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W. R. WARNER & A. SWASEY.

RUNNING GEAR FOR REVOLVING DOMES.

No. 306,197. Patented Oct. 7, 1884.

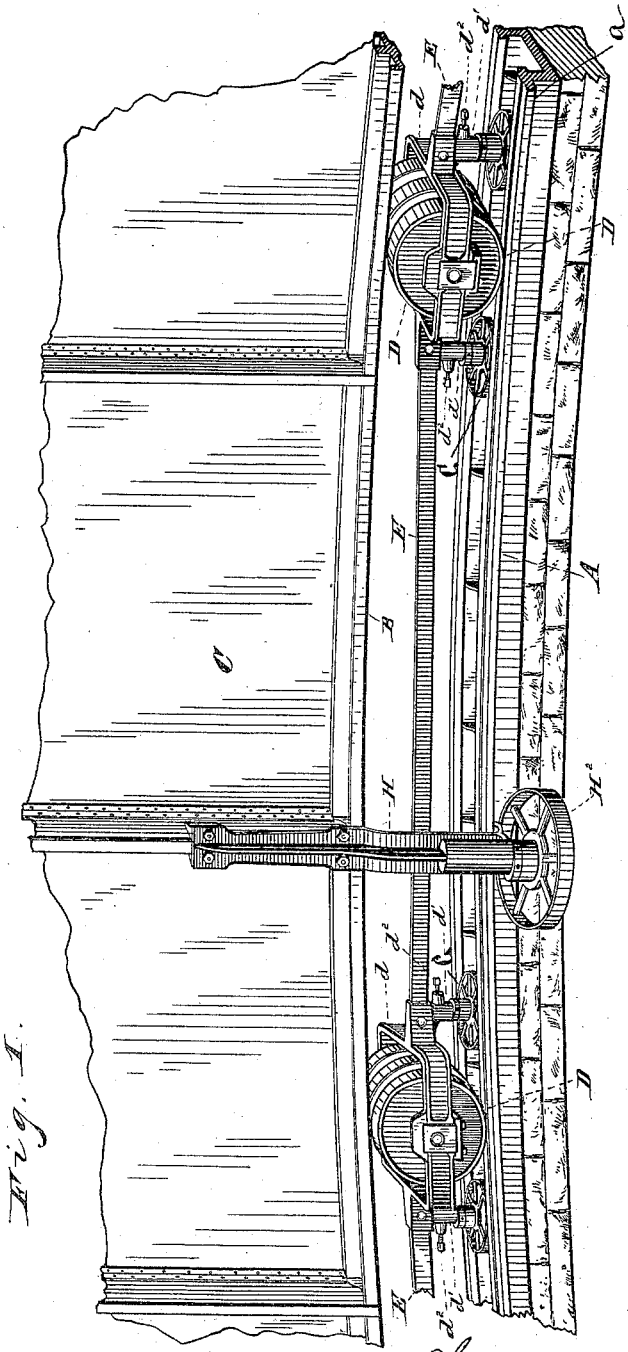

Fig. 1.

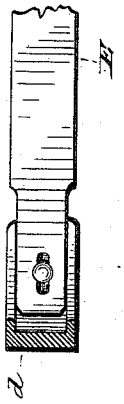

Fig. 2.

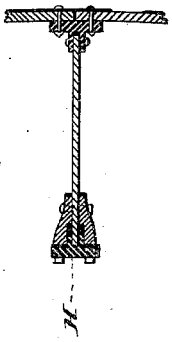

Fig. 3.

WITNESSES

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Fig. 4.

