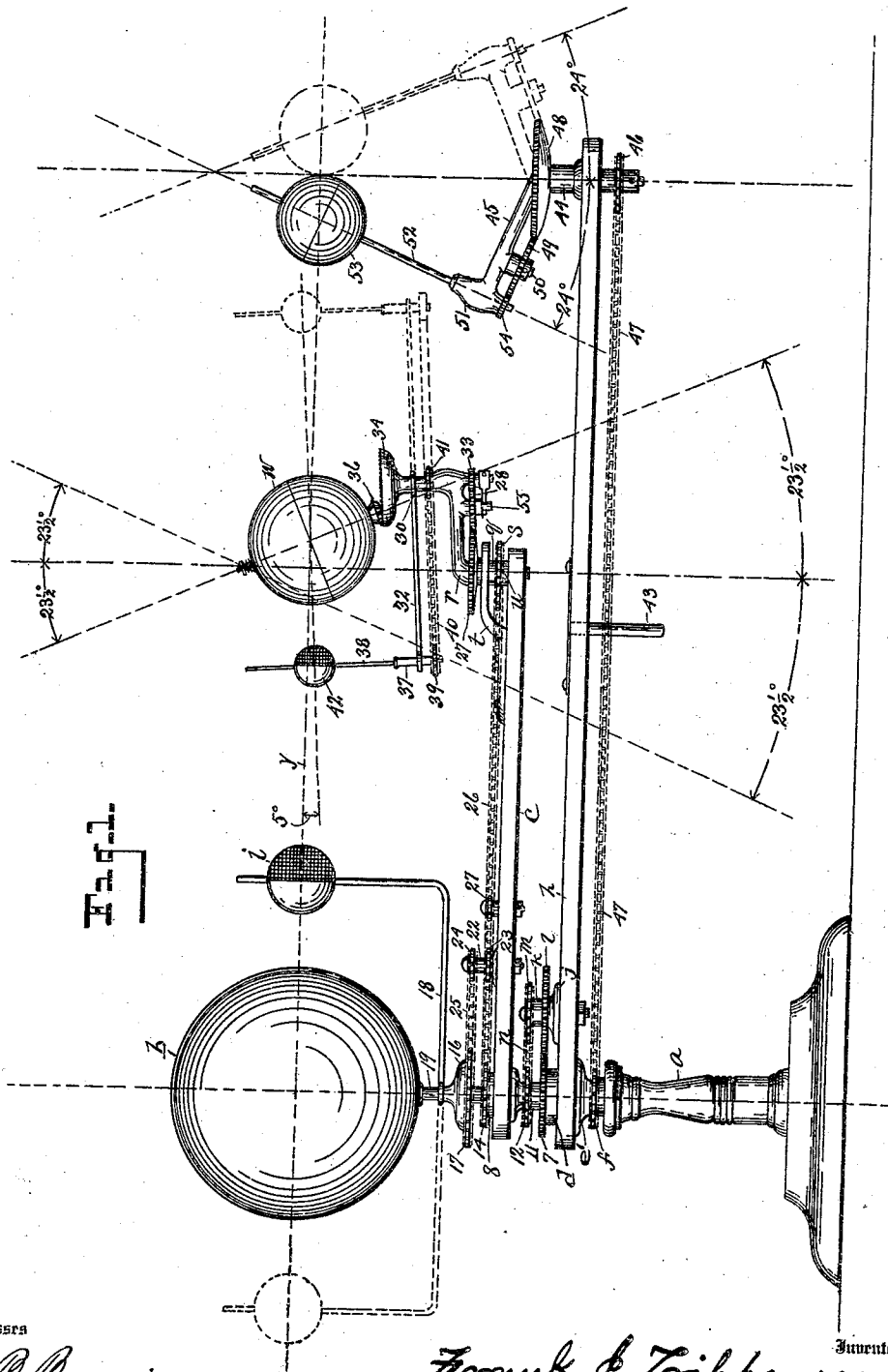


F. J. & W. F. TRIPPENSEE.
PLANETARIUM.
APPLICATION FILED SEPT. 28, 1908.

937,892.

Patented Oct. 26, 1909.
2 SHEETS—SHEET 1.



Witnesses

O. R. Baenziger.
B. E. M. Gram

Frank J. Trippensee
William F. Trippensee
By Newell S. Wright.
Attorney.

