

Sept. 7, 1937.

O. A. KNOPP
JEWEL BEARING

2,092,281

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Fig. 1.

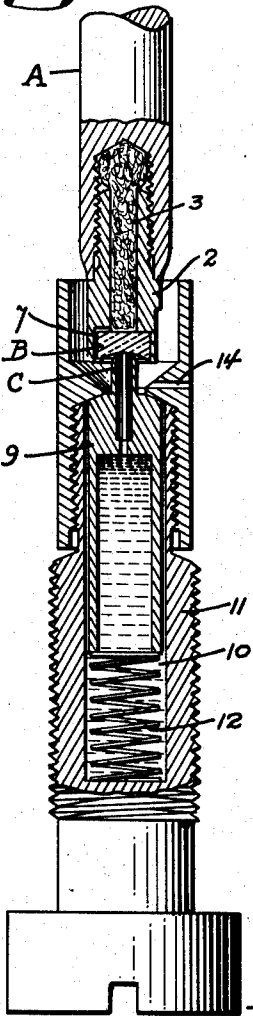


Fig. 2.

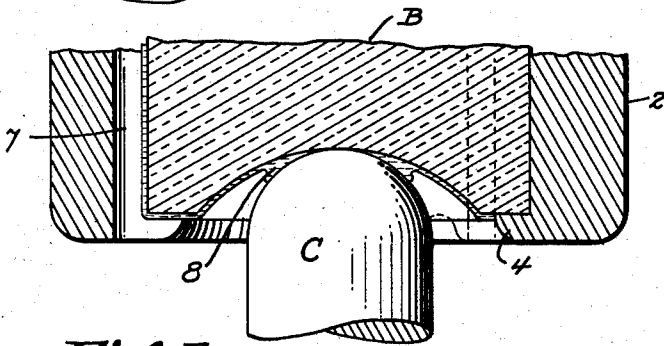


Fig. 3.

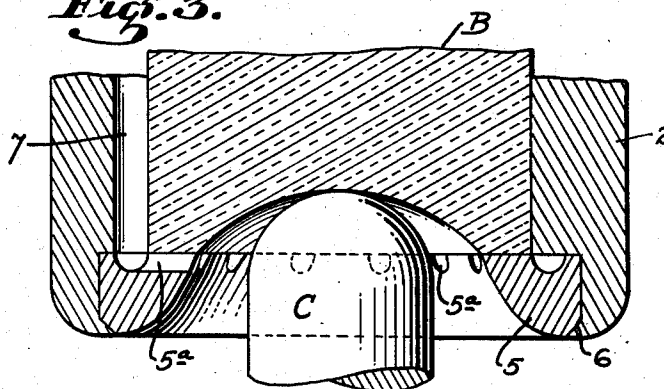


Fig. 8.

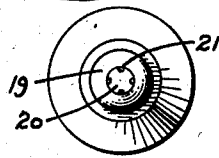


Fig. 6.



Fig. 7.



Fig. 5.



Fig. 4.

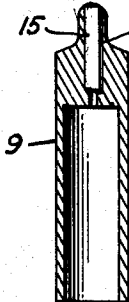
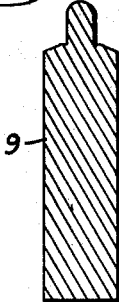


Fig. 10.



Fig. 11.

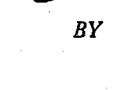
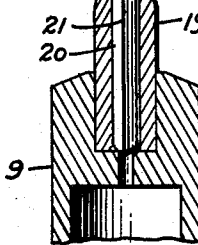


Fig. 12.



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JEWEL BEARING

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8 Claims. (Cl. 308-159)

This invention relates to jewel bearings and especially that type employed in watt-hour meters and like instruments.

The lower bearing of watt-hour meters, as presently constructed, is universally of a more or less standard construction. The vertical shaft of the watt-hour meter has a removable steel pivot point at its lower end. This pivot point rests in a cup-shaped jewel inserted in a so-called jewel screw which is carried by the frame of the meter. This type of bearing has certain disadvantages.

Any dust or dirt which finds its way into the jewel cup will accumulate there and act as a grinding medium and cause rapid wear of the jewel. The dust and dirt will continuously gravitate to a point underneath the pivot member and resist rotation in the jewel cup. In order to prevent this constant grinding action and resistance to rotation, some designers have reversed the relation of the two members; that is, the jewel and the pivot point, by placing the cup-shaped jewel at the lower end of the shaft and the pivot point in the jewel screw which is carried by the meter frame, thus preventing an accumulation of dirt and dust in the jewel cup. But this construction has not been found satisfactory as it was not possible to keep the oil in the jewel cup.

