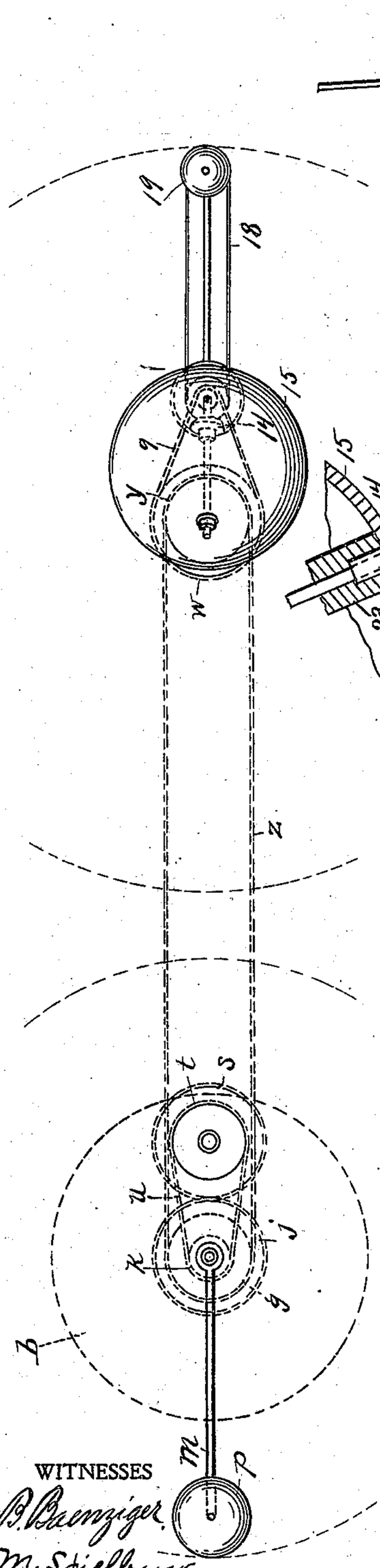
No. 881,875. PATENTED MAR. 10, 1908.

F. J. TRIPPENSEE.

PLANETARIUM.

APPLICATION FILED FEB. 16, 1907.

