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E. HILL

ROTARY PUMP

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*Fig. 1.*

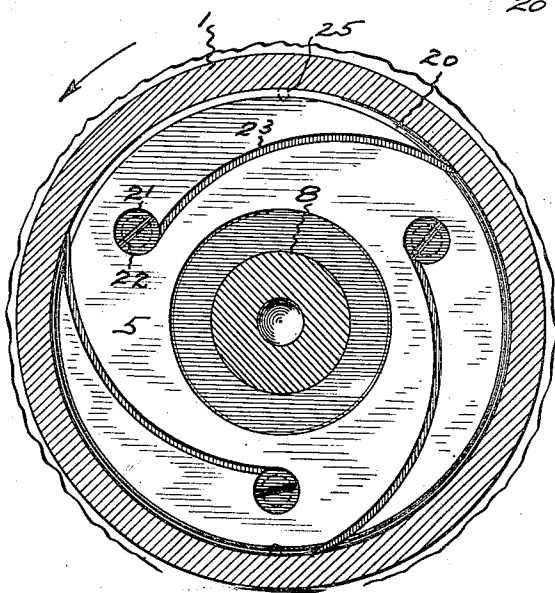
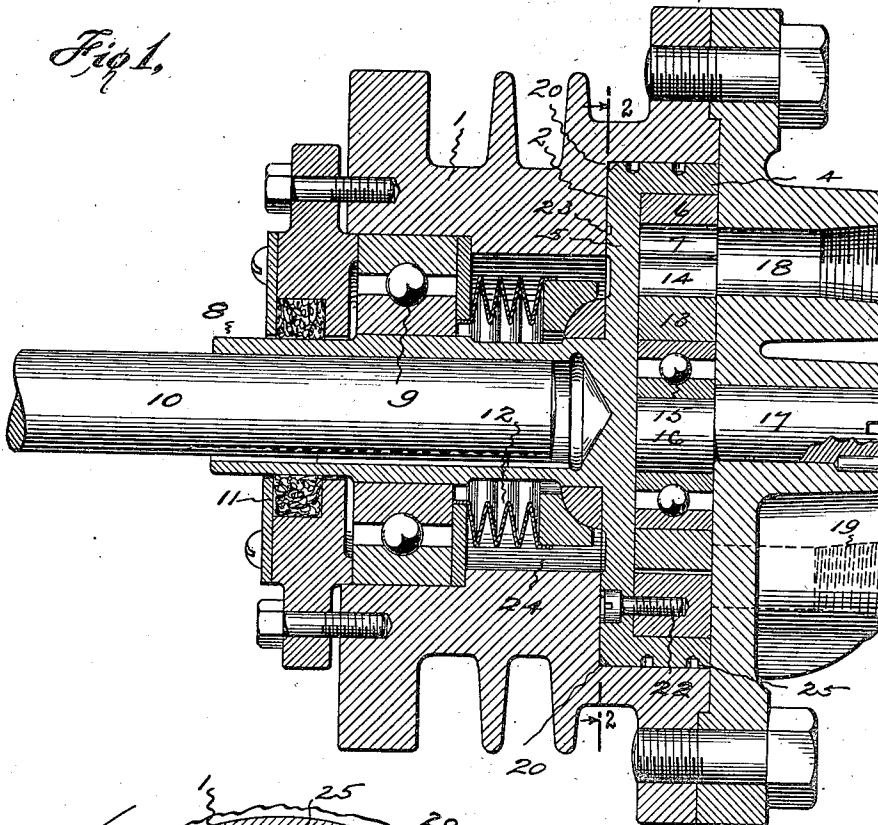


*Fig. 2.*

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## UNITED STATES PATENT OFFICE.

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## ROTARY PUMP.

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*To all whom it may concern:*

Be it known that I, EBENEZER HILL, a citizen of the United States, residing at South Norwalk, in the county of Fairfield and State of Connecticut, have invented a new and useful Improvement in Rotary Pumps, of which the following is a specification.

This invention relates to the type of rotary pumps which have a casing with a pumping chamber containing a rotatable outer element that surrounds and co-operatively engages a rotatable inner element for pumping fluids.

The object of the invention is to provide simple means for lubricating, and at the same times utilize the lubricant for packing the clearance space between the adjacent surfaces of the outer rotatable element and stationary wall of the pumping chamber, and thereby reducing the friction between the parts and decreasing the liability of leakage of fluid from the pumping chamber around the driving and bearing elements of the pump.

In attaining this object the surface of the outer pumping element adjacent to the wall of the pumping chamber is so shaped and provided with lubricant carrying channels that centrifugal force is utilized when the pump is in operation not only to spread the lubricant but cause the lubricant to pack the joints through which the fluid being pumped might otherwise possibly leak.

In the accompanying drawings Fig. 1 shows a longitudinal section of a rotary pump which embodies this invention. Fig. 2 shows transverse section of the same on the plane indicated by the dotted line 2—2 on Fig. 1, looking in the direction indicated by the arrows.

The pump illustrated has a casing 1 containing a cylindrical pumping chamber 2. A head 3 is detachably fastened to the casing over the open side of the pumping chamber. The outer pumping element has a peripheral rim 4 that snugly but rotatably fits the peripheral wall of the pumping chamber, and it has a face plate 5 that fits against the end wall of the pumping chamber. Tightly fitted within the rim of the outer pumping element is a ring 6 with internal teeth 7. The face plate of the outer pumping element has a hub 8 supported by bearings 9 and the driving shaft 10 is fitted in

and keyed to this hub. A gland packing 11 is arranged about the hub at the end of the casing and an expansible packing 12 is interposed between the casing and the hub inside of the bearing.

