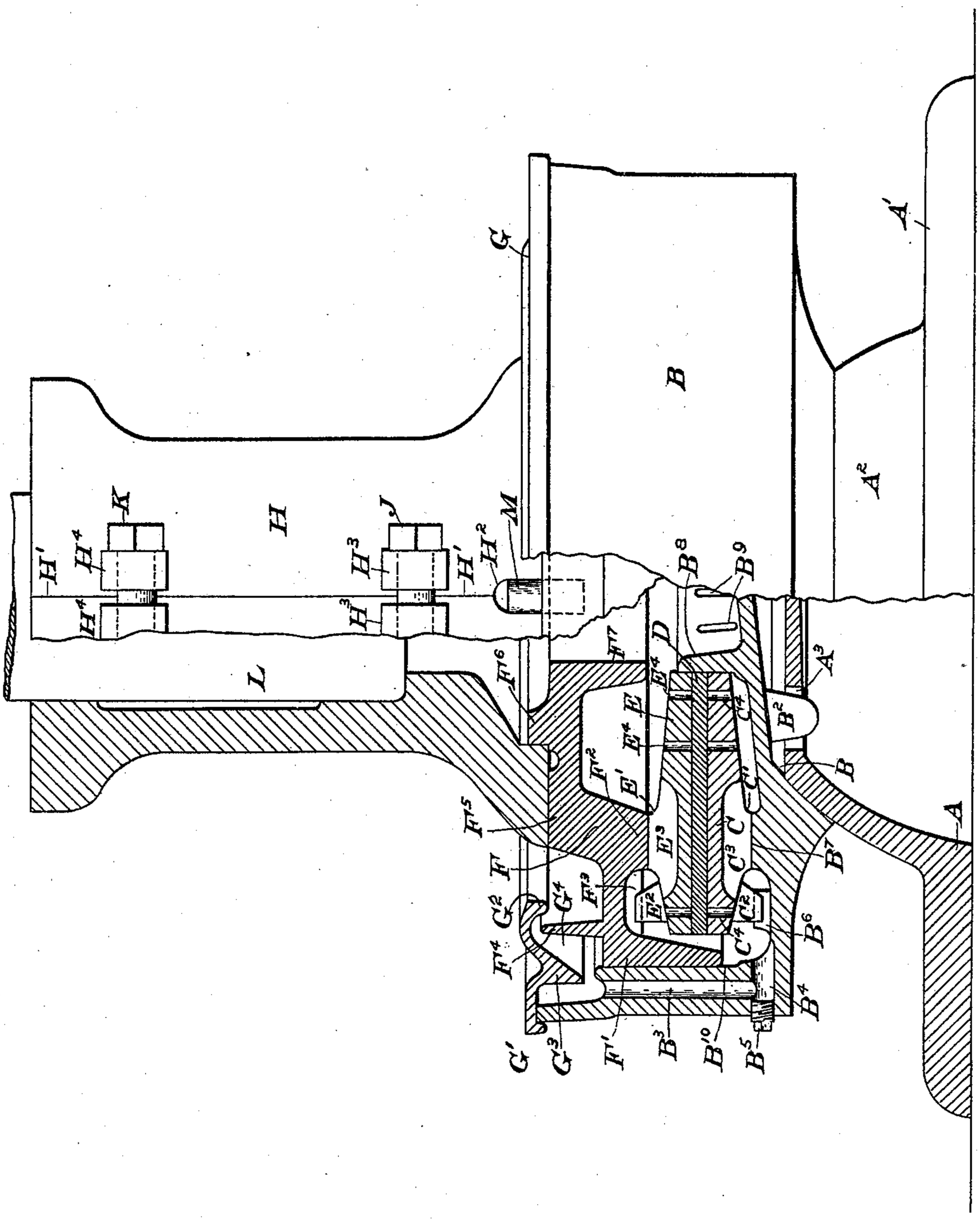
No. 673,162. Patented Apr. 30, 1901.