3 SHEETS—SHEET 2.



WITNESSES

O. B. Baenziger.

E. M. Spielberg.

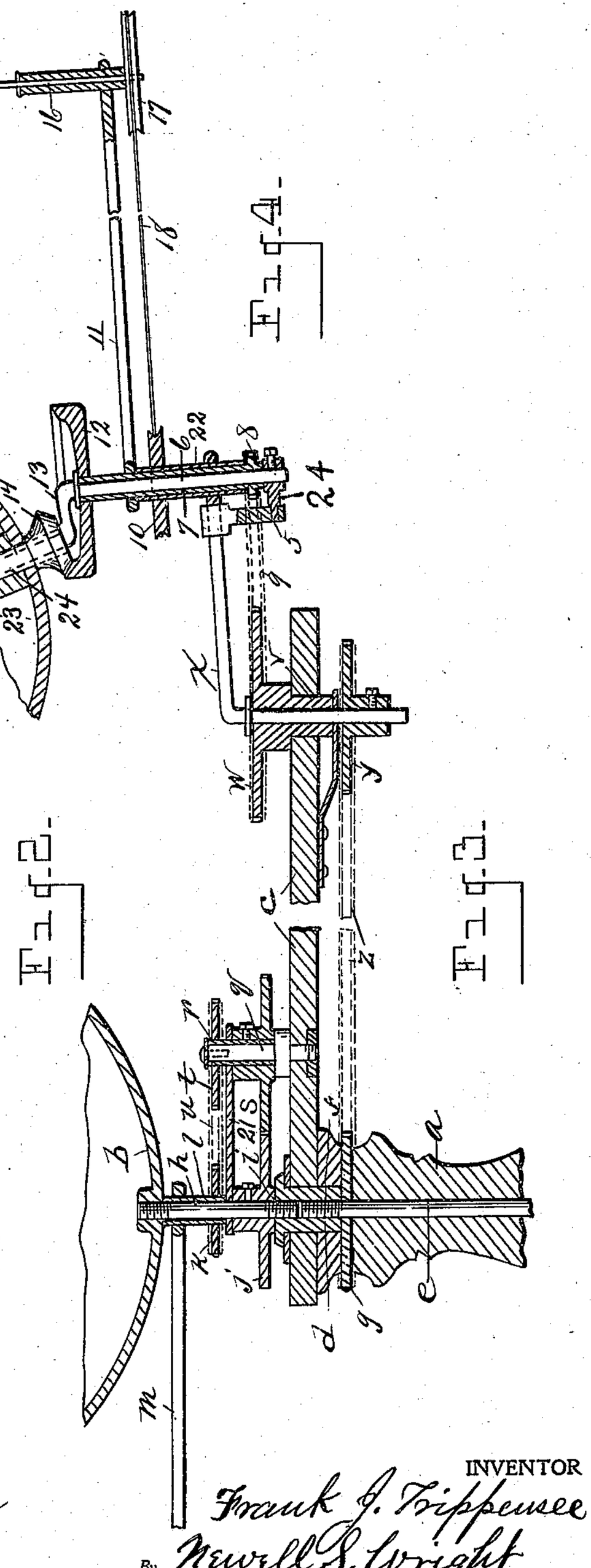


FIG. 4.

FIG. 2.

FIG. 3.

INVENTOR

Frank J. Trippensee

By Newell S. Wright

His Attorney.

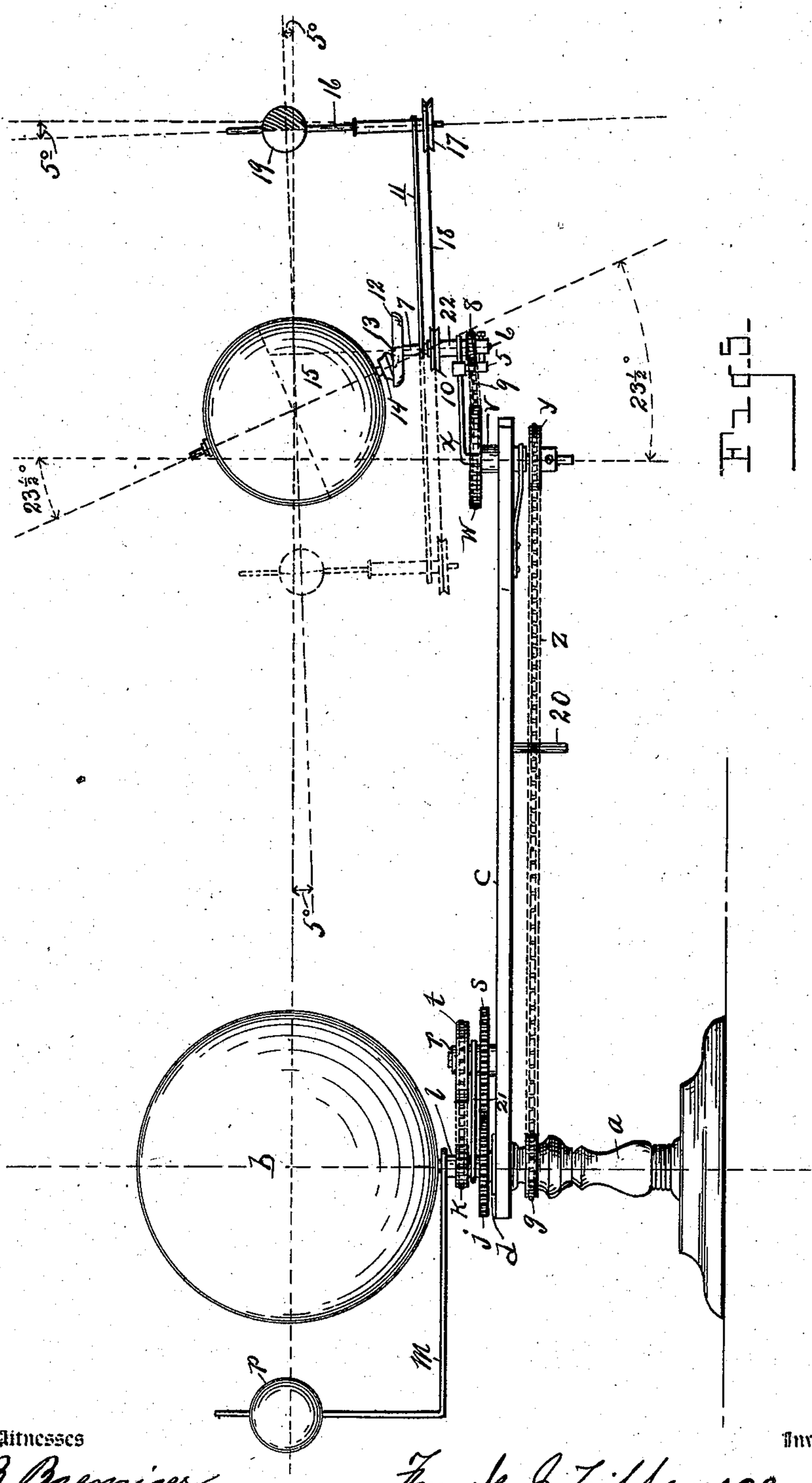
No. 881,875. PATENTED MAR. 10, 1908.

