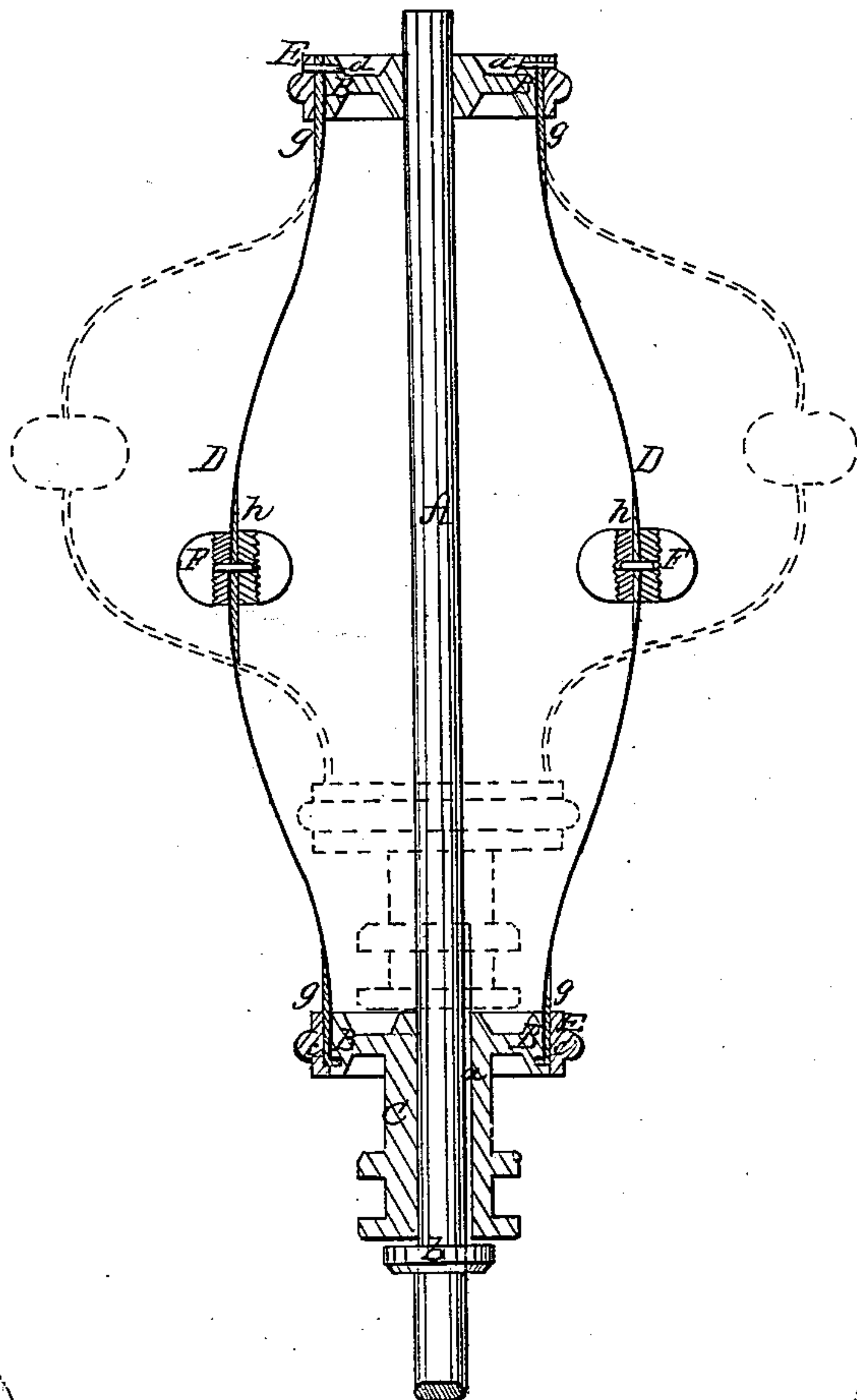