E. F. EDGECOMBE.

STEP BEARING.

(Application filed Dec. 28, 1900.)

(No Model.)



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STEP-BEARING.

SPECIFICATION forming part of Letters Patent No. 673,162, dated April 30, 1901.

Application filed December 28, 1900. Serial No. 41,409. (No model.)

To all whom it may concern:

Be it known that I, EDWARD F. EDGECOMBE, a citizen of the United States, residing at Cuyahoga Falls, in the county of Summit and State of Ohio, have invented certain new and useful Improvements in Step-Bearings; and I do 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 appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to bearings intended to support the weight and permit the rotation of vertical shafts—such, for example, as are employed in connection with grinding-pans and analogous machinery. Devices of this character are commonly known as "step-bearings."

One object of my invention is to produce a step-bearing consisting of the least number of parts, each part of simple formation and possessing maximum strength without undue weight, the wearing-surfaces having all practicable breadth within the limits of the apparatus and the whole being provided with a sufficient number of communicating channels, through which the lubricant may easily reach every surface liable to wear or heat.

Another object of my invention is to construct a support for a revolving shaft carrying any weight and driven at any speed which will by reason of its peculiar construction maintain at all times perfect contact throughout the entire extent of its bearing-surfaces, even though the shaft may wear away by use and depart slightly from the true vertical.

Still another object of my invention is to manufacture a step-bearing that may be readily removed whole, if necessary, for purposes of examination and repair and the usual laborious preparatory work of jacking up the pan avoided. In all the devices of this nature with which I am familiar when it is found needful to take out the bearing the pan must be raised by a more or less time-consuming process for a considerable distance or the step is separated into its integral parts, which are then to be handled one by one and must be replaced each by itself. During such an operation it is almost impossible to prevent the dirt and grit with which the pans are covered from dropping in among the wearing-surfaces, where it remains unnoticed, to subsequently injuriously heat and cut them.

I attain the objects stated by employing and arranging certain constituent elements, each of which is fully described in detail and its individual office, together with the mode of operation of the whole, explained at length hereinbelow.

The accompanying drawing represents a side view of my invention, partly in vertical section, the various parts being designated by the letters to which this description refers.

Letter A marks the base-casting, having the appearance of an inverted dish, provided with a very broad and heavy flange or rim A′, that is to be bolted to a bed of metal, timber, or concrete, as the case may be, in the customary manner. The upwardly-extending bulge of base A is exteriorly finished superficially as a portion of a sphere A^2, truncated, its flat top being pierced by a slot A^3. Upon the spherical surface of the base rests the bowl B, and this bowl is the receptacle for all the remaining working parts. It possesses a lower centrally-located surface B′, finished spherically to fit the like surface of the base, and it is therefore universally movable on the base. It can neither leave the base, however, nor turn around upon it, as the lug B^2, projecting from the under surface of the bowl, engages the slot A^3, as shown, and limits the movement. At one or more points in the circumferential wall of the bowl I form vertical ducts B^3, each opening below into a transverse duct B^4, extending horizontally through the wall and closed on the outside by the screw-plug B^5. These ducts afford passage for oil from top to bottom of the bowl, and by unscrewing the plug the bowl may be drained, as may be readily seen from the drawing. In addition to the features already detailed the bowl has an upwardly-projecting fin B^6 upon the inside, also the annular raised portion B^7 and the centrally-located cylindrical wall B^8, the last finished exteriorly. This cylindrical wall is not continuous, but has recesses or slots B^9 cut through it to permit the circulation of oil. No special or precise form is given the fin, lugs, and