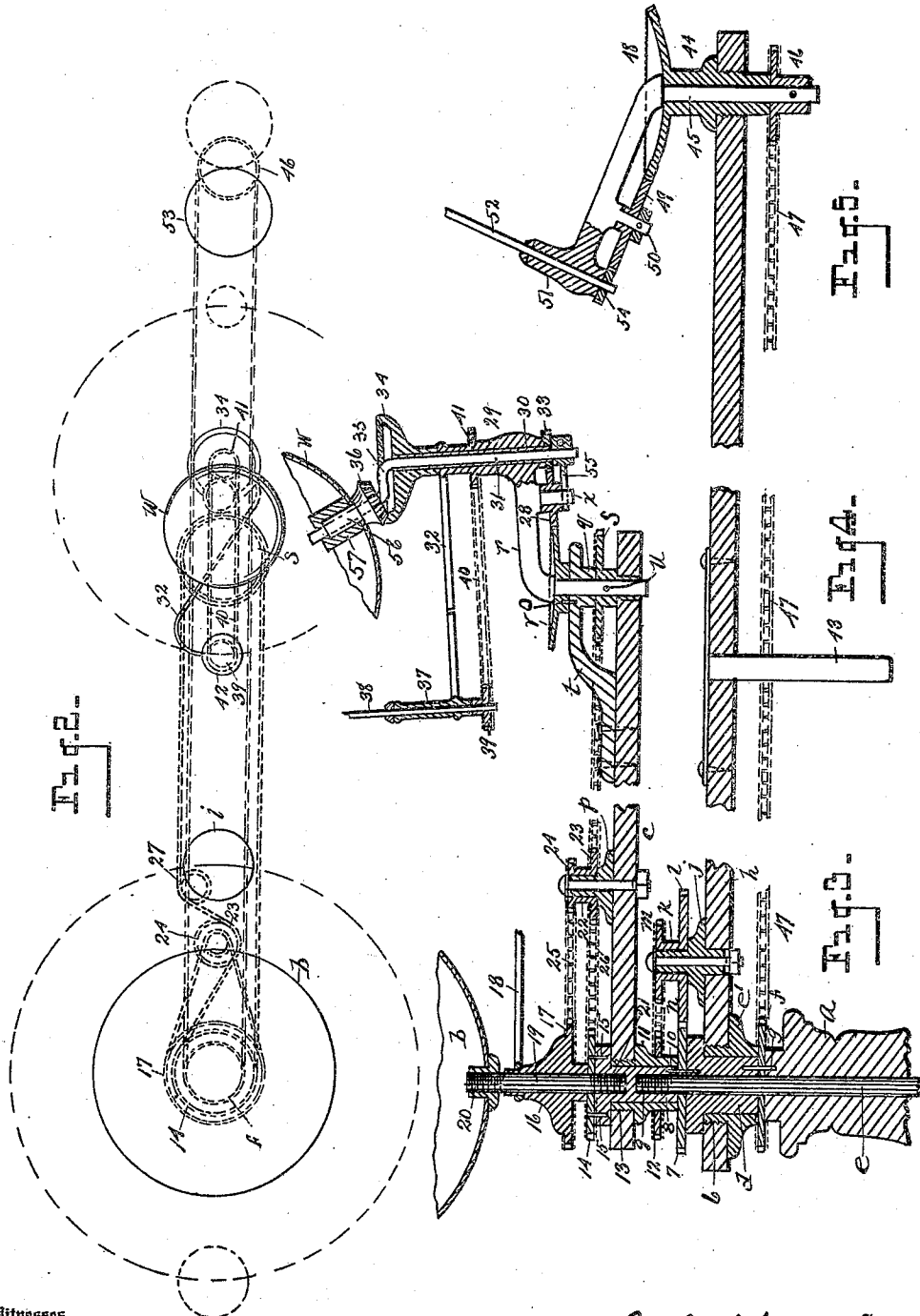
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L. E. McCarrahan

Frank J. Trippensee
William F. Trippensee
By Newell S. Wright,
Attorney.

UNITED STATES PATENT OFFICE.

FRANK J. TRIPPENSEE AND WILLIAM F. TRIPPENSEE, OF DETROIT, MICHIGAN.

PLANETARIUM.

937,892.

Specification of Letters Patent.

Patented Oct. 26, 1909.

