No. 834,897. PATENTED NOV. 6, 1906.

H. J. FLOOD.

STEP BEARING.

APPLICATION FILED JUNE 23, 1904.

2 SHEETS—SHEET 1

Fig. 1.

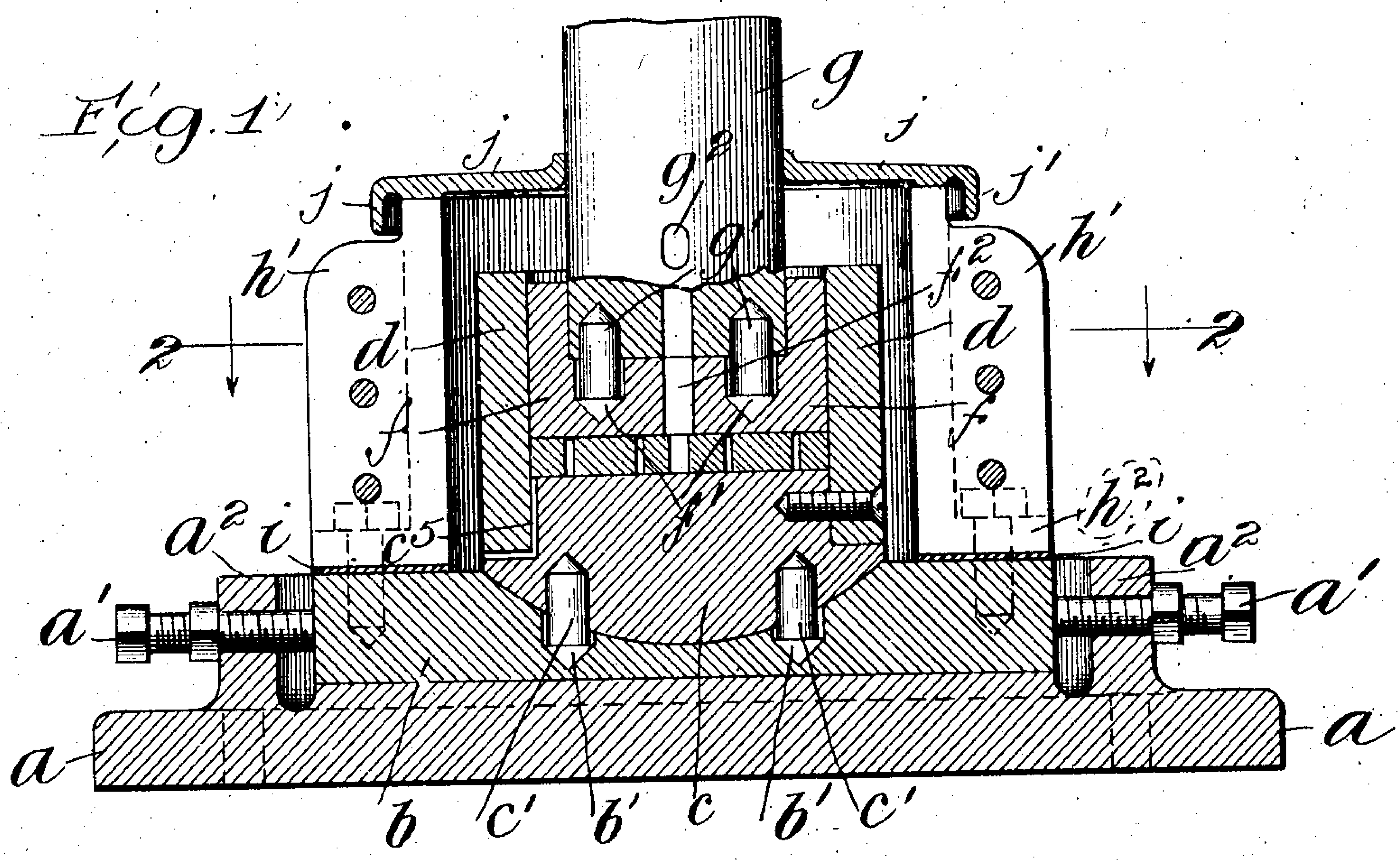


Fig. 3

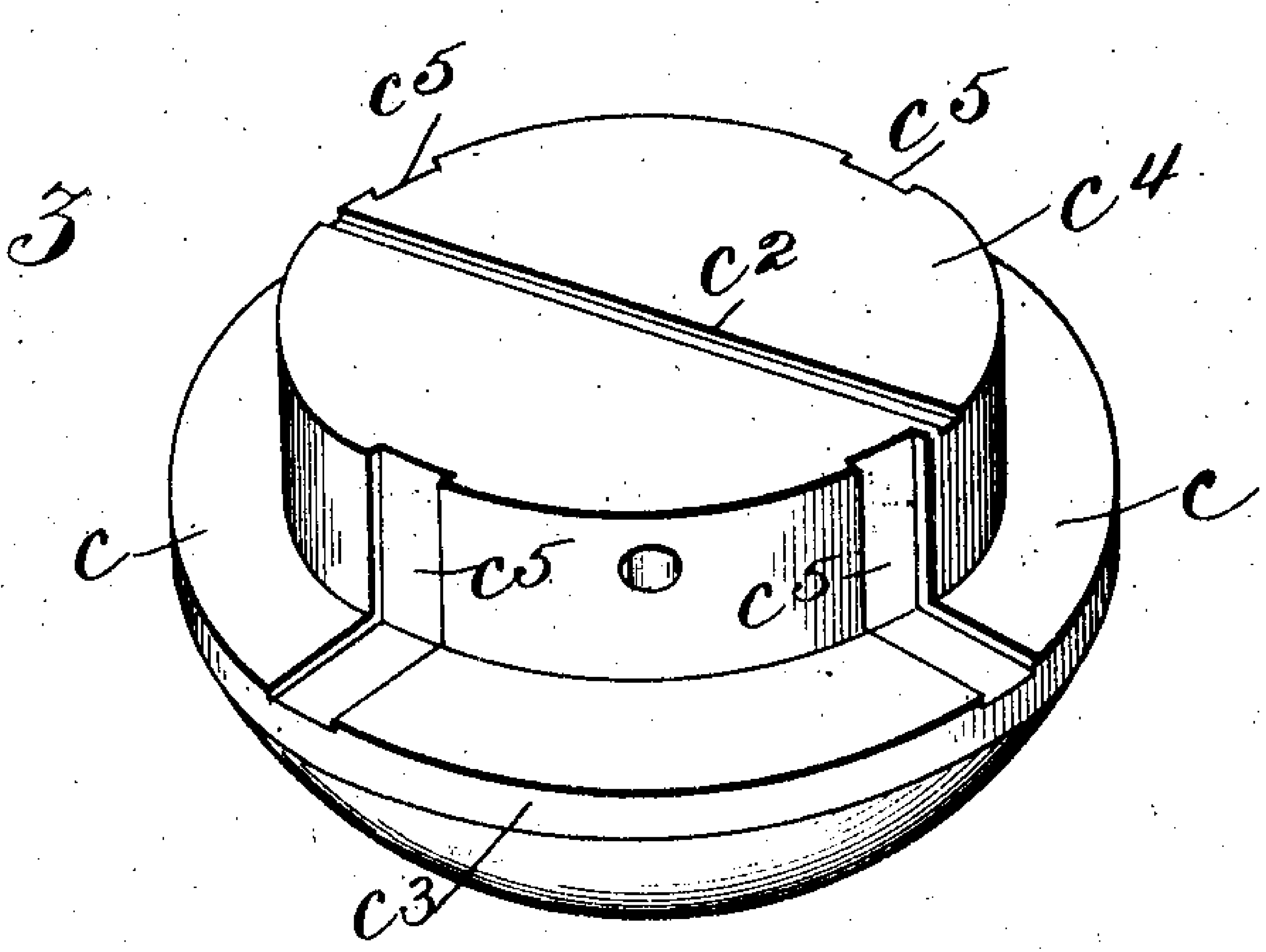
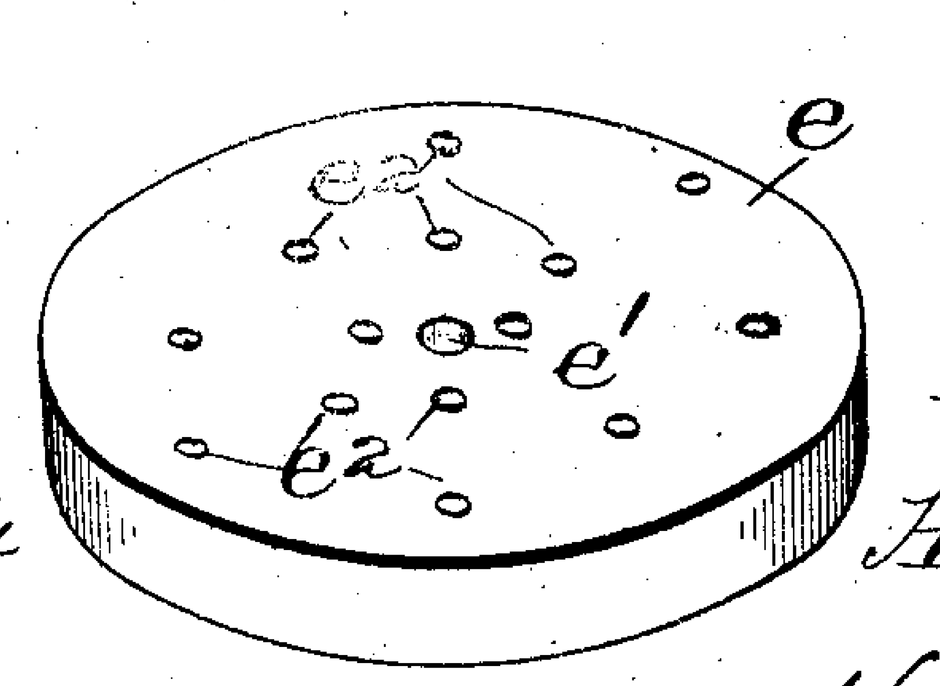