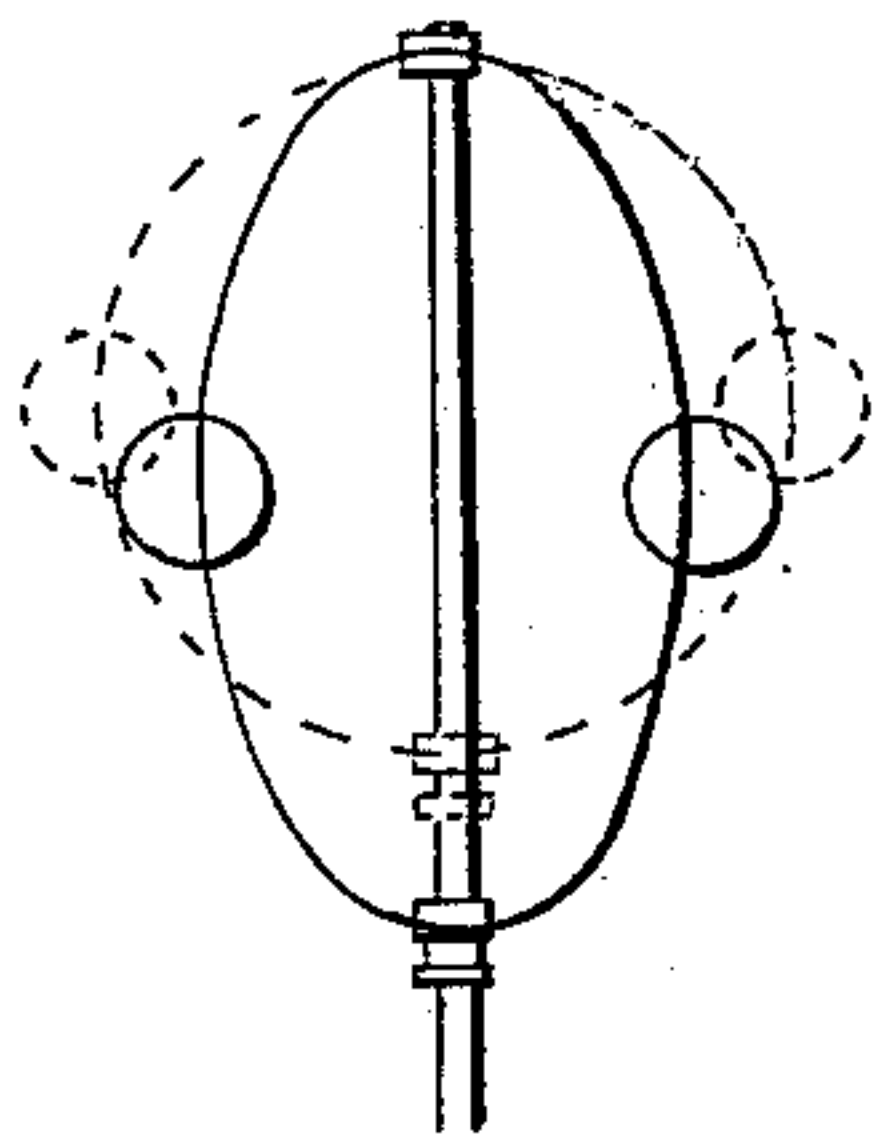
*T. R. Pickering,*  
Governor.