F. J. TRIPPENSEE.

PLANETARIUM.

APPLICATION FILED FEB. 16, 1907.

3 SHEETS—SHEET 3.



Witnesses

C. B. Baenziger.

E. M. Spielberg.

Inventor

Frank J. Trippensee

By Howell S. Wright

Attorney

UNITED STATES PATENT OFFICE.

FRANK J. TRIPPENSEE, OF DETROIT, MICHIGAN, ASSIGNOR TO THE TRIPPENSEE MANUFACTURING COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

PLANETARIUM.

No. 881,875. Specification of Letters Patent. Patented March 10, 1908.

Application filed February 16, 1907. Serial No. 357,717.

To all whom it may concern:

Be it known that I, FRANK J. TRIPPENSEE, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in a Planetarium, of which the following is a specification.

My invention has for its object to provide certain new and useful improvements in a planetarium.

The design of my invention is to provide a device of this class less complicated, more simple, and more efficient than analogous devices heretofore made, the same having for its purpose to illustrate in a general way the movements of certain heavenly bodies.

In an apparatus of this nature, while it may be used for numerous purposes has in view, for example, the use of the same in school rooms and the like.

It will be understood that it will be quite impossible to secure mathematical correctness in the relative magnitudes of the bodies themselves, or in the proportionate distance of one from another, or velocities of movement. For purely illustrative purposes scientific accuracy is not required in every detail, but while scientific accuracy may not be obtained in the sizes and operation of all the parts, it is to be held in view that the apparatus is designed simply to give a general impression or illustration of the movements and other features of certain bodies.

To these ends my invention consists in the construction, combination and arrangement of devices and appliances hereinafter described and claimed and illustrated in the accompanying drawings, in which,

Figure 1 is a view in side elevation. Fig. 2 is a diagrammatic view in plan. Fig. 3 is a view in vertical longitudinal section of portions of the apparatus adjacent to the sun globe. Fig. 4 is a view in vertical longitudinal section of various parts adjacent to the earth globe. Fig. 5 is a view in side elevation similar to Fig. 1, but showing the moon in full lines above the plane of the ecliptic and in dotted lines below the plane of the ecliptic.