Application filed September 28, 1908. Serial No. 455,105.

To all whom it may concern:

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

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

Our present invention embodies certain features of construction embraced in United States Letters Patent granted March 10th, 1908, No. 881,875, together with various improvements and additions, our present planetarium including a Mars globe, and means for actuating the same.

The design of our invention as in the patent referred to, is to provide a device of this class, 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. 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 the other, 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 such a planetarium, in the sizes and operation of all 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 embodied in the instrument.

To these ends our present invention consists in the general 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 certain parts being omitted. Fig. 3 is a view in vertical longitudinal section of the portions of the apparatus adjacent to the sun globe. Fig. 4 is a view in vertical longitudinal section of portions of the apparatus adjacent to

the earth globe. Fig. 5 is a view in vertical section adjacent to the Mars globe.

The mechanical features of the apparatus are as follows: Any suitable supporting standard is represented at *a* upon which is carried a representation of the sun or sun-globe indicated at *b*, the sun-globe being held stationary upon the standard as hereinafter described. A swinging earth supporting arm *c* is provided sleeved upon the supporting standard in any suitable manner, said arm arranged to move about the standard, to carry the earth globe about the sun. As shown the standard is provided with a hub *d*; which may be held in place, for example, by means of a bolt *e* projecting into or through the standard, provided with a sleeve *e'* upon the hub *d*. A sprocket wheel *f* is also engaged upon the standard *a*, said sprocket gear being held stationary in any suitable manner, as by a pin *g* engaging the sprocket wheel with the hub *d*. With the sleeve *e* is engaged a Mars supporting arm *h*, said Mars supporting arm and the sleeve being shown having a threaded engagement the one with the other as shown at 6, the construction being such that the Mars supporting arm may carry the Mars globe about the sun globe. Above the hub *d*, is located a stationary gear 7, above which is a stationary hub 8, shown having a threaded engagement with the upper end of the rod *e*, as indicated at 9 said hub 8 and gear 7 being held in engagement in any suitable manner, as by a pin 10. About the hub 8 is a sleeve 11 carrying with it a sprocket gear 12, and the earth supporting arm *c*, shown having a threaded engagement with the sleeve 11 as indicated at 13. Above the hub 8 is a stationary sprocket gear 14 which may be held upon the adjacent hub in any suitable manner as by pins 15. Above the sprocket gear 14 is a sleeve 16 carrying a sprocket gear 17, and a Venus globe supporting arm 18. The sun globe is shown supported upon an additional rod 19 having a threaded engagement therewith and with the hub 8, as indicated at 20 and 21. It will be evident, thus, that the Venus globe *i* may be rotated about the sun globe, as indicated in dotted lines Fig. 1. Mounted upon the Mars supporting arm is a stationary hub *j* upon which is a sleeve *k* carrying a spur gear *l* meshing with the gear 7, and a sprocket gear *m* connected by a sprocket chain *n* with the sprocket gear 12.

It will be obvious that as the Mars supporting arm is moved about the supporting standard the sleeve *k* is rotated carrying with it the sprocket gear *m* whereby the sleeve 11 is also rotated carrying with it the earth supporting arm. Upon the earth supporting arm is mounted a hub *p* upon which is carried a sleeve 22 provided with sprocket gears 23 and 24, the gear 24 being connected by a chain 25 with the gear 17 whereby the Venus globe is rotated. The sprocket gears 14 and 23 are connected by a chain 26, said chain passing about one side of the gear 23, and over an idler 27, carried upon the earth supporting arm, the chain 26 serving to rotate other parts of the apparatus, as hereinafter described.

It will be observed, as above described, that the gears *f*, hub *d*, gear 7, hub 8, and gear 14 are all stationary on the supporting standard, while the gear 17, and the sleeve 16 are rotatable. It will be observed that the gears 12 and arm *m* are of less diameter than the gears 7 and *l*, the Mars supporting arm being so geared with adjacent parts so that in operating the Mars supporting arm once about the standard, and about the sun globe, the earth supporting arm will be moved nearly twice thereabout, or given approximately 1 10/12 rotation. It is also to be noticed that the sprocket gears 14 and 23 are of different diameters, as also the sprocket gears 17 and 24, to give proper rotation of the Venus globe about the sun globe. The idler 27 serves to tighten the chain 26. Toward the opposite end of the swinging earth supporting arm *c* is mounted a hub *q* carrying a swinging angle arm *r* passing therethrough, said angle arm provided with a sprocket gear *s* connected by the sprocket chain 26 with the gears 23 and 14. The sprocket gear *s* is shown secured upon the spindle of the angle arm by a set screw *u*. The hub *q* is supported upon and forms a part of a bracket *t* secured upon the arm *c*. The hub *q* also carries a gear *v* through which the angle arm passes, said gear being fastened to said hub in any suitable manner, as by a pin *o*, the gear *v* being stationary upon the hub *q*. The angle arm *r* also carries a gear 28 meshing with the gear *v*, said latter gear being preferably dished as shown. The angle arm is provided with a spindle *x* carrying the gear 28.