Fig. 4



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2 SHEETS—SHEET 2.

Fig. 2

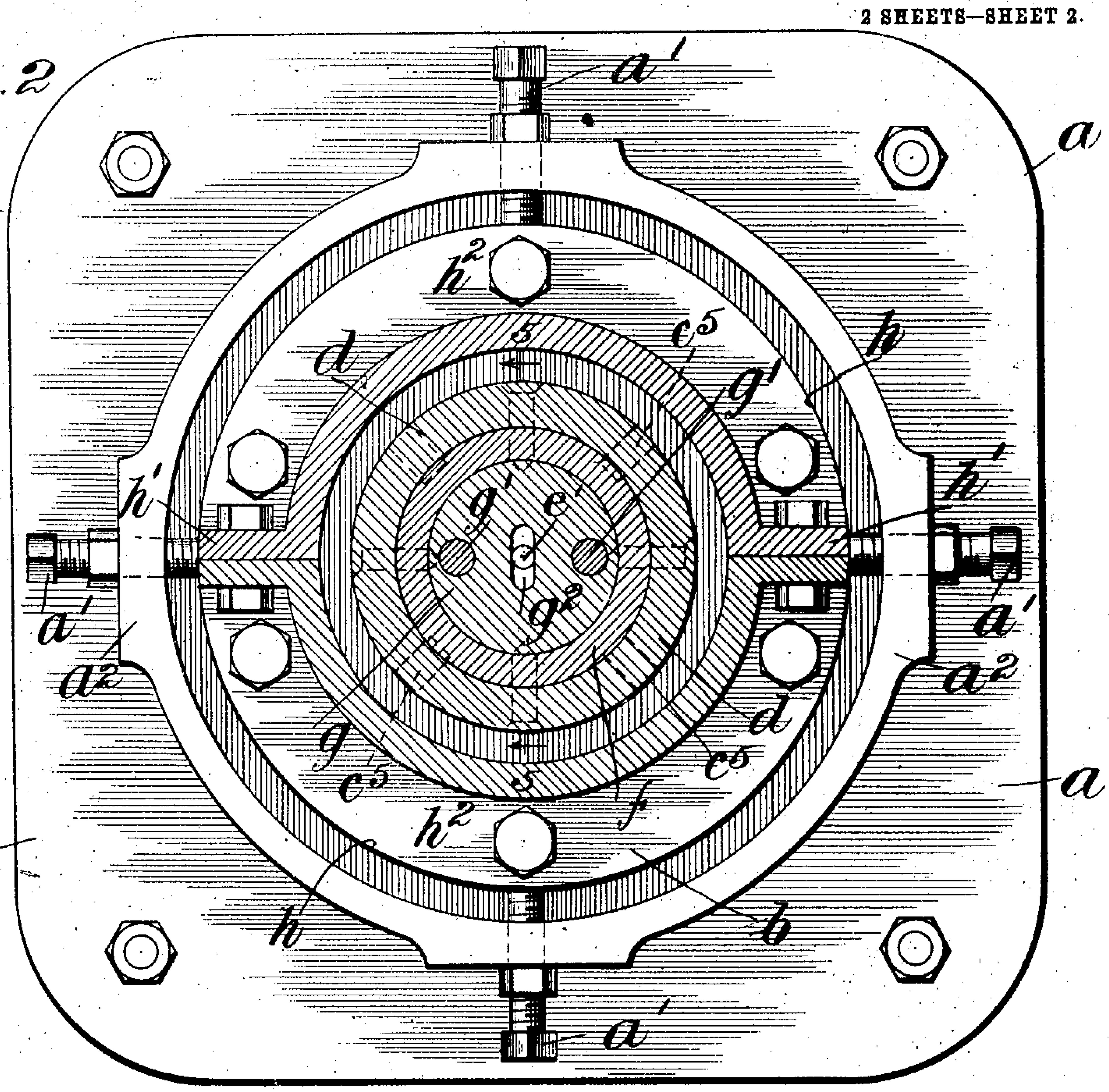
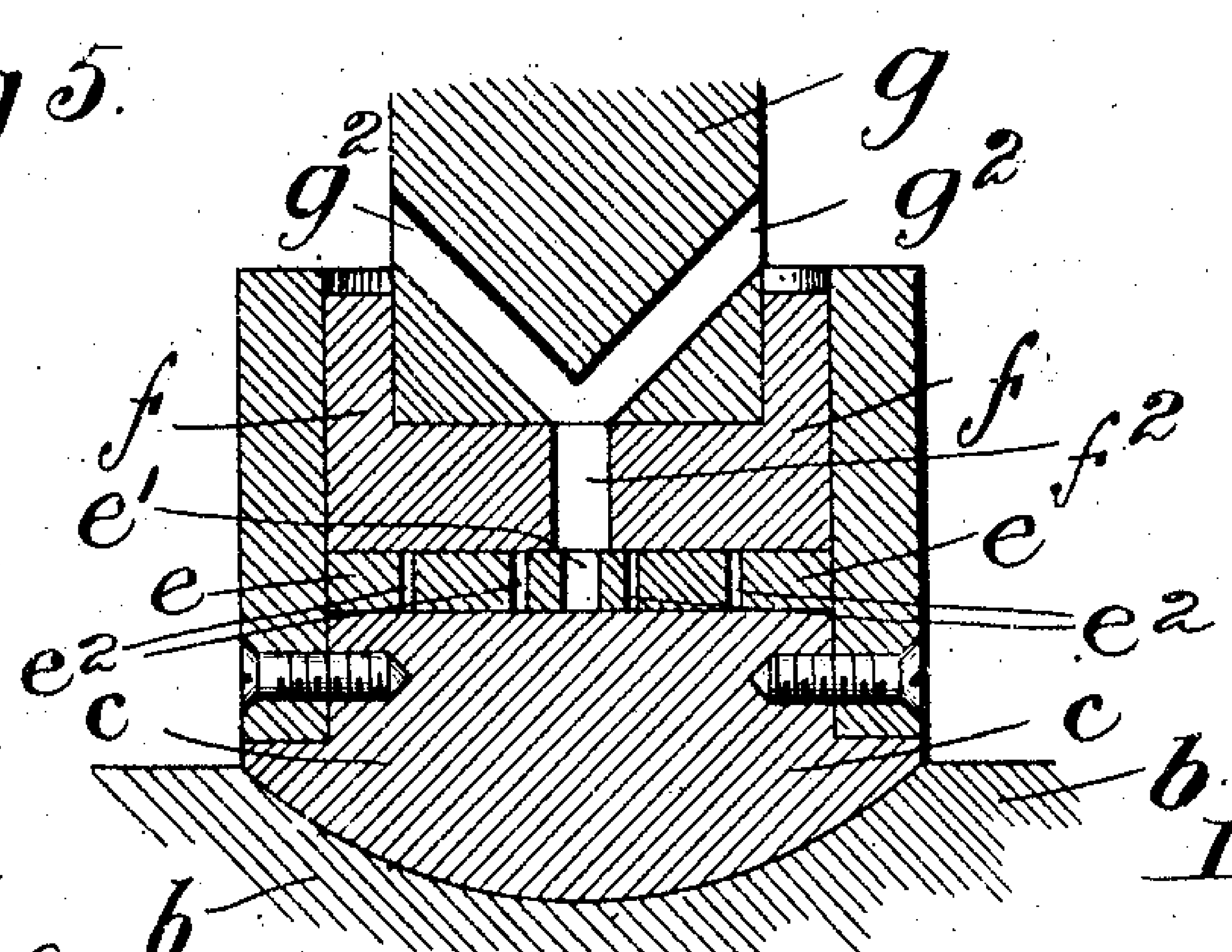