slots introduced. They are usually shaped about as shown. The main wall of the bowl has its interior surface B^{10} finished to furnish a peripheral bearing for the cup-plug hereinafter described. The next part met within the bowl is the lower bearing-plate C. This plate is usually a disk of close-grained cast-iron, having a central circular opening fitting the cylindrical wall B^8 and a flat broad bearing-surface, as shown. An annular dropped portion C′ is provided with a plane surface corresponding in form and extent with the surface of the raised portion B^7 upon the bottom of the bowl. The plate C is supported by the meeting of these two annular surfaces, as shown. Plate C is prevented from revolving within the bowl by the contact of the downwardly-projecting lug C^2 and the fin B^6. It is my desire and object, as already stated, to establish ample oilways throughout my invention, and with this end in view I form a number of recesses across the dropped portion C′ of the plate. One of such recesses is shown marked C^3. Furthermore, the plate is perforated with vertical oil-holes C^4 C^4, bored at suitable intervals.

By way of the oil-holes just mentioned the lubricant is served to the intermediate bearing-plate D. This plate is preferably of nickel-steel, in order that the bearing-plates may be of different texture, and thus minimize friction and wear. It is a circular disk, having upper and lower finished surfaces and a central circular opening fitting the cylindrical wall B^8 of the bowl, which affords a center bearing for the plates, as delineated.

Letter E marks the upper bearing-plate, in all respects the twin of lower plate C. Its features are the raised annular portion E′, the upwardly-projecting lug E^2, the transverse oil passages or recesses, of which one is shown and marked E^3, and the vertical oil-holes E^4, by way of which the upper bearing-surface of intermediate plate D is served.

The uppermost element contained by the bowl is the cup-plug F. As customarily fashioned it has a pendent cylindrical outermost wall F′, finished exteriorly and bearing against the interior surface B^{10} of the bowl, and the plug revolves, therefore, with its axis sensibly the same as that common to the bearing-plates. Plug F has an annular dropped portion F^2, provided with a plane surface of the same form and extent as the surface of the raised portion E′ of the upper bearing-plate upon which it rests. It cannot turn upon the upper bearing-plate E for the reason that the downwardly-extending web F^3 meets and cannot pass the lug E^2 of the bearing-plate. On top, near its periphery, the plug has an upright cylindrical wall F^4 and more toward the center a raised annular portion F^5, having a plane upper surface, and again near the center the annular ridge F^6, having a plane upper surface and a finished outer surface, upon which the shaft coupling or hub is centered, as more fully explained below. A depending flange F^7 completes the plug, and this flange is finished on the surface toward the center of the plug, and a vertical shaft might be centered and secured therein.

To protect the bearing from falling particles of grit, &c., I provide the ring-like cover G. The cover rests upon the upper outer edge of the bowl and is usually given a slight overhang G′. A second annular overhanging portion G^2 covers the top of the upright wall F^4 of the plug, and between the two overhanging portions the cover possesses a depending ridge G^3, the inner surface of which, G^4, will be noted as inclined. The office of this inclined surface is to direct any oil thrown upon it centrifugally from the plug downwardly toward the main body of lubricant. It will be understood that the cover G does not revolve with the plug.

There are numerous methods of attaching shafts in vertical bearings. The method I prefer to employ, but to which I do not in any sense confine myself, is to use a split clamp-hub bored to fit the shaft and also to fit the upper part of the step-plug. Letter H designates the hub, which is split on the line H′, and at the lower end of the split will be seen the recess H^2. Corresponding ears H^3 H^3 and H^4 H^4 are provided on opposite sides of the split, and through these ears are bolt-holes to accommodate the bolts J and K, by which the hub is clamped to the shaft L and the step-plug F. The hub is centered against the finished outer surface of the annular ridge F^6 and rests upon the upper surface of the raised portion F^5 of the plug. The same operation that clamps the hub on the shaft also clamps it on the plug. The motion of the hub is transmitted to the plug by means of the dowel M, which is fastened into the plug and fits the recess H^2 in the split of the hub.

