

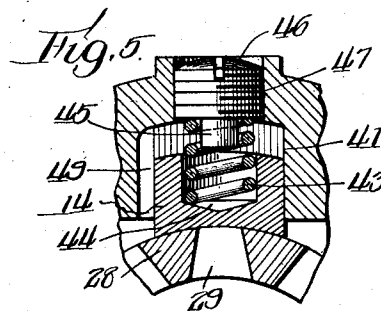
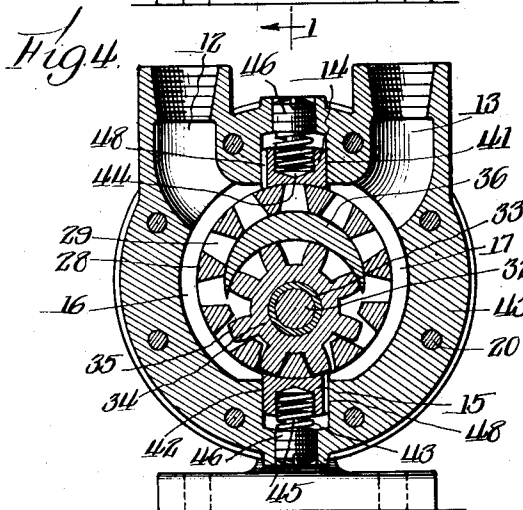
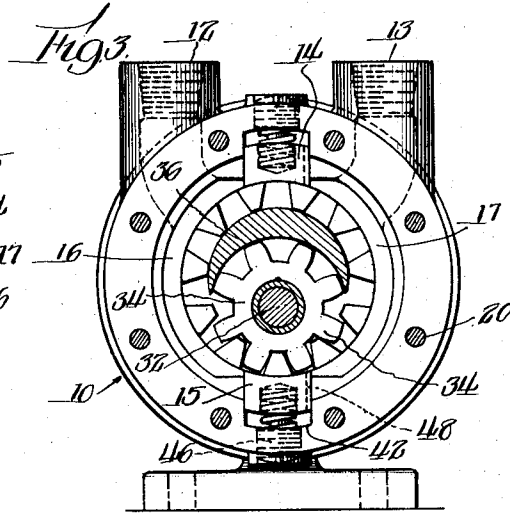
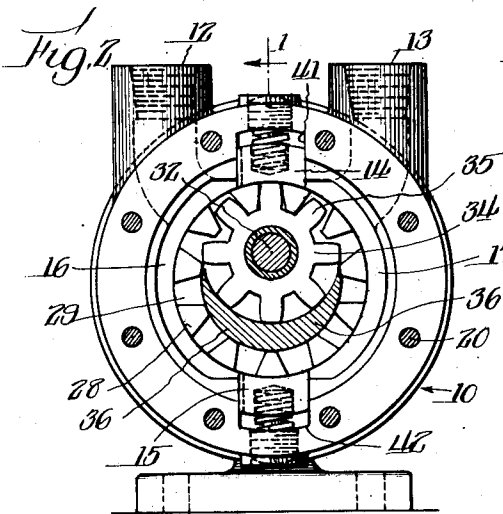
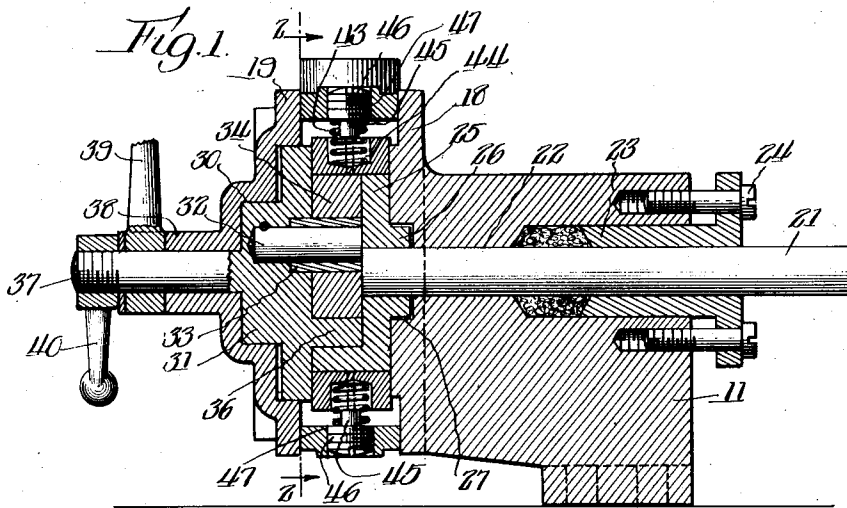
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I. H. WILSEY

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ROTARY MACHINE

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Inventor:
Irven H. Wilsey,
By Chas. E. Parker, Counselor
Attys.