The object of the present invention is generally to improve and simplify the construction and operation of jewel bearings of the character described; to provide a jewel bearing in which the cup-shaped jewel is placed at the lower or bottom end of the watt-hour meter shaft and the supporting pivot below the same; to provide one or more sources of oil supply from which the oil is fed by the force of capillary attraction and surface tension to the concave face of the cup-shaped jewel and to lubricate the same; and, further, to provide a pivot point which is resiliently supported so as to prevent injury to the jewel during shipment and installation of the meter.

The jewel bearing is shown by way of illustration in the accompanying drawing, in which—

Fig. 1 is a central, vertical section of the shaft of a watt-hour meter, said section showing the jewel bearing and the support therefor and also the means whereby the bearing surfaces are lubricated;

Fig. 2 is an enlarged section showing one method of securing the jewel in the lower end of the watt-hour meter shaft;

Fig. 3 is a similar view showing another method;

Fig. 4 is a central vertical sectional view of one form of pivot support;

Figs. 5, 6, 7, and 8 are plan views showing certain modified forms of pivot supports to be hereinafter specifically referred to, and

Figs. 9, 10, 11, and 12 are views in vertical section showing the pivot supports respectively corresponding to Figs. 5, 6, 7, and 8.

Referring to the drawing in detail, and particularly Fig. 1, A indicates the rotating shaft of a watt-hour meter, or other instrument, B a jewel mounted in the lower end thereof, and C a pivot pin which forms a support for the shaft and the jewel and upon which these members rotate.

Shaft A is, in this instance, drilled and tapped at its lower end to receive a screw 2. This is, in turn, drilled to form a central passage 3 which is enlarged at the lower end to receive and secure the jewel B; the jewel being secured or retained against removal by crimping or spinning over the inner edge as shown at 4 in Fig. 2, or by inserting a retaining washer such as shown at 5 in Fig. 3, which is secured by crimping as indicated at 6.

The central passage 3 is filled with oil soaked felt, or similar material and by mounting the jewel loosely in its seat, or by providing small ducts 7, oil by capillary action will ooze out along the periphery of the jewel and will rise upwardly into the lower cup-shaped face of the jewel by surface tension and as such will form a film of oil which thickens slightly where the pivot point bears against the surface of the cup-shaped jewel, as shown at 8 in Fig. 2. The oil thus delivered is held by a capillary action in the gap formed between the convex surface of the pivot point and the concave surface of the jewel. Any dust or dirt which enters the bearing inadvertently, or material which is worn off the pivot point of the jewel, will by gravity settle away from the contact area and thus leave a perfectly clean and lubricated contact surface between the jewel and the pivot member.

The felt which fills the passage 3 serves two main functions. First, it serves as a reservoir for the lubricating oil; and, secondly, by its capillary action it to a large extent counterbalances the gravitational force and the surface tension of the jewel, thus preventing the oil from escaping too rapidly from the reservoir.

By an arrangement of the character here shown, it is possible to automatically supply a continuous flow of lubricating oil to the bearing surfaces over a long period of time without re-

oiling, as an infinitely small fraction of the oil is exposed to the air at one time the tendency of oxidizing or causing deterioration of the supply is substantially prevented.

5 In the jewel bearings commonly employed in watthour meters and like instances the full quantity of oil required for lubrication floods the bearing surfaces and submerges the same, and as such is continuously churned up and becomes
10 mixed with dust falling into it and it becomes mixed with material worn off the bearing surface. Also, it is continuously subjected to oxidation with the result that in the course of years the oil becomes a sticky paste which increases
15 friction and adds to the wear of the pivot point and jewel.

To prevent injury to the jewel during shipment and installation of the meter, the pivot member C is mounted on the upper end of a
20 piston-like member, such as shown at 9. This is mounted in a central passage 10 formed in the screw 11 which is supported by the frame of the meter and a spring 12 is interposed, as clearly shown in Fig. 1, this spring forming a resilient
25 support for the piston-like member and the pivot pin C carried thereby and as such prevents injury to the jewel. The pressure of the spring is slight, in fact, just a little in excess of the weight of the elements C and 9 and the shaft A, with attached parts supported thereby, hence giving a
30 cushioning effect when the instrument is subjected to shock or jar.

In some instances the supply of oil carried by the oil soaked felt packed into the passage 3 is
35 sufficient to insure proper lubrication over a period of years. If during insertion, there is an excess flow of oil a drain passage, such as shown at 14, is provided to carry off the excess and to prevent any accumulation.

40 The oil may also be supplied from a source below the bearing. For instance, by hollowing out the piston-like member 9 and filling the same, together with the passage 10, with oil such a supply may be drawn on to supply the bearing surface; this being accomplished by placing a pin
45 15 in the upper end of the piston-like member and forming capillary grooves exterior thereof as shown at 16.