The angle arm *r* is constructed to always point in the same direction relative to the plane of the ecliptic or earth's orbit, this causing the change of the seasons, throwing the earth's axis at different inclinations relative to the sun. Upon the outer end of the angle arm *r* is engaged a supporting arm or hub 29 having a stationary engagement upon the arm *r*, and preferably integral therewith, said hub supporting a rotatable sleeve 30, through which is passed a spindle 31, said

sleeve having engaged therewith an arm 32, and being provided with a gear 33 having a stationary engagement with said sleeve, the gear 33 meshing with the gear 28, the latter being an intermediate gear, to give proper direction to the movement of the gear 33. A gear 34 is also engaged upon the sleeve 30 and rotated therewith. The upper end of the spindle 31 is bent or offset above the gear 34 as indicated at 35 and carries a gear indicated at 36 rotatable about the spindle 31, and meshing with the gear 34. Upon the upper end of the spindle 31 is carried a representation of the earth or earth globe indicated at *w*, the same being rotatable about the spindle 31, the upper end of the spindle 31 extending upward at a suitable angle, as at an angle of $23\frac{1}{2}$ degrees to the plane of the ecliptic, the said plane being indicated by the dotted line *y*. The earth may be revolved upon the upper end of the spindle 31 independently of the gear 34 when desired by simply lifting the gear 36 out of mesh therewith, and will be rotated by means of the gear 34, when the apparatus is in operation. Upon the outer end of the arm 32 is carried a stationary sleeve 37 through which extends a spindle 38 provided with a sprocket gear 39 at its lower end connected by a chain 40 with a sprocket gear 41 upon the hub 29, said hub formed upon the angle arm *r*. The spindle 38 is provided with a sprocket gear 39 at its lower end having a stationary engagement upon the spindle 38. The spindle 38 carries at its upper end a representation of the moon or moon globe indicated at 42. The lower end of the spindle or axis 31 is inclined at an angle of about five degrees to the plane of the earth's orbit, while the upper end of the axis carries the earth 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 axis 31 being at an inclination of five degrees, and the arm 32 being at right angles therewith, and the spindle 38 being at right angles to the arm 32 brings the inclination of the orbit of the moon at an angle of about five degrees to the plane of the earth's orbit. The spindle or axis 31 is shown held in engagement with the stud *x* by means of an arm 55 upon the lower end of said axis. The swinging arm *h* is provided, preferably, with an operating handle indicated at 43.

At the outer end of the Mars globe supporting arm is a stationary hub 44 carrying an angle arm 45 sleeved therethrough said arm provided with a sprocket gear 46 connected by a chain 47 with the gear *f*. Rigidly connected with the hub 44, and preferably formed integrally therewith is a cup shaped gear 48. The arm 45 carries a gear 49 meshing with the gear 48, the gear 49 being carried by a pin 50 connected with said arm.

The spindle 45 is constructed with a hub 51 forming a part of said spindle, through which is sleeved a Mars globe supporting spindle 52, surmounted by the Mars globe 53. At the lower end of the spindle 52 is a gear 54 meshing with the gear 49. The arm 45 is formed at such an angle as to carry the Mars globe in proper relative position viz., an angle of 24 degrees to the plane of its orbit.

It will be evident that the 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 43, the arm *h* may be swung entirely about the supporting standard carrying the Mars supporting arm 45 and Mars globe therewith, and also the earth globe supporting arm *c* with the earth and the moon about the sun, the Venus globe 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. The Mars globe is also rotated as indicated in dotted lines, Fig. 1.