UNITED STATES PATENT OFFICE.

IRVEN H. WILSEY, OF CHICAGO, ILLINOIS, ASSIGNOR TO JAMES B. TUTHILL, OF CHICAGO, ILLINOIS.

ROTARY MACHINE.

Application filed October 30, 1926. Serial No. 145,127.

The present invention relates to improvements in rotary machines, particularly machines of the type disclosed in my copending applications Serial No. 94,149 filed March 12, 1926, and Serial No. 133,349 filed September 3, 1926.

The general object of the invention is to provide a rotary machine having novel cut-off lands which are movable in the casing relative to the rotor.

A further object of the invention is to provide a rotary machine having floating lands, the outer surfaces of which are exposed through vents in the machine casing to the pressure in one of the chambers in the machine. If said surfaces are vented to the inlet side of the machine, excessive pressures in the discharge side of the machine will cause the lands to move away from the rotor to permit an automatic pressure relief by by-passing fluid from the discharge side to the inlet side. If said surfaces are vented to the discharge side of the machine, pressure acting on the opposite ends of the lands will be balanced, thereby permitting the handling of heavy liquids having thick natural films, such as molasses. The balanced lands will locate and hold the proper film for the liquid that is being handled, regardless of the existing pressures, and will thereby prevent the dissipation of the excessive power commonly wasted in cutting this natural film. If the outer end surface of one land is exposed to the pressure in one chamber and the corresponding surface of the other land is exposed to the pressure in the other chamber, excessive pressures will be relieved when the pump is operating in either direction.

Another object is to provide a novel pump in which the floating vented lands can be readily reversed to obtain any one of the three above mentioned conditions.

Still another object resides in the provision of floating lands of the above character in a rotary gear machine which is adjustable to vary the direction of flow and the volume of flow in either direction. The venting of the lands if both are vented to one side of the pump can be reversed without reversing the lands, by adjusting the pinion and segment of the pump through approximately 180°.

A further object is to provide a new and improved rotary gear machine which is ad-

justable to vary the direction of flow and the volume of flow in either direction, and in which there is no hydraulic lock tending to resist this adjustment.

A general object of the invention is to provide a new and improved pump having lands which are highly resistant to wear, which follow the contour of the rotor as wear occurs, which permit grit, chips and other small foreign particles to pass through, which permit the proper film thicknesses of the different liquids that may be handled, and which result in a high efficiency and a minimum power output for a given capacity.

Further objects and advantages will become apparent as the description proceeds. In the accompanying drawings,

Figure 1 is a longitudinal sectional view of a rotary machine embodying the features of my invention, said view being taken along line 1—1 of Fig. 2.

Fig. 2 is a sectional view taken along line 2—2 of Fig. 1.

Fig. 3 is a view similar to Fig. 2, but showing the operating elements of the machine adjusted through 180 degrees.

Fig. 4 is a view similar to Fig. 2, but showing the outer end surfaces of the lands vented respectively to opposite sides of the pump.

Fig. 5 is a fragmentary sectional view of a modified form of the pump in which the vent passage is formed in the wall of the casing instead of the side of the land.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawings and will herein describe in detail the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Referring more particularly to the drawings, the exemplary embodiment of the invention consists of a pump casing 10 which is supported by a suitable base 11, and which preferably is cylindrical in shape. The interior of the casing is also cylindrical in shape and communicates at opposite sides with fluid admission and discharge ports 12 and 13, which are adapted to be connected to

any suitable fluid line (not shown). Diametrically opposed lands 14 and 15 are mounted in the peripheral wall of the casing 10, and separate the interior of the casing into fluid admission and discharge chambers 16 and 17. The ends of the casing 10 are closed by removable heads 18 and 19 held in place by means of a plurality of bolts 20. Preferably the head 18 is formed integral with the base 11.