Again, referring to Fig. 6, the pin may be provided with capillary grooves in its outer face, as
50 shown at 17, or a single capillary passage may be formed in the pin as shown at 18, see Fig. 7.

A further modification is shown in Fig. 8, in which two pins are employed as shown at 19
55 and 20. The pin 20 is provided with capillary grooves 21 in its surface and said pin is harder than pin 19 so as to carry the brunt of the wear.

Where the oil is supplied both from above and below the bearing surface, one source of supply
60 will tend to counterbalance the other, hence if one source should become depleted there would still be the other source to supply the desired lubrication.

By referring to Fig. 2, it will be noted that the
65 capillary grooves 7 extend only to the peripheral lower edge of the jewel. By inserting a washer, such as shown at 5 in Fig. 3, and forming radial grooves 5a therein, the oil is carried directly to the cup-shaped lower face of the jewel and surface tension will there carry it to the bearing
70 point; and while this and other features of the invention have been more or less specifically described and illustrated, it should be understood that various changes may be resorted to within
75 the scope of the appended claims. Similarly,

that the materials and finish of the several parts employed may be such as the manufacturer may decide, or varying conditions or uses may demand.

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

1. In a bearing of the character described a vertical shaft, a jewel having a cup-shaped bearing surface secured in the lower end thereof, a pivot member disposed below the jewel and upon
10 which the jewel rests, a source of oil supply, and means between said source of supply and the jewel whereby oil is fed by the force of capillary attraction and surface tension to maintain a lubricating film between the jewel and the pivotal support.
15

2. In a bearing of the character described a vertical shaft, a jewel having a cup-shaped bearing surface secured in the lower end thereof, a pivot member disposed below the jewel and upon
20 which the jewel rests, a source of oil supply disposed in the shaft above the jewel and capillary ducts connecting said source with the lower cup-shaped face of the jewel, said ducts feeding oil by capillary action and surface tension in a sufficient quantity to maintain a lubricating film of oil between the jewel and the pivotal support.
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3. In a bearing of the character described a vertical shaft, a jewel having a cup-shaped bearing surface secured in the lower end thereof, a pivot member disposed below the jewel and upon
30 which the jewel rests, a source of oil supply disposed below the pivotal support, capillary ducts connecting said source with the upper end of the pivotal support, said ducts feeding oil by capillary action and surface tension in a sufficient quantity to maintain a lubricating film of oil between the jewel and the pivotal support.
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4. In a bearing of the character described a vertical shaft, a jewel having a cup-shaped bearing surface secured in the lower end thereof, a pivot member disposed below the jewel and upon
40 which the jewel rests, two separate sources of oil supply, capillary ducts connecting one source with the bearing point of the pivotal support, and capillary ducts connecting the other source with the cup-shaped face of the jewel, said ducts feeding oil by capillary action and surface tension to the respective surfaces in a sufficient quantity to maintain a lubricating film between them.
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5. In a bearing of the character described a vertical shaft terminating in its lower end in a cup-shaped bearing surface, a pivot member disposed below the cup-shaped bearing surface and forming a point contact support for the concave bearing surface on the shaft, a source of oil supply adjacent said bearing surfaces but separated therefrom, and means for delivering oil from the source of supply to said bearing surfaces by means of capillary action and surface tension.
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6. In a bearing of the character described a jewel secured at the lower end of a shaft, a pivot member engaging the point surface of said jewel and supporting the shaft and jewel, means for supplying a lubricant to the upper surface of the jewel and capillary passages surrounding the jewel whereby the oil will be delivered to the lower surface of the jewel by capillary action and surface tension.
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7. In a bearing of the character described, a vertical shaft, a jewel mounted at the lower end of the shaft and having a downwardly presented cup-shaped bearing surface, an upstanding pivot member mounted below the shaft and upon which the said jewel rests, means including a source of
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oil in the shaft above the jewel whereby oil is fed by capillary action and surface tension to maintain a lubricating film over the cup-shaped bearing surface of the jewel, and means including a source of oil supply below the pivot member for feeding oil by capillary action and surface tension to the jewel engaging upper end of the pivot member for establishing static equilibrium with the feed of oil from above the jewel to assist in preventing rapid drain of the upper jewel oiling means.

8. In a bearing of the character described, a vertical shaft, a jewel mounted in connection

with the lower end of the shaft and having a downwardly presented bearing surface, an upstanding pivot member having a support below the shaft and upon which the bearing surface of the jewel rests, and means including a source of oil supply below the pivot member for feeding oil by capillary action and surface tension to the upper jewel engaging end of the pivot member, said means including capillary ducts in the pivot member spaced from the surface thereof and opening upwardly through its jewel engaging end.

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