

March 31, 1925.

1,531,904

L. DINESEN

ROTARY PUMP

Filed Oct. 23, 1922

2 Sheets-Sheet 1

Fig. 2

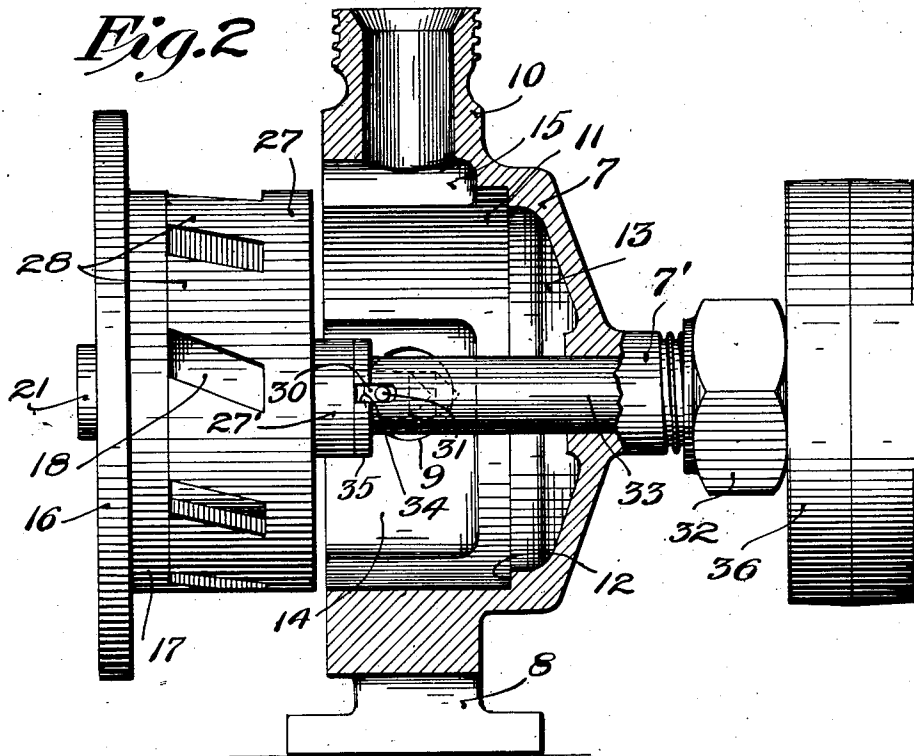
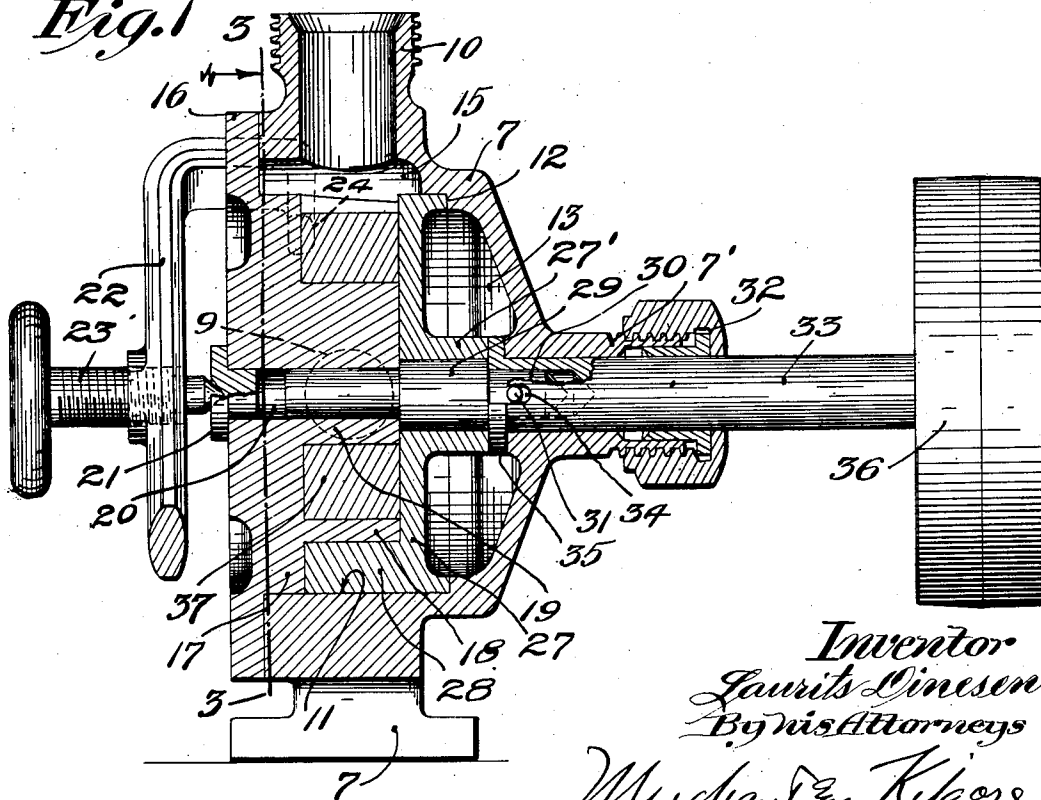