A rotor is mounted centrally in the casing 10, and on a drive shaft 21 adapted to be connected to a suitable source of power (not shown). The shaft 21 extends outwardly through a bore 22 in the support 11, and through a packing box 23 suitably secured to the end of the support by screw bolts 24. The rotor is substantially smaller in diameter than the interior of the casing 10, and therefore defines with the latter an annular space which is divided by the heads 14 and 15 to provide the chambers 16 and 17 referred to in the foregoing. The rotor comprises a circular plate 25 having a hub 26 which fits into a recess 27 in the inner face of the head 18 and which is rigidly mounted on the inner end of the shaft 21. Formed on the inner face and at the periphery of the plate 25 are a plurality of laterally projecting circumferentially spaced internal gear teeth 28 of any suitable form separated by spaces 29. The spaces 29, upon rotation of the shaft 21, are adapted to be moved successively across the lands 14 and 15 from communication with one to the other of the chambers 16 and 17.

Rotatably mounted in a circular recess 30 in the inner face of the head 19 is a carrier 31 which in the present instance is in the form of a circular disk coaxial with the shaft 21. On its inner face the carrier 31 is provided with a pin 32 which extends inwardly between the teeth 28 and eccentrically of the shaft 21. Mounted on a sleeve 33 on the pin 32 is an idler pinion 34 having teeth 35 meshing at one side of said idler pinion with the adjacent teeth 28 of the rotor. The other side of the pinion 34 is spaced from the teeth 28 on the remote side of the rotor, and is separated therefrom by a crescent-shaped projection or partition 36 extending inwardly from the carrier 31 and bearing against the inner ends of the teeth 28 and the outer ends of the teeth 35 through approximately 180°. The outer and inner curved surfaces of the partition 36 thus conform respectively to the curvatures of the internal gear and of the pinion 34.

To adjustably support the carrier 31, it is provided with a shaft 37 in alinement with the shaft 21 and journaled in a hub 38 formed integral with the head 19. Keyed to the outer end of the shaft 37 is an operating or adjusting lever 39. A locking lever 40 is threaded onto the outer end of the

shaft 38 next to the lever 39, and upon being tightened will clamp the carrier 31 in adjusted position against the inner face of the head 19.

The lands 14 and 15 are movable in the casing 10, and hence are separate from said casing. It is therefore possible to case-harden the lands and to make them of material highly resistant to wear, thereby prolonging the life and efficiency of the pump. While the lands may be of any suitable form and may be mounted in the casing 10 in any suitable manner, I prefer to provide lands in the form of blocks (see Fig. 5) which are slidably mounted in suitable guideways 41 and 42 for movement toward and from the rotor. Each land is shaped to conform to the curvature of the rotor, and is yieldingly held in engagement with the periphery of the rotor by a spring 43. In the present instance, each spring 43 is disposed in a depression 44 in the outer surface of the land, and is mounted on a pin 45 on the inner end of a plug 46 threaded into a bore 47 opening through the wall of the casing 10. The plugs 46 constitute means for adjusting the tension of the springs. This tension should be such as to compensate for the weight of the lands, and the vacuum in the inlet side of the pump.

In Figs. 2 and 3, each land is formed on one side with a longitudinal notch or passage 48 which serves to vent the interior of the guideway 41 or 42 to one side of the casing. In Fig. 5 a vent passage 49 is formed in the side of the guideway. In Fig. 2, the vent passages 48 open into the admission chamber 16. The lands may be reversed so that the vent passages 48 will open into the discharge chamber 17. The same effect can be obtained without reversing the lands, by adjusting the pinion 34 and the segment 36 through 180° as shown in Fig. 3. The vent passages 48 in Fig. 3 communicate with the discharge chamber 16. In Fig. 4, the vent passages 48 communicate respectively with the admission chamber 16 and discharge chamber 17.

While I have shown the movable lands in a rotary machine of the gear type, it is to be understood that in so far as this phase of the invention is concerned, such lands may be incorporated in any engine or pump in which a rotor carries fluid past a land.

By providing lands yieldingly engaging the rotor, it will be seen that grit, dirt, and other foreign substances can pass through the machine without causing excessive wear. In machines with rigid lands, after wear occurs leakage often results. The lands provided in the present instance may be made of material highly resistant to wear, are self-seating and will therefore follow the contour of the rotor as wear occurs. Since the lands will yield to permit the natural film

thickness to exist, the machine is well adapted for different kinds of liquids having different film thicknesses. This results in a considerable saving of power since the power required to break the natural film of a liquid is high.