It will be seen that the apparatus may thus be used to described and illustrate many features; among which are; the diurnal motion of the earth, the annual revolution of the earth about the sun, the ecliptic or plane in which the earth revolves about the sun, equinoxes and solstices, the change of seasons, the causes of different conditions of climate, the causes of the tides, the earth's zones, the circles of illumination of the various bodies revolving about the sun, long and short days, midnight sun, the moon's motions, the moon's phases, apogee and perigee, morning and evening stars, eclipses, transits, perihelion and aphelion, right ascension and declination, precession of the equinoxes, amplitude, leap year, relative motions of Mars etc. Other features will readily be noted in the study and use of the device.

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 gear 36 is provided with a sleeve 56 projecting into a core or analogous device 57 in the earth globe. The earth's axis is obviously stationary relative to the angle arm by which it is carried. The arm *r*, it will be observed, is located, as above noted, at an angle of 5° from the horizontal to be at right angles with the sleeve 30. The

swinging arm 32, it will be observed, is arranged at an angle of about 5° to the horizontal to give proper inclination to the orbit 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 is in apogee when in that point of her orbit farthest from the earth, and in perigee when nearest to the earth.

It will be obvious that the movement of the Mars globe about the hub carrying the angle arm upon which said globe is mounted, as indicated in dotted lines, provides for the eccentricity of the orbit about the sun, and changes the position of the Mars globe with reference to the sun, thereby causing the proper seasons of the Mars globe.

The mode of the operation will now be understood.

What we claim as our invention is:

1. In a planetarium the combination with a standard, of a sprocket wheel fixed on the standard, a Mars supporting arm rotatable upon the standard above the sprocket, an angle arm carried by the Mars supporting arm, a sprocket secured to the lower end of the angle arm, a sprocket chain engaging said sprocket and the fixed sprocket, a Mars globe carried by the angle arm, means for rotating said globe by the turning of the angle arm, a fixed gear on the standard above the Mars supporting arm, a rotatable gear carried by the supporting arm in mesh with the fixed gear, a sprocket secured to the rotatable gear, an earth supporting arm rotatable upon the standard above the fixed gear, a sprocket secured to the earth supporting arm, a sprocket chain engaging said sprocket and the sprocket on the gear, an angle arm rotatable upon the outer end of the earth supporting arm, an earth globe carried by said angle arm, a sprocket secured to the angle arm, a fixed sprocket secured to the standard adjacent to the earth supporting arm, a sprocket chain engaging said sprockets, a sprocket carried by the earth supporting arm intermediate its ends and engaging said sprocket chain, a sprocket secured to the intermediate sprocket, a sprocket rotatable upon the standard, a chain engaging the two last named sprockets, a Venus supporting arm carried by the last named sprocket, and a Venus globe on said arm.

2. In a planetarium the combination of a supporting standard, a stationary hub upon said standard, a Mars globe supporting arm rotatable about said hub, a rotatable hub carried by said standard, a Venus globe supporting arm carried by the rotatable hub, an intermediate stationary hub carried by the standard between the above named sta-

tionary hub and the rotatable hub, a sleeve
about the intermediate hub provided with a
gear, an earth globe supporting arm carried
by said sleeve, said Mars globe supporting
5 arm geared with the first named hub and
with said sleeve, said earth globe supporting
arm geared with the intermediate hub and
with said rotatable hub.

3. In a planetarium the combination of a
10 supporting standard, a stationary hub pro-
vided with stationary gears at the lower and
upper extremities of the hub, a sleeve upon
said hub, a Mars globe supporting arm en-
gaged with said sleeve and geared with said
15 hub, a rotatable hub carried by the stand-
ard, a Venus globe supporting arm carried
by the rotatable hub, an intermediate sta-
tionary hub provided with a stationary gear,
a sleeve upon the intermediate hub provided

with a gear, an earth globe supporting arm 20
engaged with the last named sleeve, said
Mars globe supporting arm geared with the
first named stationary hub and with the
sleeve carrying the earth globe supporting
arm, said earth supporting arm geared with 25
the gear upon the intermediate hub and
with the rotatable hub, and a Mars globe
supporting angle arm carried by the Mars
globe supporting arm and geared with the
first named stationary hub. 30

In testimony whereof we have signed this
specification in presence of two witnesses.

FRANK J. TRIPPENSEE.
WILLIAM F. TRIPPENSEE.

Witnesses:

N. S. WRIGHT,
G. E. McGRANN.