Fig 5.



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UNITED STATES PATENT OFFICE.

HARRY J. FLOOD, OF CHICAGO, ILLINOIS.

STEP-BEARING.

No. 834,897. Specification of Letters Patent. Patented Nov. 6, 1906.

Application filed June 23, 1904. Serial No. 213,872.

To all whom it may concern:

Be it known that I, HARRY J. FLOOD, a citizen of the United States, residing at the city of Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Step-Bearings, of which the following is a specification.

My invention relates to step-bearings for machinery; and the objects of the invention are, first, to obtain a large bearing-surface in proportion to the diameter of the shaft; second, to provide a step wherein the bearing-surface will make proper contact whether the upright shaft is exactly vertical or not. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a central vertical section of the complete bearing. Fig. 2 is a sectional plan view thereof on line 2 2, Fig. 1. Fig. 3 is a perspective view of the lower thrust-block. Fig. 4 is a perspective view of the perforated plate intended to be interposed between the upper and lower thrust-blocks; and Fig. 5 is a fragmentary vertical sectional view on line 5 5, Fig. 2, showing the communicating oil-passages in the shaft, the upper thrust-block, and the interposed plate.

Similar letters refer to similar parts throughout the several views.

The base-plate *a* is designed to rest upon any suitable foundation and is provided with adjusting-screws *a′ a′* for adjustably retaining the thrust-block holder *b*. Said base-plate has the vertically-arranged portion a^2, which in the present instance is a raised annular boss for receiving said screws *a′* and carrying them in a substantially horizontal position. The said thrust-block holdre *b* has a spherical recess therein, adapted to receive the spherical lower extremity of the thrust-block *c*. The dowel-pins *c′*, preferably two in number, are fastened to the thrust-block *c* so as to project downward into the pockets *b′ b′* in the thrust-block holder *b*. In the present instance said block is drilled and the pins fitted and driven into the holes thus formed. By preference said pins are cylindrical, and the pockets *b′*, which are also cylindrical, have a diameter great enough to permit lateral play of said pins therein. As a result said block may assume various angles of inclination in the holder, but will be prevented from rotating.