Fig. 1



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Fig. 5

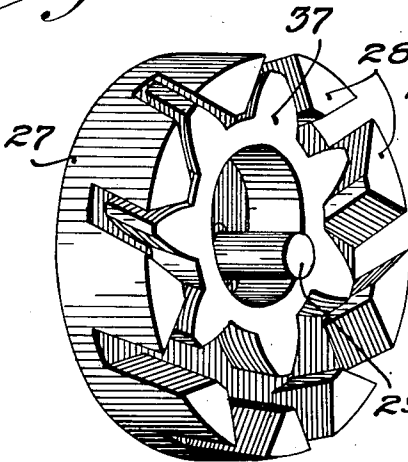


Fig. 6

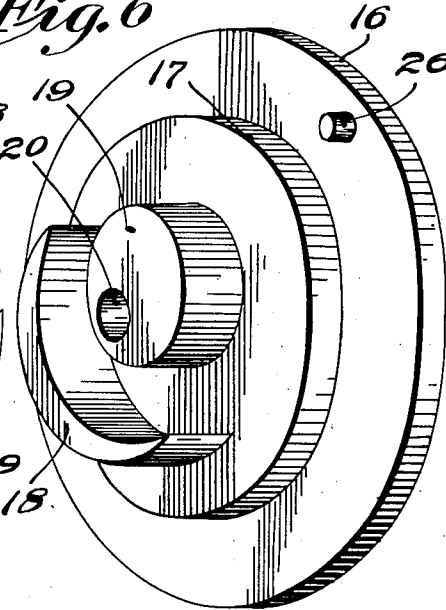


Fig. 3

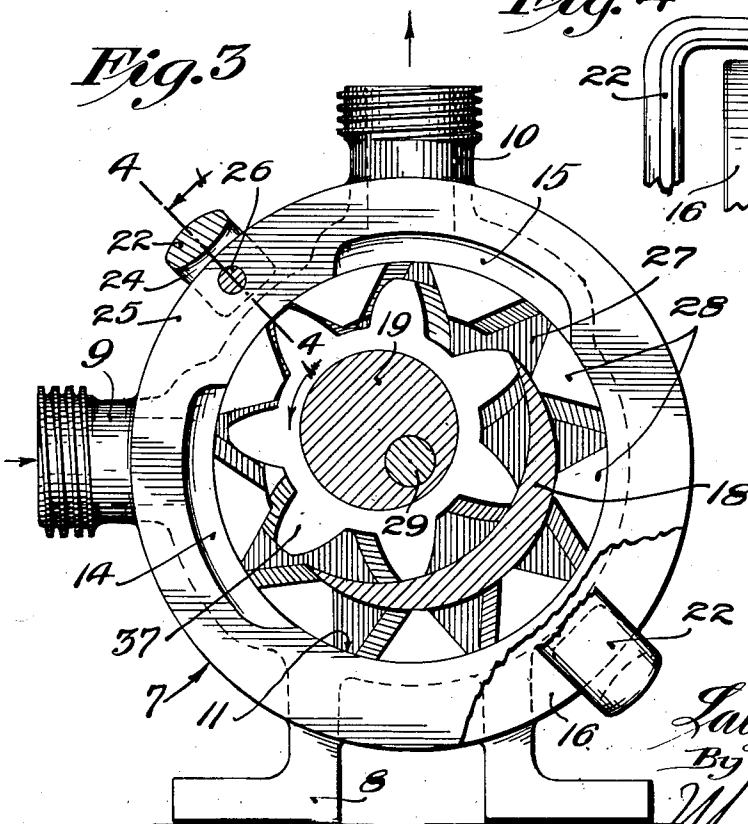
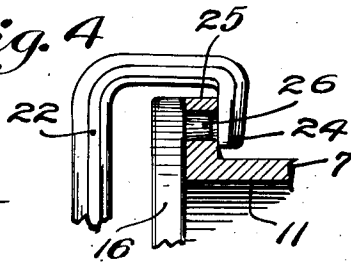


Fig. 4



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UNITED STATES PATENT OFFICE.