In carrying out my invention I will first describe the mechanical features of the apparatus and then describe their operation. To this end *a* represents any suitable supporting standard upon which is carried a representation of the sun indicated at *b*, the sun being stationary upon the standard. A swinging arm *c* is provided sleeved upon the supporting standard in any suitable manner, said arm arranged to move about the sun. As shown the standard is provided with a collar *d*, which may be held in place for example, by means of a bolt *e* projecting through the standard and having a threaded engagement at its upper end with said collar, as shown at *f*, the arm *c* being sleeved upon the collar *d*. A stationary sprocket wheel *g* is also engaged upon the standard *a*, as upon the bolt *e*. The sun *b* is carried upon the supporting standard in any suitable manner, as by means of a threaded spindle *h*, having a threaded engagement with the collar *d*, as indicated at *i*. Upon the spindle *h* is mounted a stationary gear *j*. A rotatable sprocket wheel *k* is also mounted about the spindle *h*, as upon an intervening sleeve *l* upon said spindle. Upon the sleeve *l* is also engaged an arm *m* carrying a representation of Venus, as indicated at *p*, the arm *m* being movable about the sun. Upon the swinging arm *c* toward the end thereof adjacent to the sun globe is mounted an arbor *q* provided with a sleeve *r* thereabout, upon which sleeve is mounted a rotatable gear *s* meshing with the stationary gear *j*. Upon said sleeve *r* is also mounted a sprocket gear *t* rotatable with the gear *s*, upon the arbor *q*. A sprocket chain *u* engages the sprocket wheel *t* with the sprocket wheel *k*, which rotates the Venus arm *m* about the standard *a*.

Toward the opposite end of the swinging arm *c* is mounted a hub *v* carrying a sprocket wheel *w*, said hub and the sprocket wheel *w* being stationary on the arm *c*. A swinging angle arm *x* extends through the hub *v* and carries toward its lower end a sprocket wheel *y* engaged with the sprocket wheel *g* by a chain *z*. The sprocket wheel *y* is stationary upon the angle arm *x*, the angle arm *x* and sprocket wheel *y* moving together. The sprocket wheels *g* and *y* are of the same size, and hold the angle arm always pointing in the same direction, relative to the plane of the ecliptic, or earth's orbit, this causing the change of seasons, throwing the earth's axis at different inclinations relative to the sun. Upon the outer end of the angle arm *x* is engaged a supporting arm indicated by the numeral 5. The arm 5 has a stationary engagement upon the arm *x* and supports a

spindle 6, as by means of an intervening arm 24 having a stationary engagement thus with the arm x. Upon the spindle 6 is located a rotatable sleeve 7 provided with an arm 11 and with a sprocket wheel 8 having a stationary engagement with the sleeve 7, and engaged with the sprocket wheel w by a chain 9. About the sleeve 7 is located an outer sleeve 22 having a stationary engagement with the angle arm x, and upon which is mounted a pulley 10. A friction disk 12 is also engaged upon the sleeve 7, and rotates therewith. The upper end of the spindle 6 is bent or offset above the disk 12 as indicated at 13 and carries a friction wheel or cone indicated at 14 rotatable about the spindle 6, and arranged to have frictional contact with the disk 12. Upon the upper end of the spindle 6 is carried a representation of the earth, indicated at 15, the same being rotatable about the spindle 6, the upper end of the spindle 6 extending upward at a suitable angle, as at an angle of $23\frac{1}{2}$ degrees to the plane of the ecliptic. The earth is revoluble upon the upper end of the spindle 6 independently of the disk 12 when desired, and will be rotated by means of the friction cone 14 when the apparatus is in operation. Upon the outer end of the arm 11 is carried a stationary sleeve through which extends a spindle 16 provided with a pulley 17 at its lower end, having a stationary engagement upon the spindle 16, the pulleys 10 and 17 being actuated by a band or belt 18. The spindle 16 carries at its upper end a representation of the moon indicated at 19. The lower end of the spindle or axis 6 is inclined at an angle of about five degrees to the plane of the earth's orbit, while the upper end of the spindle 6 carrying the earth is inclined at a further angle of $18\frac{1}{2}$ degrees, making the total inclination of the earth's axis $23\frac{1}{2}$ degrees to the plane of the earth's orbit. The lower end of the spindle 6, being at an inclination of five degrees, and the arm 11 being at right angles therewith, and the spindle 16 being at right angles to the arm 11, brings the inclination of the axis of the moon about five degrees to the plane of the earth's orbit. The swinging arm c is provided preferably with an operating handle indicated at 20. A brace arm is indicated at 21.