In operation, let it be assumed that the rotor is turning counter-clockwise and that the machine is operating as a pump. Fluid will then enter the port 12 and the chamber 16, and will be discharged into the chamber 17 and out of the port 13. In the construction shown in Fig. 2 in which the vent passages 48 open into the chamber 16, if the pressure in the chamber 17 is built up by outside piping, valves and the like (not shown), the pressures acting against the inner and outer ends of the lands will become unequal. If the pressure in the chamber 17 rises to a predetermined value sufficient to overcome the springs 43 and the pressure in the chamber 16, it will cause the lands to move away from the periphery of the rotor, thereby relieving the pressure in the chamber 17 by by-passing fluid therefrom past the lands to the admission chamber. The spring tension should compensate for the vacuum in the chamber 16. The predetermined maximum pressure can be adjusted by adjusting the compression in the springs 43. It will be evident that by this construction any desired pressure may be maintained without the use of outside pressure regulating valves, and that the lands in themselves constitute a relief valve for the pump pressures. If the vent passages 48 open into opposite sides of the casing 10, as shown in Fig. 4, the lands will permit relief of excessive pressures irrespective of the direction in which the pump is operated.

If the vent passages 48 communicate with the discharge chamber, as they do in Fig. 3 where the pinion and segment have been adjusted through 180°, the pressures on opposite sides of the lands, disregarding the small pressure of the springs 43, will be equal and will substantially balance each other, thereby stabilizing wear, leakage, running friction, etc. This arrangement permits the pump to handle heavy liquids such as molasses having thick natural films, since the lands will locate and hold the natural film thickness of any liquid that may be handled.

By providing floating lands, adjustment of the pinion 34 and the segment 36 to adjust the flow through the pump or engine can be easily and quickly accomplished, since the hydraulic locking effect which normally takes place principally at the center of the land 14 in Fig. 2 and land 15 in Fig. 3 is eliminated.

I claim as my invention:

1. A rotary machine having, in combination, a casing having inlet and outlet ports

and having a pair of diametrically opposed guideways in its peripheral wall on a line between said ports, a rotor having internal gear teeth at its periphery in said casing, a head closing one end of said casing, a gear pinion rotatably mounted on said head eccentrically of said rotor and meshing with said teeth, a partition on said head between one side of said pinion and said teeth, said partition serving as a cut off, a pair of lands movably mounted in said guideways for movement to and from the periphery of said rotor, means for pressing said lands into engagement with said rotor, means for venting the inner ends of said guideways past said lands to the interior of said casing, and means for adjusting said pinion and said partition into any angular position to obtain any desired flow up to a maximum, or any direction of flow.

2. A rotary machine having, in combination, a casing having inlet and outlet passages, a rotor in said casing, said rotor having internal gear teeth, an idler pinion engaging said teeth, a crescent partition between one side of said pinion and said teeth, means for adjusting said idler pinion and said partition to vary the flow through said machine, and a pair of movable lands mounted in said casing between said inlet and outlet passages, the backs of said movable lands being exposed to the pressure in one of said passages.

3. A rotary machine having, in combination, a casing having inlet and outlet ports and having a pair of diametrically opposed guideways in its peripheral wall on a line between said ports, a rotor having internal gear teeth at its periphery in said casing, a pinion mounted eccentrically of said rotor and meshing with said teeth, a partition between one side of said pinion and said teeth, a pair of lands slidably mounted in said guideways for movement to and from the periphery of said rotor, means for venting the inner ends of said guideways to the interior of said casing, and means for adjusting said pinion and said partition into any angular position to obtain any desired flow up to a maximum.

4. A rotary machine having, in combination, a casing having inlet and outlet ports, a rotor in said casing, said rotor having internal gear teeth, an idler pinion engaging said teeth, a cut-off partition between one side of said pinion and said teeth, means for adjusting said idler pinion and said partition to vary the flow through said machine, and a pair of movable lands mounted in said casing between said inlet and outlet passages.

5. A rotary machine having, in combination, a casing having inlet and outlet ports, a rotor in said casing, said rotor having internal gear teeth, an idler pinion engaging

said teeth, a cut-off partition between one side of said pinion and said teeth, means for adjusting said idler pinion and said partition to vary the flow through said machine, and a pair of movable lands mounted in said casing between said inlet and outlet passages, the backs of said movable lands being exposed to the pressure in one of said passages.