*N<sup>o</sup> 36,621.*

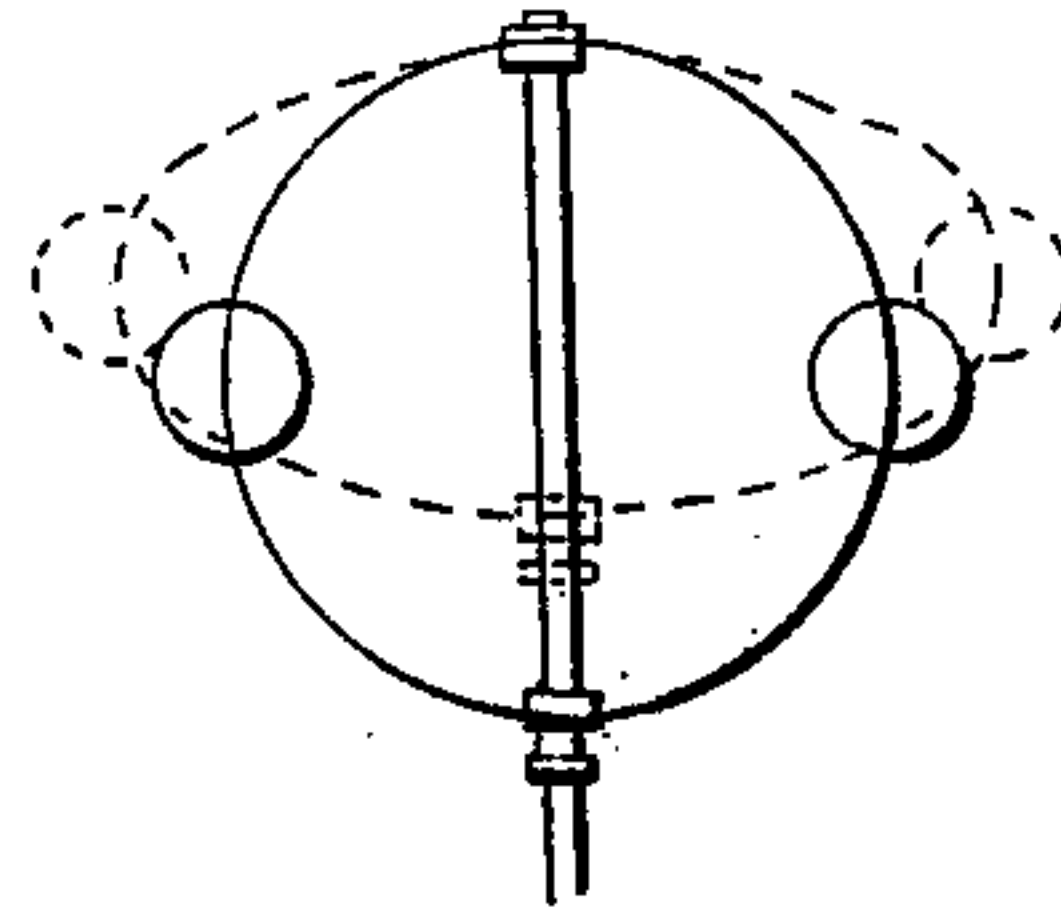
*Fig 1. Patented Oct. 7, 1862.*



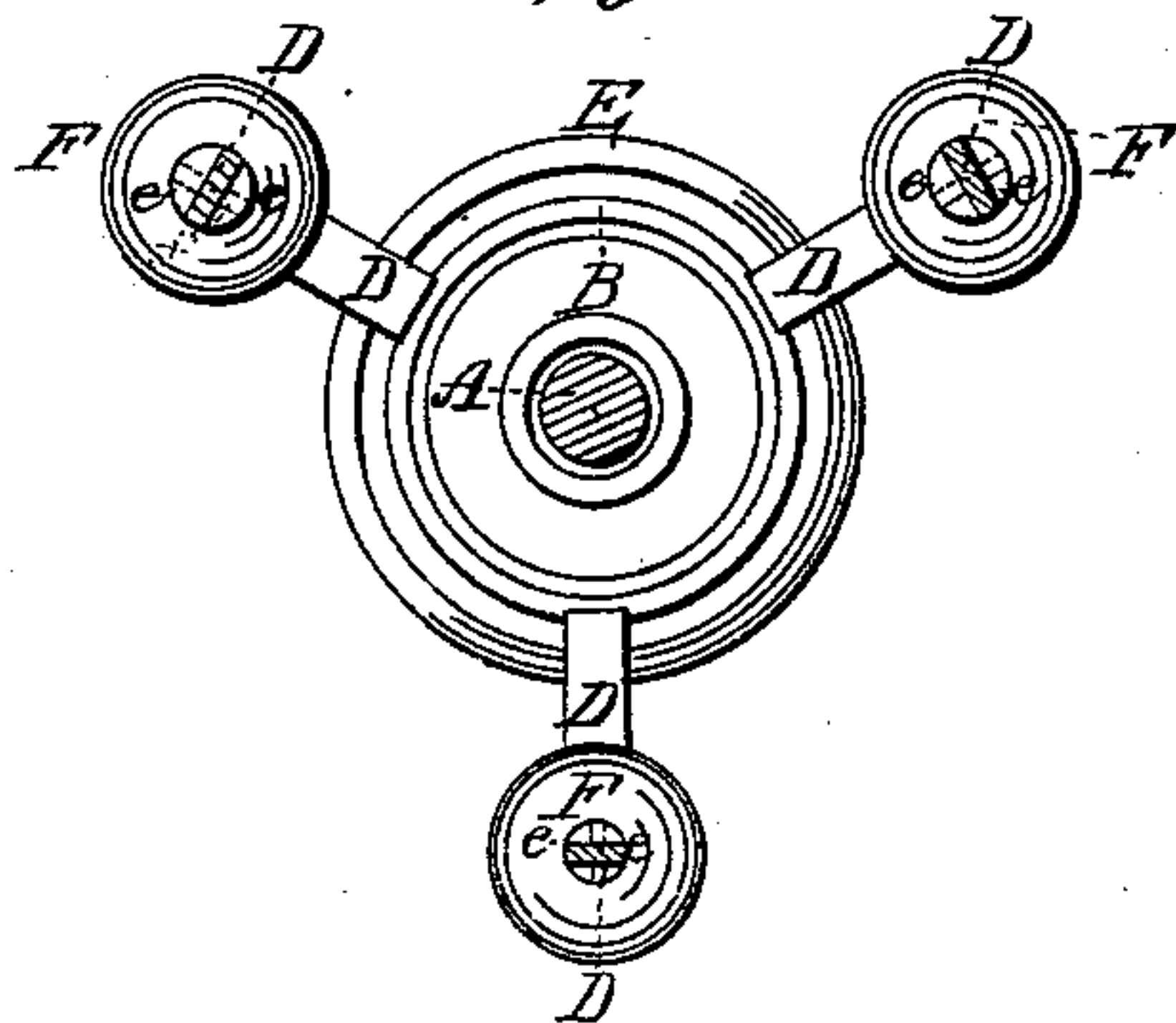
*Fig 3.*



*Fig 4.*



*Fig 2.*



*Witnesses.*

*James Lind  
Edw M. Anderson*

*Inventor.*

*T. R. Pickering*



# UNITED STATES PATENT OFFICE.

THOMAS R. PICKERING, OF NEW YORK, N. Y.

## IMPROVED CENTRIFUGAL GOVERNOR.

Specification forming part of Letters Patent No. 36,621, dated October 7, 1862.

*To all whom it may concern:*

Be it known that I, THOMAS R. PICKERING, of the city, county, and State of New York, have invented a new and useful Improvement in the Centrifugal Governor for Marine and other Steam-Engines and other Motors; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is an axial section of a governor constructed according to my invention. Fig. 2 is a transverse section of the same.

Similar letters of reference indicate corresponding parts in both figures.

This invention relates to the attachment of the balls or centrifugal weights of the governors to springs one of the two extremities of each of which is made fast relatively to the spindle and the other relatively to the slide or sleeve of the governor. In governors of this kind as heretofore constructed, the springs have been so arranged that they have been of elliptical or semi-elliptical form, as shown in black outline in Fig. 3, when the governor has been at rest, and have tended to assume a circular or semicircular form, as shown in red outline in the same figure, when the governor was set in motion with an increasing velocity, or else they have been of nearly circular form, as shown in black outline in Fig. 4, when at rest, and have tended to assume an elliptical form when the governor was set in motion, as shown in red outline in the latter figure.

Now, in a centrifugal governor it is a desideratum to have the weight of the centrifugally-moving parts collected as much as possible in two or more points—that is to say, practically speaking, on the balls—and it is therefore desirable to have the springs to which the balls are attached as light as possible; but with springs of the above-mentioned form sufficient strength to produce the necessary centripetal force to act in opposition to the centrifugal force of the balls, or sufficient stiffness to counteract the effects of gravitation upon the balls when the governor is in an inclined or horizontal position, cannot be obtained without making the springs somewhat heavy.

The object of this invention is to enable the requisite centripetal force and stiffness to be obtained with a lighter spring.

To enable others skilled in the art to make

and apply my invention, I will proceed to describe it, with reference to the drawings.

A is the spindle of the governor, having firmly secured to it a broad and deep flange, B, having a cylindrical periphery, and having fitted loosely to it the sleeve or slide C, which is furnished with a broad flange, B', of similar size to B, or thereabouts. The slide C is only permitted to move longitudinally upon the spindle, being prevented from turning thereon by a feather, *a*. The peripheries of the flanges B and B' have provided on them, at equal distances apart, grooves for the reception of the ends of the springs, said grooves being parallel with the axis of the governor, and the grooves in one flange being opposite to those in the other one.