LAURITS DINESEN, OF MINNEAPOLIS, MINNESOTA.

ROTARY PUMP.

Application filed October 23, 1922. Serial No. 596,294.

To all whom it may concern:

Be it known that I, LAURITS DINESEN, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Rotary Pumps; and I do hereby 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.

My present invention has for its primary object the provision of a simple, efficient and sanitary rotary pump, which, when used for pumping cream and milk, will meet the requirements of creamery service and which, moreover, will receive the approval of health commissioners and the like.

Of course, this improved pump may be used generally for a great many different purposes and it may also be operated as a fluid current motor, but a pump that will be efficient in operation for pumping milk, cream or other fluid food substances and that will meet the approval of State Boards of Health, Sanitary Commissions and the like, must have certain features that make it an easy matter to completely clean and thoroughly sterilize all of those parts of the pump that come into contact with the fluid substances. I have provided a pump that is not only of the highest possible efficiency but which meets all of the sanitary conditions as to cleaning, etc.

In the accompanying drawings, which illustrate the improved pump, like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a vertical axial section of the improved pump;

Fig. 2 is a view partly in elevation and partly in vertical axial section showing certain of the parts pulled out of the pump casing;

Fig. 3 is a side elevation of the pump with some parts removed and with some parts sectioned on the irregular line 3—3 of Fig. 1;

Fig. 4 is a fragmentary view with some parts sectioned on the line 4—4 of Fig. 3;

Fig. 5 is a perspective showing the internal and external piston-acting gears of the pump; and

Fig. 6 is a perspective showing the remov-

able head or plate of the casing detached from the casing proper.

The pump casing 7, as shown, is a casting having a supporting base 8 and at one side a fixed or integral head but open at its other side. The fixed head of this casing has an axially projecting bearing hub 7' and, at circumferentially spaced points, preferably 90° apart, said casing has radially projecting intake and discharge necks 9 and 10, respectively, to which circulating tubes or pipes may be connected by any suitable means. The piston-engaging internal surface of this casing is cylindrical and extends to the open side thereof, but terminates against an annular shoulder 12 that forms the inner portion of the fixed head of said casing, the said fixed head being bulged to afford a clearance space 13 between the same and the solid web of the rotary internal gear or piston member to be presently noted.

The necks 9 and 10 connect directly to intake and discharge ports 14 and 15, respectively, formed in the cylindrical surface 11 and extended circumferentially thereof through 90° more or less. The highly important feature to here note is that these ports 15 are not in the form of pockets but rather in the form of grooves that open at full diameter or radial distance from the axis of the cylinder at the open side of said cylinder. Considering these important features further, it may now be noted that the casing or cylinder casting, starting from its smallest internal diameter adjacent the bearing sleeve 7', progressively increases in diameter toward the open side of the cylinder and has no radial reentrant or inwardly projecting portions in an outward direction. Even the ports 14 and 15 have as large or greater diameter or radial distance from the cylinder axis at their open outer sides than at any other point. These features make it an easy matter to thoroughly clean the interior of the cylinder and to note, by inspection, that they are clean. There are no pockets into which the food substance may get lodged and from which it may not readily be removed by an ordinary washing and sterilizing process.

For closing the open side of the casing or cylinder casting, I provide a displaceable cylinder head 16 that is formed with an inset

cylindrical portion 17, with a crescent-shaped partition 18 and with an eccentric cylindrical hub 19. The offset cylindrical portion 17 telescopes with close fit into the outer portion of the cylinder 11 and here it may be noted that the ports 14 and 15 extend beyond the inner face of said shoulder 17 to the outwardly projecting flange of the head 16. This feature also facilitates cleaning.

The outer surface of the crescent-shaped partition 18 is concentric to the cylindrical surface of the offset shoulder 17 and to the cylinder 11, but the inner surface of said partition is concentric to the cylindrical surface of the bearing hub 19. Moreover, said partition 18, in a circumferential direction, is located with its radially thickest portion diametrically opposite to a point midway between the necks 9 and 10. The detachable cylinder head 16 is provided with a bore or hole 20, the axis of which is coincident to the axis of the cylinder 11. To facilitate cleaning of this hole, it is normally closed with a liquid-tight joint by a detachable flanged plug 21.