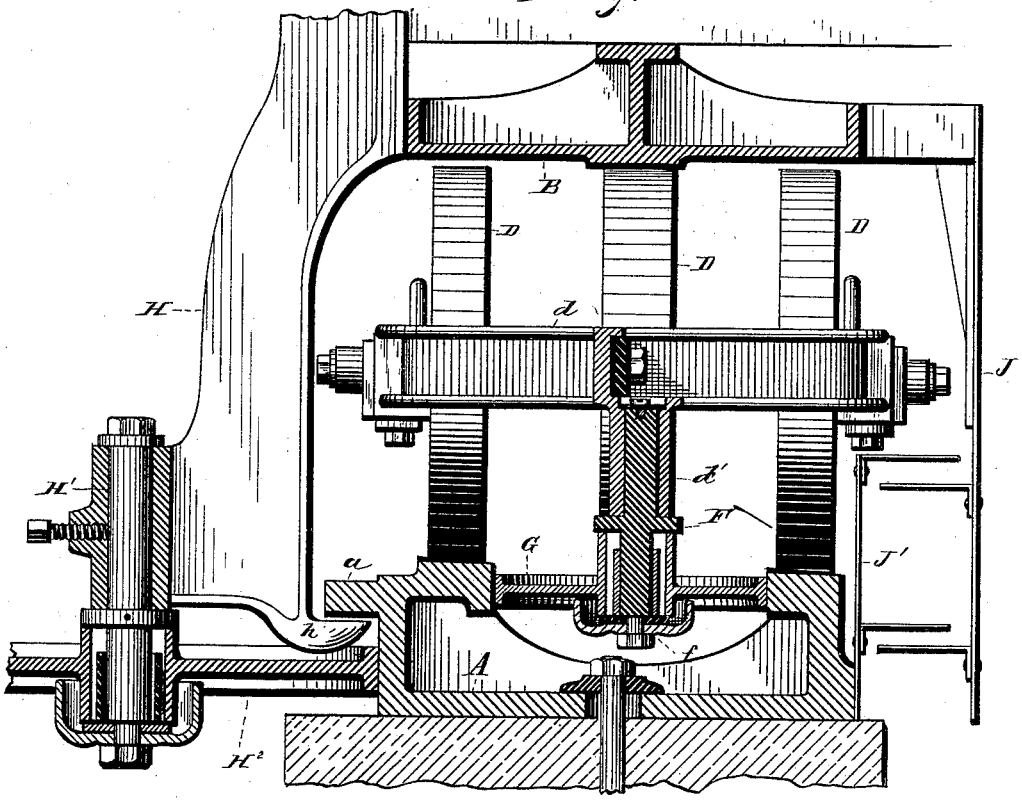


Fig. 5.

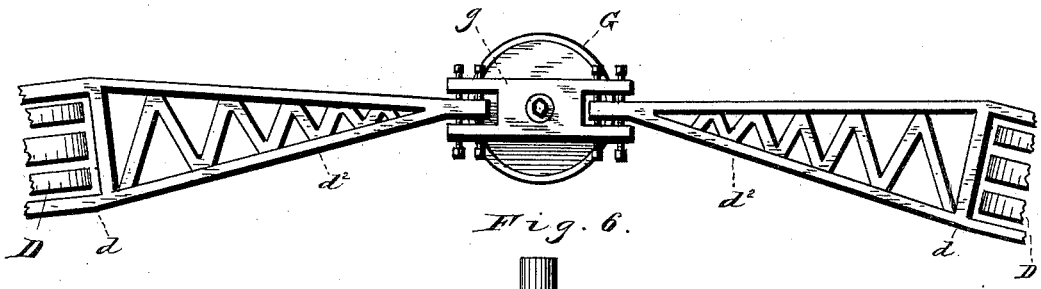
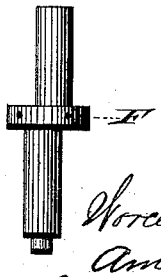


Fig. 6.



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UNITED STATES PATENT OFFICE.

WORCESTER R. WARNER AND AMBROSE SWASEY, OF CLEVELAND, OHIO.

RUNNING-GEAR FOR REVOLVING DOMES.

SPECIFICATION forming part of Letters Patent No. 306,197, dated October 7, 1884.

Application filed October 19, 1883. (No model.)

To all whom it may concern:

Be it known that we, WORCESTER R. WARNER and AMBROSE SWASEY, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Running-Gear for Revolving Domes; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

Our invention relates to improvements in the running-gear for revolving domes, more especially for astronomical observatories; and it consists in certain features of construction and in combination of parts hereinafter described, and pointed out in the claims. Mechanism for revolving heavy domes have usually been constructed with a wall-plate resting upon a suitable foundation, and with what is known as a "sole-plate" above, upon which rests the load, and with what is known as "conical wheels" intervening, that roll on the wall-plate and carry the sole-plate. It is essential to the perfect working of the dome that the conical wheels be held with their axes radial with the circle of the wall-plate, not approximately radial, as in similar constructions heretofore, but absolutely radial. In the construction of domes for telescopes, light-houses, and for some other purposes, it is impracticable to use radial arms extending from a common center to guide the conical wheels. In place thereof the conical wheels have usually been guided by flanges and held approximately radial by having their axles journaled in a circular revolving frame known as the "live-ring." Some of the larger telescopes have domes more than forty feet in diameter, and it is impracticable to construct a live-ring of such dimensions sufficiently rigid to hold the conical wheels with the accuracy that is required. With the former construction the live-ring was necessarily of great weight, and was supported by the axles of the conical wheels, thereby causing considerable friction; also, by reason of the unequal expansion and contraction of the parts, the live-ring would not always conform to the wall-plate. For the purposes aforesaid it is desirable to have the dome move as easily and accurately as possible. In view of the present state of the art and of the facts aforesaid, we have invented a combination of mechanism for revolving domes in which, first, each set of conical wheels is provided with a small frame, in which the axle of the conical wheels is journaled, and the frame is guided and the conical wheels held in position with their axis always radial with the circle of the wall-plate by means of lateral guiding-wheels supported from the said frame and operating between circular ways or guides on the wall-plate, and independent in their adjustment and guidance of the live-ring, or of the other conical wheel of the live-ring; and the cone-wheels and attachments, being guided by the wall-plate, always conform to it, and are always in proper position thereon, regardless of the expansion of the parts; second, with our construction the live-ring is reduced to a minimum weight, consisting, in addition to the said frames and wheels, only of slight connecting-rods between the frames, and so flexible laterally as not to cramp the wheels or interfere with their adjustment and guidance as aforesaid.