D D are the springs, composed of thin flat strips of steel plate. These may be in their normal condition either curved, as shown in Fig. 1, or straight; but I prefer to make them straight, and to set them in the curved form, so that they will retain it even while the governor is at rest, by setting the slide C up toward the fixed flange B, and securing it by a collar, *b*, fastened on the spindle. Two ways of securing the springs to the flanges B B' are represented, in both of which an internally-cylindrical collar, E, is used, such collar being fitted tightly over and secured to the flange, and serving to keep the end portion of the springs parallel with the shaft. The said collars may be grooved internally parallel with their axis for the reception of the springs, which will in that case be received partly within the collars and partly within the flanges. The springs are prevented from being displaced from the flange B' in a longitudinal direction by providing a groove, *c*, around the flange, and bending the extreme ends of the springs inward to enter the said groove; but the same result is effected in the flange B by drilling holes through the collar and the spring and into the flange, and inserting pins, screws, or rivets *d d*. Either of the above modes of securing the springs against longitudinal displacement may be adopted.

F F are the balls, made with central openings of conical form, the smaller ends of which are of a diameter greater than the width of the springs, to allow them to be slipped easily along the springs to the middle of the length thereof, and the said openings having screw-threads cut in them. The balls thus constructed are each secured to its respective spring by fitting



two taper-plugs, *ee*, of wood or other material, to opposite sides of the spring and screwing the ball onto the said plugs, first securing the plugs against any movement lengthwise of the spring by drilling holes through them and through the spring and inserting short transverse pins *ff*. This mode of securing the balls to the springs clamps the portions of the springs within the balls between the two flat faces of the plugs *ee*, and consequently keeps the middle portion of the spring straight. In an upright governor screw-threads in the balls will not be necessary, if the balls are arranged with the smaller ends of their central openings upward. By thus securing the ends and middle portions of the springs parallel with the shaft, the deflection of the springs, whether by centrifugal force or by drawing their ends toward each other, is caused to be in the compound curved form represented in Fig. 1—that is to say, each half or the portion on each side of or above and below the balls being of the form of a cyma, and in this form the springs offer great resistance in comparison to the thickness of the steel, to the tendency so to bend them produced by the centrifugal force of the balls, and hence the springs are enabled to be made of very light steel, and a larger proportion of the weight of the centrifugally-acting parts of the governor is enabled to be collected in the balls.

To enable the springs to be made of still lighter steel than they could otherwise be, I apply outside of the end portions taper-leaves *gg* of similar steel, securing the said leaves with the springs between the flanges *B B'* and collars *E E*, and also apply other leaves, *hh*, tapered toward each end to line the inner faces of the springs contiguous to the balls, securing the latter by passing them through the balls along with the springs. These leaves are all

straight in their normal condition, but bend slightly with the springs. An important result from the application of these leaves is the prevention of such sudden bends in the springs immediately contiguous to the balls and flanges as would be liable to break them.

In the application of this governor constructed as described, the spindle may be arranged in a vertical inclined or horizontal position, as it will work as well in one position as another, and hence it is specially well adapted for marine-engines. The valve or regulator of the engine or other motor to be governed is connected with the slide *C* in the same manner as it would be to the slide of an ordinary ball-governor, and the centrifugal action of the balls tends to draw the slide toward the flange *B*, and so to operate upon the valve or regulator to reduce the speed of the engine or motor, and the tendency of the springs to straighten acts in opposition to this force, and tends to draw the slide in the opposite direction, and so to operate upon the valve-regulator to increase the speed of the engine or motor.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The employment of the collar *E* with the spring ends and the flange *B*, as and for the purpose herein shown and described.

2. The combination of the leaves *gh* with the spring *D*, as and for the purpose herein shown and described.

3. The employment of the central plugs, *ee*, in combination with the balls *F* and springs *D*, in the manner and for the purpose herein shown and described.

T. R. PICKERING.

Witnesses:

JAMES LAIRD,  
EDW. W. HODGSON.