6. A machine having, in combination, a casing having admission and discharge passages in opposite sides and having a radial guideway in its peripheral wall between said passages, a rotor for conveying fluid from one passage to the other, a land slidably mounted in said guideway and adapted to engage the periphery of said rotor, means for pressing said land into engagement with said rotor, means for adjusting the force of said last mentioned means, and means continuously venting the inner end of said guideway to one side of said casing to expose the back of said land to the pressure in one of said passages.

7. A machine having, in combination, a casing having admission and discharge passages in opposite sides and having a guideway in its peripheral wall between said passages, a rotor for conveying fluid from one passage to the other, a land slidably mounted in said guideway and adapted to engage the periphery of said rotor, means for pressing said land into engagement with said rotor, and means continuously venting the inner end of said guideway to one side of said casing to expose the back of said land to the pressure in one of said passages.

8. A machine having, in combination, a hollow casing having an inlet passage and a discharge passage, a rotor in said casing, said rotor having a plurality of gear teeth, a second gear member meshing with said rotor and adapted to force the liquid out of the spaces between the said gear teeth when said spaces open to said discharge passage, and a land slidably mounted in said casing and engaging said rotor opposite said gear member.

9. A machine having, in combination, a casing having admission and discharge passages and having a pair of diametrically opposed guideways between said passages, a rotor having internal gear teeth on one side in said casing, a gear pinion mounted eccentrically of said rotor and meshing with said teeth, a partition between said pinion and said teeth, and a pair of movable lands slidably mounted in said guideways.

10. A machine having, in combination, a casing having admission and discharge passages in opposite sides and having a radial guideway in its peripheral wall between said passages, a rotor for conveying fluid from one passage to the other, a land slidably mounted in said guideway and adapted to

engage the periphery of said rotor, means for pressing said land into engagement with said rotor, and a venting groove in one side of said land connecting the inner end of said guideway to one side of said casing to expose the back of said land to the pressure in one of said passages.

11. A machine having, in combination, a hollow casing having an inlet passage and a discharge passage, a rotor in said casing, said rotor having a plurality of gear teeth, a second gear member meshing with said rotor and adapted to force the liquid out of the spaces between the said gear teeth when said spaces open to said discharge passage, and a land movably mounted in said casing and engaging said rotor opposite said gear member, the outer surface of said land being exposed to the pressure in one of said passages, and said land being reversible to expose said surface to pressure in the other of said passages.

12. A machine having, in combination, a casing having admission and discharge chambers and having a pair of opposed guideways between said chambers, a rotor having internal gear teeth on one side in said casing, a gear pinion mounted eccentrically of said rotor and meshing with said teeth, a partition between said pinion and said teeth, a pair of movable lands slidably mounted in said guideways, and vent passages connecting the inner ends of said guideways to said admission chamber.

13. A machine having, in combination, a casing having admission and discharge chambers and having a pair of opposed guideways between said chambers, a rotor having internal gear teeth on one side in said casing, a gear pinion mounted eccentrically of said rotor and meshing with said teeth, a partition between said pinion and said teeth, a pair of movable lands slidably mounted in said guideways, and vent passages connecting the inner ends of said guideways to said discharge chamber.

14. A machine having, in combination, a casing having admission and discharge chambers and having a pair of opposed guideways between said chambers, a rotor having internal gear teeth on one side in said casing, a gear pinion mounted eccentrically of said rotor and meshing with said teeth, a partition between said pinion and said teeth, a pair of movable lands slidably mounted in said guideways, and vent passages connecting the inner ends of said guideways respectively to said admission and discharge chambers.

15. A machine having, in combination, a casing having admission and discharge passages and having a pair of diametrically opposed guideways between said passages, a rotor having internal gear teeth on one side in said casing, a gear pinion mounted

ed eccentrically of said rotor and meshing of each land, the parts formed with said
with said teeth, a partition between said vent passages being reversible to selectively
pinion and said teeth, a pair of movable connect each guideway with either of said 10
lands slidably mounted in said guideways, first mentioned passages.
5 and two vent passages for connecting the In testimony whereof, I have hereunto
inner ends of said guideways to said casing, affixed my signature.
one vent passage extending along one side IRVEN H. WILSEY.