In the drawings, Figure 1 is a view in perspective of a portion of our improved running-gear in which the wall-plate, sole-plate, and two sets of conical wheels and their connections and attachments are shown, and also a portion of the dome and the mechanism for guiding the same. Fig. 2 is a side elevation showing the manner of attaching a connecting-rod with the conical wheel-frame by means of an expansion-joint. Fig. 3 is a transverse section of a portion of the dome, through one of the girders, showing also the upper end of an armature. Fig. 4 is an elevation of conical wheels and frame and a portion of an armature, and in vertical section shows the sole-plate, wall-plate, and the lateral guiding-wheels and attachments. Fig. 5 is a plan view of a modication where the arms of adjacent conical wheel-frames extend toward each other and have in common a single guiding-wheel. Fig. 6 is an elevation of an eccentric spindle for a guiding-wheel.

A, B, and C represent, respectively, a portion of the wall-plate, sole-plate, and dome.

D represents conical wheels, each set having a common axle journaled, respectively, in the frames *d*. The end wheels of each set roll on the wall-plate, while the center wheels carry the dome. These sets of conical wheels are alike, and are of such shape that when in their proper positions, with their axes radial with the circle of the wall-plate, lines across the faces of sets of conical wheels will meet at the axis of the wall-plate. The top surface of the wall-plate, that forms tracks upon which the said end wheels travel, has a slight inclination in cross-section, the outer edge being the lowest, so that when the conical wheels are in position a radial line across the top of a set of wheels will be horizontal. The frames *d* are connected by the rods E, that may be thin and flexible sidewise, but are sufficiently stiff vertically to hold the frames *d* from tilting. One or more of the connections between the rods E and the frames *d* are made with an expansion-joint, preferably as shown in Fig. 2, that allows the live ring to adjust itself circumferentially, and to always conform to the wall-plate, regardless of expansion or contraction.

Each end of each of the frames *d*, as shown in Fig. 1, has a hub, *d'*, pendent from the frame, and provided with a vertical central bore that forms a socket in which is fitted and secured by set-screws d^2, respectively, the upper portions of the eccentric spindles F. On the lower portions of these spindles are journaled, respectively, the guiding-wheels G, that are held in position vertically by a screw and washer, as shown at *f*, Fig. 4. There is an offset in the central portion of these spindles, as shown more clearly in Fig. 6, so that the two parts of the spindle have separate axes that are parallel with each other, forming a crank or eccentric. The collar shown in the central part of the spindles may have holes, as shown in Fig. 6, or be provided with other means by which the spindles may be turned in their respective sockets. The guiding-wheels G operate between tracks or ways formed on the inner edges of the wall-plate, as shown in Fig. 4. These tracks or guides embrace the wheels G so closely that when the wheels engage the track on one side there will be only just enough clearance between the wheel and the opposite track or guide to avoid the rubbing or friction of the parts. As these wheels practically cannot move laterally, it follows that when the spindles F are turned by means of their being eccentric, as aforesaid, the ends of the frame *d* are turned laterally, and this furnishes an accurate means of adjustment, whereby the conical wheels may be brought and held with their axes radial to the axis of the wall-plate. The live-ring and sole-plate are designed to move concentrically with the wall-plate, and this movement should be as perfect as possible. The small clearance of the wheels G, as aforesaid, admits only of a lateral variation that is so small as to be hardly perceptible, yet the construction is such that ordinarily even this slight variation is avoided. The inclination, as aforesaid, of the tracks on the wall-plate on which the conical wheels travel tends slightly to work the conical wheels outward, by means of which the guiding-wheels G press gently against the outer guiding-track, and never engage the inner track except by some disturbing cause—such, for instance, as dirt on the track—and in such a case the inner track acts as a safety-guide.