The top of the thrust-block *c* is so formed that when said block is in normal position in its holder the upper surface will lie horizontal. The upper surface of the thrust-block *c* has an oil-groove c^2. The upper portion of thrust-block *c* is of reduced diameter, thereby forming a flange c^3, the horizontal upper surface whereof is adapted to receive the lower extremity of the bushing *d*. The portion c^4 of block *c* above flange c^3 has cylindrical sides of a diameter equal to the inside diameter of said bushing *d*, and when the parts are assembled said bushing fits over said upper portion of block *c* and rests upon said flange. Said bushing is adapted to be screwed, bolted, or otherwise secured to thrust-block *c*, and in order that oil may pass from the top surface of block *c* underneath and around the bottom of bushing *d* oil-grooves c^5 are formed in the side of part c^4 and upper surface of flange c^3.

The disk-like plate *e*, which is composed, preferably, of hardened steel, is of a diameter approximately equal to the inside diameter of the raised portion c^4 of block *c* and is adapted to lie thereon and form a bearing for the upper thrust-block *f*. Said plate *e* has a central vertical aperture *e′* and a set of similar vertical apertures e^2, through which the oil may flow through said block onto the top surface of the lower thrust-block *c*. By preference the oil-holes e^2 are arranged on a spiral or in such a manner that when said plate has made one complete revolution upon said thrust-block the oil will have been deposited in a series of concentric circles over practically the entire surface from center to periphery of raised portion c^4. The central aperture *e′* of plate *e* is designed to afford a suitable supply of oil to the groove c^2, which being closed at its ends by the bushing *d* acts as a small auxiliary reservoir or supply-chamber from which oil may be dragged by the plate *e*. The upper thrust-block *f* also fits within the bushing *d* and is adapted to have a bearing upon plate *e*, so as to revolve thereon about a vertical or approximately vertical axis. Said upper thrust-block is counterbored to receive the lower extremity of the main shaft *g*, for which this device constitutes a step-bearing. Said shaft is bored at its lower extremity, so that the dowel-pins *g′ g′* may be driven thereinto, and said upper thrust-block *f* has pockets *f′ f′* for receiving said dowel-pins *g′* to prevent said shaft from rotating in said upper thrust-block. An oil-passage f^2 is arranged in thrust-block f, so as to afford communication from the oil-passages g^2 in shaft g to the oil-passage e' in plate e and to the upper surface of said plate e. The oil-passages g^2 are preferably two in number and arranged obliquely, so that their upper mouths open at the side of the shaft above the top of the thrust-block f.

The bushing d and parts therein are inclosed within the oil-pot h, which in the present instance is formed in two parts bolted together by means of the flanges h' h'. Said oil-pot consists of a cylindrical vessel having an inside diameter somewhat greater than the outside diameter of the bushing d, so as to leave a space for the storage of the lubricating-oil. The size of the pot also permits the angular play of the shaft g and bearing parts without interfering therewith. At the bottom of the oil-pot h are the flanges h^2, which are adapted to be bolted down into the thrust-block holder b. In order that the joint between the flange h' and the holder b may be oil-tight, a shim i, of paper or other suitable material, may be interposed between said oil-pot and thrust-block holder. The oil-pot h is somewhat higher than the upper openings of the oil-passages g^2, so that the oil may have access to said passages.

A cap j is adapted to fit over the oil-pot and is apertured so as to approach, but not bind, the shaft g. By preference said pot has a depending annular flange j', having a diameter greater than the outer diameter of the oil-pot, so that said cover may move laterally upon the oil-pot to accommodate itself to the various angles of inclination of the shaft.

In operation when the parts are being assembled the base-plate a is first bolted down upon the foundation in approximately the proper position. The thrust-block holder b is then placed within said base-plate, and after the two thrust-blocks, the shaft, and oil-pot are assembled in the manner shown the shaft is trued up by means of the adjusting-screws a', so as to stand approximately vertical. After the oil-pot has been securely bolted down onto the thrust-block holder b it is filled approximately full of oil and the cover j lowered into position.