As a convenient means for clamping the detachable cylinder head to the cylinder casing and for holding the plug 21 in position, I provide a clamping yoke 22 provided at its central portion with a jam screw 23 and having hook-like ends 24, (see Figs. 3 and 4), that are arranged to be interlocked with lugs 25 outwardly projecting from the pump casing adjacent its open side. To insure proper positioning of the detachable cylinder heads and the parts thereon and to securely hold the same against rotation, the outstanding flange of said cylinder head is shown as provided with a dowel pin 26 that is engageable with a seat in the lug 25.

Working with close fit within the cylinder 11 is an internal gear-acting piston member 27, which, at one side, has a solid or complete cylindrical web, the outer portion of which is seated against the annular shoulder 12. Projecting laterally from its solid cylindrical web, the piston member 27 is provided with laterally projecting circumferentially spaced internal gear teeth 28 that run in close contact with the walls of the annular channel formed between the cylindrical surface 11 and external surface of the crescent-shaped partition 18. The interdental spaces between the gear teeth 28 are open at their inner and outer portions, and, at one side and the extended faces of said teeth, run in close contact with the inner face of the offset portion 17 of the cylinder head 16. For an important purpose, the said teeth 28 and the interdental spaces are obliquely or spirally cut or set, which not only makes a smooth running gear but produces a more efficient pumping action.

The solid web of the piston member 27 is

provided with an axial hub 27' that is rigidly secured to a short shaft 29. As shown, said shaft 29 has a reduced portion that is journaled in the bore 20 of the detachable cylinder head 16 and at its other end it is shown as formed with a reduced trunnion or end 30 having a diametrically projecting coupling pin 31.

The solid side of the pump casing 7 is formed with the axial outstanding hub 7' to the outer end of which, as shown, a stuffing box 32 is applied. The numeral 33 indicates a driving shaft which is journaled in the hub 7' and extends outward through the stuffing box 32. At its inner end, this shaft 33 has a recess or bore into which the reduced end or trunnion 30 of the shaft 29 is adapted to be telescoped, and this bored end of said shaft is formed with axial notches 34 that receive the ends of the coupling pins or projections 31 to couple the two shafts together with freedom for ready separation by axial movements. As shown, the shaft 33 is provided at its inner ends with an outstanding flange 35 that engages as a stop with the inner extremity of the hub 7' and which flange makes it necessary to insert the shaft 33 to working position by axial movement through the open side of the pump casing when the various other displaceable parts are removed. At its outer end, the shaft 33 is shown as provided with a pulley 36 over which a power-driven belt, not shown, may run to drive the pump. It will not frequently be necessary to disconnect the shaft 33 from the pump casing, but if the flange 35 is to be permanently secured to said shaft, then the pulley 36 must be removed to permit the removal of said shaft.

Mounted to rotate on the eccentric hub 19 is a piston-acting external spur pinion 37, the teeth of which mesh with the teeth 28 of the internal gear-acting piston member. This pinion is of the same width as said teeth 28 and said pinion at one side runs in close with the solid web of the internal gear or piston member 27, while at the other side said pinion runs in contact with the inner face of the offset portion of the cylinder 16. The outer portions of the teeth of said pinions run in contact with the internal or concave cylindrical surface of the crescent-shaped partition 18. The working faces of the teeth of said pinion 37 are spirally or obliquely cut so that they run in proper contact with the working surfaces of the internal teeth 28.

Operation.

As already indicated, the pump will be driven by power applied through the shaft 33 directly to the main or internal gear-acting piston member 27 and, of course, when said member 27 is rotated, the pinion

37 will be rotated therewith and in the same direction. When these two piston-acting members 27 and 37 are rotated in the direction of the arrow marked on Fig. 3 or in an anti-clockwise direction in respect to said view, the milk, cream or other fluid substance will be drawn through the neck 9 into the pocket 14 and thence into the interdental spaces between the teeth of the said piston-acting members. As the teeth of these two members separate, they will draw in the liquid, and this drawing action will continue until its teeth have passed the radially thickest portion of the crescent-shaped partition 18, but under continued movement in the direction indicated, the teeth of the said two members will approach each other and will crowd or force the fluid first to the port 15 and thence out through the discharge neck 10. Because of the oblique arrangement of the teeth of said piston-acting rotary members, the open interdental spaces between the teeth 28 will pass progressively (not abruptly) into and out of alignment with the portion 14 and 15, and thus, pulsations in the pumping action are eliminated.