The inner pumping element 13 has external teeth 14 and it is mounted on a bearing 15 which is fitted upon an arbor that has a journal 17 in the head. When the shaft is rotated the intermeshing gears of the pumping elements draw fluid in through the intake 18 and force it out through the discharge 19 in the well known manner.

In carrying out this invention the corner of the rim of the outer pumping element is cut away, preferably by chamfering off the edge so as to provide an annular cavity 20 between the corner of the outer pumping element and the corner of the pumping chamber. In the back of the face plate of the outer pumping element there are cavities 21. There may be any desired number of these cavities and they may have any suitable shape. In the particular instance illustrated these cavities are the clearance holes for the heads of the screws 22 which are used to fasten the toothed ring 6 to the face plate 5. Grooves 23 are made in the back face of the plate from these cavities to the chamfered corner at the periphery of the outer pumping element. These grooves preferably start from the inside edges of the cavities 21 and curve outward to the periphery more or less spirally. The exact number, particular cross sectional shape, and the special curvature of these grooves is immaterial, as these characteristics may be altered as desired. In the periphery of the outer pumping element there may be lubricant pockets 25 for collecting and distributing lubricant between the peripheral surface of the pumping element and the peripheral wall of the chamber.

In operation lubricant, either from the cavity 24 in the casing, or that which works in from the pumping chamber, is pocketed in the cavities 21, grooves 23 and cavity 20. As the pumping elements are rotated this lubricant is spread around so as to form a film between the back face of the plate and the adjacent end wall of the pumping chamber. Under centrifugal action lubricant is conducted outward through the grooves and fills the cavity 20 at the corner of the pumping chamber and thus packs

the joint between the movable and stationary parts at this locality with a pressure dependent upon the speed of the pump. Owing to the fact that the grooves 23 start from the inside of the cavities 21 not all of the lubricant will be forced out of the cavities, enough remaining under centrifugal action in their outer sections of the cavities to provide proper lubricant for the back of the plate.

Should any fluid attempt to leak from the pumping chamber around the periphery of the outer pumping element it is met and obstructed by the lubricant in the annular cavity 20, which lubricant is held therein under pressure. Any pressure of leaking fluid would only tend to force the lubricant back into the grooves, which action would be resisted and overcome by the outward pressure of the lubricant due to the centrifugal movement of the lubricant in the grooves, and thus the lubricant packing would be made tighter as a result of any leakage pressure of the fluid being pumped. At most the effect would be to force some of the lubricant out of the grooves and cavities and spread it over the clearance space between the back of the pumping element and the end wall of the chamber thus making a more effective general seal for the pump and at the same time ensuring an effectual lubrication of the surfaces in frictional contact.

The invention claimed is:—

1. A rotary pump having a casing with a pumping chamber, and a rotatable pumping element within the chamber, said chamber having an annular cavity adjacent to the periphery of the pumping element, and said pumping element having means for causing lubricant to flow under centrifugal action to and exert pressure in said annular cavity.

2. A rotary pump having a casing with a pumping chamber, and a rotatable pumping element within the chamber, the corner of said pumping element being cut away to provide an annular cavity between the pumping element and the wall of the pumping chamber, and said pumping element having means for causing lubricant to flow under centrifugal action to and exert pressure in said annular cavity.

3. A rotary pump having a casing with a pumping chamber, and a rotatable pumping element within the chamber, said pumping

element having a corner cut away to provide an annular cavity in the pumping chamber, and said pumping element having grooves in its back face, leading inward from the cut away corner to localities nearer the axis of the pumping element.

4. A rotary pump having a casing with a pumping chamber, and a rotatable pumping element within the chamber, said pumping element having cavities in its back face, a peripheral corner chamfered off and grooves extending from the cavities to said chamfered corner.

5. A rotary pump having a casing with a pumping chamber, and a rotatable pumping element within the chamber, said pumping element having a chamfered edge so as to provide an annular cavity within the pumping chamber, said pumping element also having cavities in the back face and curved grooves leading from the cavities to the chamfered edge.

6. A rotary pump having a casing with a pumping chamber, and a rotatable pumping element having an annular peripheral wall with internal teeth on the inside of said peripheral wall and a face plate closing one side of the pumping element, said pumping chamber having an annular cavity adjacent to the corner of the periphery of the pumping element, and said plate having in its back wall adjacent to the end wall of the pumping chamber cavities with grooves extending in the face of the plate from the cavities to said annular cavity in the pumping chamber.

7. A rotary pump having a casing with a pumping chamber, and a rotatable pumping element within the chamber, said chamber having an annular cavity adjacent to the periphery of the pumping element, and said pumping element having spiral grooves in its back face for causing lubricant to flow under centrifugal action to and exert pressure in said annular cavity.

8. A rotary pump having a casing with a pumping chamber, and a rotatable pumping element within the chamber, said pumping element having cavities in its back face, a peripheral corner chamfered off and grooves extending from the inner edges of said cavities to the chamfered corner of the pumping element.

EBENEZER HILL.