H represent armatures attached to the sole-plate and to the girders of the dome. These armatures extend below the live-ring, and are provided with eccentric spindles H' and lateral wheels H^2, similar in construction to the spindles F and the wheels G. By means of the eccentricity of the spindles H', the wheels H^2 are brought to bear against their track on the inner circumference of the wall-plate, as shown in Fig. 4. By this means the sole-plate and dome are guided and held in their place laterally independent or the live-ring or conical wheels. These armatures are provided each with a hook or lateral projection, *h*, extending under the ledge *a* on the wall-plate. These two parts ordinarily do not touch each other, but are in close proximity, and form what might be called a "safety clutch" or "guard," that would hold the dome from displacement in case of high winds or other disturbing forces. If, at such times, the dome should be forced a trifle to one side, its horizontal position would not be disturbed, because, as aforesaid, the conical wheels are level on top. It may be said of the wall-plate that it should be fitted with great care and accuracy, and that the guides or tracks for the wheels G and H^2 should be parallel with each other, and that all of the dressed surfaces of the wall-plate should be made concentric with a common axis.

J and J' are plates, the one extending downward from the dome and the other extending upward from the wall-plate, and are both provided with lateral plates extending toward and overlapping each other. This part of the device is to exclude as far as possible wind, dust, &c., and the overlapping lateral plates should be as close to each other as is practicable without contact.

In the modification shown in Fig. 5 a single guiding-wheel, G, is supported midway between two sets of conical wheels by arms d^2, that extend from the frames *d* into recesses in the ends of the block *g*, when, by means of set-screws shown, the arms are so adjusted as to bring the axes of the attached conical wheels in radial lines, as aforesaid. These blocks *g* support the spindles on which the guide-wheels G are journaled.

The spindles may be straight, and may be rigidly attached to the blocks *g*, as all of the adjustments are made by the aforesaid set-screws in the ends of the blocks *g*.

What we claim is—

1. In running-gear for revolving domes, the combination, with a frame and guiding-wheels supported by said frame, of tracks or ways on the wall-plate of the structure on which conical wheels in said frame travel, and several series of conical wheels, each series having a common spindle which is journaled in the frame, substantially as set forth.

2. In running-gear for revolving domes, the combination, with several series of conical wheels, of lateral guiding-wheels operating between circular ways or guides on the wall-plate, and provided with suitable connecting mechanism connecting adjacent lateral wheels with the intervening conical wheels, so that each set of conical wheels is guided independent of the live-ring or of the other conical wheels in the live-ring, substantially as set forth.

3. In running-gear for revolving domes, the combination, with a suitable wall or base and a dome, of conical wheels on which the dome rests and moves, lateral guiding-wheels and frame connecting the conical wheels with the guiding-wheels, whereby the former are guided by the latter, substantially as set forth.

4. In running-gear for revolving domes, the combination, with a base or wall and dome, of two or more series of intermediate conical wheels, frames in which the several series of wheels are journaled, and an eccentric spindle secured to each frame and provided with a guiding-wheel, substantially as set forth.

5. In running-gear for revolving domes, a live-ring provided with one or more expansion-joints, whereby the live-ring is made self-adjustable circumferentially, substantially as described.

6. In running-gear for revolving domes, armatures attached to the sole-plate, and provided each with a lateral wheel journaled on an eccentric spindle, substantially as set forth.

7. In running-gear for revolving domes, the combination, with a base or wall, a wall-plate provided with the ledge *a*, and a dome, of intermediate devices for supporting the dome, the armatures secured to the dome, and provided with lugs extending laterally under the ledge *a*, and guiding-wheels journaled to the lower ends of the armature, substantially as set forth.

8. In running-gear for revolving domes, the combination, with the armature H, provided with the eccentric spindle H′, the lateral wheel H^2, and the lug or hook *h*, of the ledge *a*, integral with the wall-plate, substantially as shown and described.

9. In running-gear for revolving domes, the combination of a frame, *d*, containing one or more conical wheels, and guiding-wheels G, traveling between suitable circular guides, said guide-wheels determining the position of said frame, and thereby determining the radial position of the axes of the conical wheels journaled in said frame, substantially as set forth.

In testimony whereof we sign this specification, in the presence of two witnesses, this 12th day of October, 1883.

WORCESTER R. WARNER.
AMBROSE SWASEY.

Witnesses:
ALBERT E. LYNCH,
GEO. W. KING.