In practice oil is poured into the bowl and finds its way by the various ducts, recesses, and oil-holes throughout the bearing. The bowl is filled until the upper mouths of vertical ducts B^3 are well submerged. It will now be understood that all bearing-surfaces being beneath the surface of a considerable body of oil, constantly agitated and caused by the revolution of the plates to visit every part of the apparatus, the problem of effective lubrication is solved as far as it may practicably be done. In the upper portion of the bearing the rotation affects the lubricant centrifugally, tending to move it from the center. In the lower portion of the bowl the parts including the oil are still, and as the revolving upper levels of the liquid travel outwardly, the comparatively quiet lower levels having lost most of their movement flow in to supply the central lack, and this action is continuous during the operation of the bearing. Particles of foreign matter which in spite of every precaution find entrance to such bearings in actual use eventually gravitate to the bottom of the bowl, where they remain.

After the machinery to which the shaft may be connected above has been for some time in operation, the unavoidable wear or other displacing effect will occasionally throw the shaft out of an exact vertical attitude. Under such conditions the bowl will tilt slightly upon the spherical basic surface, enough to permit the bearing-plates, as well as all the other elements contained in the bowl, to keep their original positions with relation to each other and the full extent of their surfaces always in even contact. For this reason the life of the bearing is greatly prolonged and its frictional effect reduced to a minimum.

To remove the bearing it is only necessary to take the weight of the pan from it. The pan need not be raised at all. The bolts of the hub are withdrawn and the hub taken away. The space it occupied is more than enough to allow the bowl, with its contents and cover, to be lifted off base A and out. It will be noted that the bowl need not be raised greatly to free it from the base.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a step-bearing, the combination of a base having a partly-spherical surface, a bowl having a corresponding surface resting upon the spherical surface of the base, the said bowl having the inner surface of its outer wall finished as a bearing-surface, the said bowl having also a central cylindrical bearing-surface, bearing-plates one supported by the other within the bowl and having circular central openings fitting the cylindrical bearing-surface of the bowl, a step-plug fitting the bowl interiorly, the said step-plug resting upon the uppermost bearing-plate, and means whereby the said step-plug and upper bearing-plate are compelled to move together when rotated, substantially as described.

2. In a step-bearing, an annular bearing-plate having a central opening and circular bearing-surface, also an upper flat bearing-surface, and a downwardly-extending portion provided with transverse recesses, substantially as described.

3. In a step-bearing, the bowl having the inner surface of its outer wall finished as a bearing-surface, a cylindrical centrally-located wall exteriorly finished as a bearing-surface, an annular raised portion, vertical oil-ducts in the said outer wall, and transverse oil-ducts communicating with the vertical ducts, substantially as described.

4. In a step-bearing, the combination of a bowl having the inner surface of its outer wall finished as a bearing-surface, a cylindrical centrally-located wall exteriorly finished as a bearing-surface, and an annular raised portion, a lower bearing-plate C, means for preventing the rotation of plate C within the bowl, an intermediate bearing-plate, an upper bearing-plate E, the step-plug F, and devices adapted to prevent the rotation of plate E and plug F with respect to each other, all constructed and arranged substantially as described.

5. In a step-bearing, the step-plug F, having a central shaft-opening, a lower annular bearing-surface, a peripheral bearing-surface, and an upright cylindrical wall F^4, substantially as described.

6. In a step-bearing, the combination of the base having a partly-spherical protuberance, a bowl having a corresponding surface resting upon the said spherical protuberance and means adapted to retain the bowl movably thereon, the said bowl having vertical and transverse oil-ducts, the said bowl having the inner surface of its wall finished as a bearing-surface, the said bowl having a central cylindrical slotted wall, bearing-plates having central openings fitting the said slotted wall and provided with annular extended or thickened portions crossed by transverse recesses, a step-plug fitting the bearing-surface of the wall of the bowl and resting on the uppermost bearing-plate, devices constructed and arranged to compel the said upper bearing-plate and plug to move together when rotated, the said step-plug having an upright cylindrical wall, and an annular cover resting upon the wall of the bowl, the said cover extending inwardly over the upright cylindrical wall of the plug, substantially as described.

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

EDWARD F. EDGECOMBE.

Witnesses:

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