It will be evident that the sprocket mechanism employed causes positive motion to be imparted to the parts controlled thereby and prevents any loss of motion which would occur by the slipping of belts if they were employed.

It will be evident that by grasping the handle 20, the arm c may be swung entirely about the supporting standard carrying the earth and moon about the sun, the globe Venus also being carried about the sun. At the same time the moon is carried about the earth and the inclination of the earth's axis is likewise changed so as to present the earth's surface toward the sun at proper inclinations corresponding to various seasons.

It will be seen that the apparatus thus described illustrates many features: the rotation of the earth upon its axis, its rotation about the sun, the rotation of the moon about the earth, as well as the travel of the moon and earth in their various relations about the sun, the travel of Venus about the sun, the earth in its orbital motion around the sun with the moon.

The mechanism also illustrates the eclipses of the sun and moon, the apogee and perigee of the moon, also its nodes. The rotation of the moon also shows the cause of the tides. Other features will readily be noted in the studs and use of the device.

My present invention is designed more particularly, as an improvement upon an analogous apparatus for which United States Letters Patent were granted to Alexander Laing, #578,101, March 2, 1897, now owned by the applicant.

The instrument shows the path of the moon about the earth at an angle of about 5° across the ecliptic, crossing the ecliptic at two opposite points in the heavens, thus showing the moon's nodes as already observed, that from south to north called the ascending node, and that from north to south called the descending node.

The various representations of the heavenly bodies hereinbefore mentioned may be called, respectively, a sun globe, a Venus globe, an earth globe, and a moon globe, for brevity and definiteness.

The friction cone 14 is provided with a sleeve 24 projecting into a block or analogous device 23 in the earth globe. The earth's axis is stationary relative to the angle arm by which it is carried. The arm x, it will be observed, is located as above observed, at an angle of 5° from the horizontal to be at right angles with the sleeve 7. The swinging arm 11, it will also be observed, is arranged at an angle of about 5° to the horizontal to give the proper inclination to the axis of the moon globe.

It will be evident that in the rotation of the apparatus the moon will be nearer to the earth at certain periods of its revolution than at others. The moon therefore, it will be seen, is in apogee when in that point of her orbit farthest from the earth, and in perigee when nearest to the earth.

The mode of operation will now be understood. The operator grasping the handle 20 moves the swinging arm c about the supporting standard a and about the sun. By means of the gears j and s and sprocket mechanism k, t, u, acting as above set forth, the Venus globe is simultaneously rotated about the sun. By means of the sprocket mechanism g, y, z, above described, the

swinging angle arm x is held in position to maintain the proper position of the axis of the earth. The sleeve 7 actuated by means of the sprocket mechanism w, 8, 9, carries the friction disk 12. The earth globe 15, carried by the spindle 6, may be revoluble, as above described, independently of the disk 12, whenever desired, the same being rotated also by means of the friction cone 14 in manner above set forth. By means of the pulleys 10 and 17, the spindle 16 is actuated, upon which is carried the representation of the moon. The arm 11, having a stationary engagement upon the sleeve 7 rotates therewith, the same as the friction disk 12, thereby carrying the moon supporting arm 11 about the earth. In this manner the moon globe is carried about the earth as well as about its own axis, while the earth is rotated upon its axis and carried about the sun.