When the shaft rotates, the dowel-pins g' will cause the upper thrust-block f to rotate with the shaft, while the dowel-pins c' will prevent the lower thrust-block c from rotating. The interposed plate e being free to rotate will be rotated by the friction of the rotating thrust-block f; but the rotation of said plate e will be retarded by its friction upon said lower thrust-block, so that said plate will rotate at a slower speed than the shaft. Consequently there will be two rubbing or bearing surfaces, one on the top of the lower thrust-block and the other at the bottom of the upper thrust-block. This therefore gives a bearing-surface equal to the combined area of said thrust-blocks, and the lubricating-surface is consequently twice as great as it would be if plate e were not present.

It will be noted that the diameter of plate e is considerably greater than that of shaft g, and as a result there is afforded in my device an area of lubricating or bearing surface much greater than the area afforded in a step-bearing where the shaft bears directly upon its step, and the area here is still greater than in a step-bearing where the shaft bears directly upon a non-rotating part.

During the rotation of the shaft the oil which enters into the passage g^2 first reaches the top of plate e from passage f^2 and by centrifugal action spreads out in all directions over the top of said plate. The oil in thus spreading out reaches the small oil-passages e^2 and passes downward through them onto the top surface of the lower thrust-block c. Inasmuch as said passages e^2 are spaced at different distances from the center, it will occur that when said plate has made a complete revolution it will have spread oil upon practically the entire upper surface of thrust-block c. Being influenced still by centrifugal action, due to the rotation of plate e, the oil will tend to spread to the perphery of the raised portion c^4 of thrust-block c and will be drawn off by the oil-passages c^5 c^5, finally exuding into the bottom of the oil-pot h. This passing out of the oil through the passages c^5 causes more oil to be drawn down through the passages g^2, f^2, e', e^2, and c^5, and as long as the rotation of the shaft continues this flow of oil will be uninterrupted. This continuous flow of oil through the bearing is of great advantage both in keeping the bearing cool, in promoting lubrication, and protracting the life of the oil, and this continuous and effective circulation of the oil, taken in connection with the greatly-increased bearing-surface, gives the step-bearing a high efficiency.

In the erection of heavy machinery it is often difficult to cause the shaft to stand in a perfectly vertical position and to maintain a strictly vertical position when rotating. With the present construction, however, in which the spherically-convex thrust-block c rests within a corresponding spherical recess in the thrust-block holder b, the shaft may incline a considerable amount from the vertical without in any way impairing the efficiency of the bearing.

Inasmuch as the flange c^3 projects considerably beyond the sides of the shaft g, a large bearing-surface at the bottom of thrust-block c is provided, and said thrust-block may work from side to side and still remain seated in said thrust-block holder.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a step-bearing, the combination of a shaft, a thrust-block for supporting said shaft; a thrust-block holder whereon said block is angularly movable for supporting the shaft in various angular positions above it, a base-plate for supporting said holder, means for laterally adjusting said holder upon said base-plate, and an oil-pot upon said holder, said pot communicating with the surfaces at which the thrust-block and holder make contact with each other, and said pot rising to a point above the top of said thrust-block.

2. In a step-bearing, the combination of a thrust-block having a convex lower extremity; and a thrust-block holder having a spherical concavity for receiving said thrust-block, one of said parts having a plurality of dowel-pins and the other of said parts having pockets for receiving said dowel-pins to prevent displacement of said block, and prevent rotation thereof, said pockets being of greater diameter than the dowel-pins for permitting angular play of said block.

3. In a step-bearing, the combination of an upright shaft, an upper thrust-block for supporting it, means for imparting the rotation of the shaft to the thrust-block, a lower non-rotating thrust-block, means for supporting the latter in various angular positions, means for laterally adjusting said lower thrust-block, said upper and lower thrust-blocks both having cylindrical side portions greater in diameter than said shaft; and a bushing fitting over said cylindrical portions of said thrust-blocks for holding one above the other.

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