When the pump is to be cleaned and sterilized, the parts thereof may be quickly separated, first by removing the clamping yoke 22 and then removing from the pump casing the head 16 together with the piston-acting internal and external gears. This removal of said parts may be quickly effected by pushing on the shaft 33, which will displace the parts, as shown in Fig. 2. When the parts are in the positions shown in Fig. 2, the shaft 29 will readily come away from the shaft 23 with the internal gear 27 and this gear and the external pinion and the cylinder head may then be readily separated and separately cleaned and sterilized. Moreover, the plug 20 may be readily removed so that the bore 20 may be cleaned out and sterilized. Thus, it will be seen that all of the parts and services that come into contact with fluid food, such as milk or cream, for example, may be completely exposed and separately and readily cleaned, which makes the pump completely satisfactory from a sanitary point of view. Of course, the parts of the pump may be as readily assembled as they may be disassembled. The efficiency of the device as a pump has been thoroughly demonstrated in practice.

For convenience of expression, the device herein disclosed and claimed is designated as a "pump," but it will, of course, be understood that any device involving the novel features defined in the claims would be within the scope of said claims even if such devices were used as motors.

As above indicated, this improved pump

is capable of many different uses. As a further example, it will be highly efficient for pumping paints and varnishes in paint factories, and in this use, it is also of the utmost importance that the pump be of such construction that it may be quickly and easily taken apart and thoroughly cleaned.

What I claim is:

1. A rotary pump comprising a cylindrical casing normally open at one side but provided with a removable head, and co-operating internal and external gear-acting piston members rotatable within said casing and removable through the open side thereof when said head is removed, said casing having circumferentially spaced intake and discharge ports radially extended from the interior cylindrical surface thereof and extended laterally with full radial diameter to the normally open side of said casing.

2. A rotary pump comprising a cylindrical casing normally open at one side but provided with a removable head, and co-operating internal and external gear-acting piston members rotatable within said casing and removable through the open side thereof when said head is removed, said casing having circumferentially spaced intake and discharge ports, the interior of said casing at no place having a diameter dimension that is greater than the diameter in the same radial plane at a point nearer to the normally closed side of said casing.

3. A rotary pump comprising a cylindrical casing normally open at one side but provided with a removable head, and co-operating internal and external gear-acting piston members rotatable within said casing and removable through the open side thereof when said head is removed, said casing having circumferentially spaced intake and discharge ports, said detachable head having a cylindrical portion telescopically fitting the cylindrical surface of said casing, said casing having intake and discharge ports that extend beyond the inwardly offset portion of said head and open at the normally open side of said casing, against the flange of said head.

4. A rotary pump comprising a cylindrical casing normally open at one side but provided with a removable head, said head having an inset cylindrical portion fitting said cylinder and further having an eccentric hub and a crescent-shaped partition, a rotary gear-acting piston member having circumferentially spaced laterally projecting internal teeth with radially open interdental spaces, said piston member rotatively fitting said cylinder, and an external piston-acting spur pinion journaled on said eccentric hub and intermeshing with the teeth of said first noted piston member,

said casing having circumferentially spaced intake and exhaust passages and cooperating transversely extending intake and discharge ports, which latter extend to the normally open side of the cylindrical surface of said casing but are normally closed by said head.

5. A rotary pump comprising a cylindrical casing normally open at one side but provided with a removable head, cooperating internal and external gear-acting piston members rotatable within said casing and removable through the open side thereof when said head is removed, said casing having circumferentially spaced intake and discharge passages, said internal piston member fitting the cylindrical surface of said casing and said external piston member being eccentrically journaled on said head, a short shaft secured to said internal piston member and journaled in said head, and a driving shaft journaled in the normally closed head of said casing and detachably coupled to the first noted shaft.

6. The structure defined in claim 5 in which said driving shaft is capable of axial movements to force said piston members

and head from working position when the latter is released.

7. The structure defined in claim 5 in which said head has an axial bore opening therethrough, and a detachable plug normally closing the outer end of said bore.

8. The structure defined in claim 7 in further combination with a yoke detachably engageable with said casing and having a clamping device directly engaging said plug to hold the same and said head in working position.

9. A rotary pump comprising a casing normally open at one side and provided with a removable head, a rotary pump mechanism working in said casing and including a large internal gear and a cooperating pinion, a shaft to which said pinion is secured, said head having as a seat for said shaft an axial passage that normally opens completely through said head, and a removable plug normally closing the outer end of said axial passage.

In testimony whereof I affix my signature.

LAURITS DINESEN.