What I claim as my invention is:

1. In a planetarium the combination of a supporting standard, a sun globe carried thereupon, a swinging arm mounted upon said support and movable thereabout, a swinging angle arm upon the outer end of the swinging arm, an axis or spindle carried by the angle arm, sprocket mechanism to actuate said angle arm when the swinging arm is moved, mechanism actuated by the angle arm to actuate said axis, an earth globe carried upon said axis, a moon supporting arm rotatable with said axis, a moon globe carried upon the moon supporting arm, and means actuated by the rotation of said axis to rotate the moon supporting axis and to cause the moon globe to travel about the earth globe, substantially as described.

2. In a planetarium the combination of a supporting standard, a sun globe carried thereupon, a Venus globe carried upon the standard rotatable about the sun globe, a swinging arm mounted upon said standard, sprocket mechanism to rotate the Venus globe about the sun simultaneously with the movement of said swinging arm, an earth supporting axis carried at the outer extremity of the swinging arm, an earth globe upon the axis, sprocket mechanism to drive said axis, friction mechanism to rotate the earth upon said axis, a moon supporting axis movable simultaneously with the earth supporting axis, a moon globe upon the moon supporting axis, and mechanism to rotate the moon upon its axis.

3. In a planetarium the combination of a supporting standard, a sun globe carried thereupon, a swinging arm sleeved upon the standard, a sprocket wheel carried upon the standard, an angle arm carried upon the outer extremity of the swinging arm, a sprocket wheel in engagement with the sprocket wheel upon the standard to actuate the angle arm, an earth axis carried upon the angle arm, sprocket mechanism upon the said axis, an earth globe upon said axis, friction mechanism to rotate the earth globe upon its axis, a moon supporting arm upon said axis and rotatable therewith to carry the moon about the earth, and means to rotate the moon upon its axis.

4. In a planetarium the combination of a supporting standard, a collar upon the standard, a swinging arm upon said collar, a threaded spindle engaged with said collar, a gear upon said spindle, a sleeve upon said spindle, a sprocket gear upon said sleeve, a swinging arm carried by said sleeve, a Venus globe carried by the last named arm, a sun globe carried upon said spindle, an arbor upon the first named arm, a gear upon said arbor in mesh with the first named gear, and a sprocket gear upon said arbor connected with the first named sprocket gear.

5. In a planetarium a supporting standard, a sun globe carried thereby, a swinging arm carried by the standard and movable thereabout, an earth globe carried by said swinging arm, a moon globe carried upon the swinging arm rotatable upon its axis and about the earth, and friction mechanism to rotate the earth globe upon its axis.

6. In a planetarium a supporting standard, a sun globe carried thereupon, a swinging arm carried by the standard and movable thereabout, an axial spindle carried upon the outer end of the swinging arm, a sleeve about said spindle, sprocket mechanism to actuate said sleeve, and friction mechanism carried by said spindle and by said sleeve to rotate the earth globe.

7. In a planetarium the combination of a supporting standard, a sprocket wheel upon said standard, a swinging arm upon said standard, a hub toward the outer extremity of the swinging arm, an angle arm carried by said hub, sprocket mechanism to actuate said angle arm when the swinging arm is moved, an axial spindle having a stationary engagement with said angle arm, an inner sleeve upon the axial spindle, sprocket mechanism connected with said hub to actuate said inner sleeve, a moon supporting arm carried by said inner sleeve, an outer sleeve upon the axial spindle, a pulley upon said inner sleeve, a moon supporting axis carried by said moon supporting arm, pulleys upon said moon supporting axis and upon said outer sleeve to rotate the moon supporting axis, a friction disk upon the inner sleeve an earth globe upon the axial spindle, and friction mechanism upon the inner sleeve and upon the axial spindle to rotate the earth globe.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK J. TRIPPENSEE.

Witnesses:

N. S. WRIGHT,

E. M. SPIELBURG.