

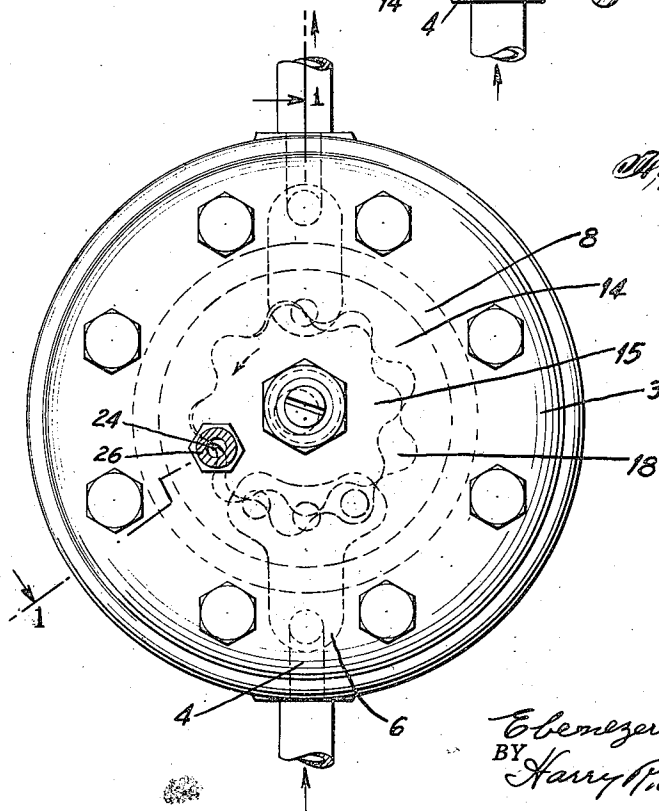
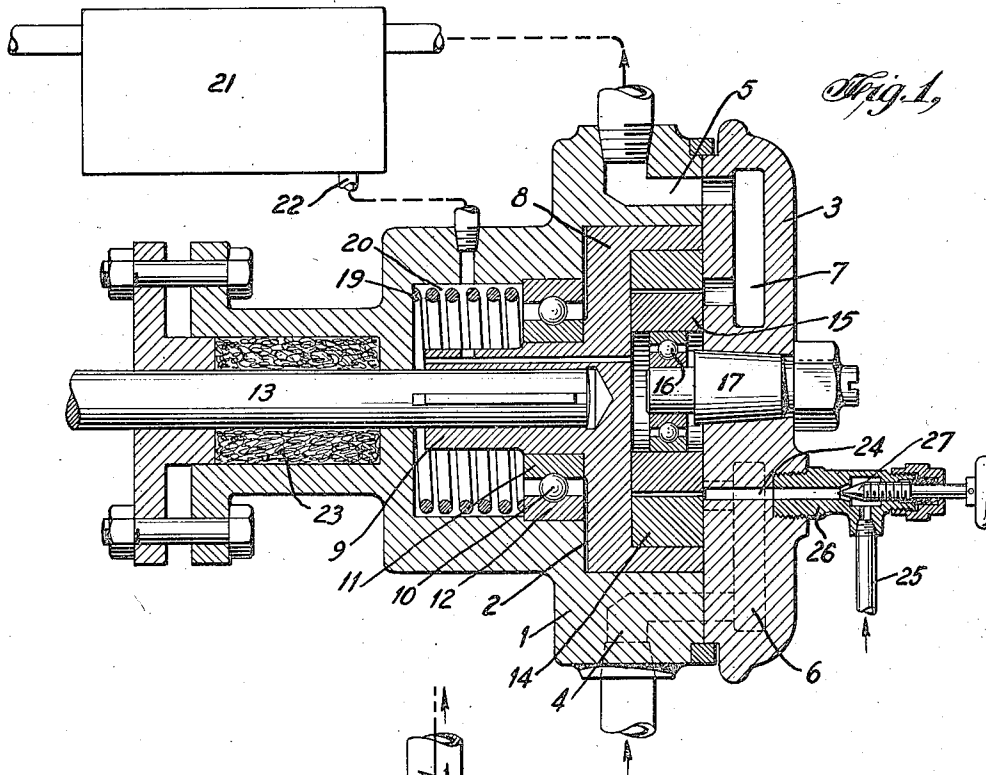
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COMBINED LIQUID AND AIR PUMP

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COMBINED LIQUID AND AIR PUMP.

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This invention relates to rotary pumps of the type having an internally toothed driving gear or annular engaged by an externally toothed driven gear or pinion, said pinion being rotatably mounted within and eccentric to the annular and having fewer teeth whereby during rotation the teeth so engage as to form pockets or chambers between them which open to receive fluid and close to force fluid therefrom.

The object of the present invention is to provide a pump of this character which is specially designed for mixing and pumping fluids having different qualities, such a pump being adapted to supply fuel, for example air and oil, under pressure in a vaporized condition to the burner of an oil heater.

This object is attained by locating the intake for air at such a point that a slight vacuum is created in the pockets during the rotation of the annular and pinion before those pockets reach the air intake, and providing a fluid intake on the intake side of the gears as they rotate, between the discharge and the air intake whereby fluid will be first drawn into the pockets as they come around and then air drawn in. The fluid and air become mixed in the pockets and are finally discharged under pressure with the fluid atomized. With this arrangement not only is the fluid broken up and mixed with the air and discharged under pressure, but it becomes heated by the compressing action of the pump and somewhat gasified. Furthermore, the fluid will act, under proper conditions, both to lubricate the moving parts and seal the joints.

In the accompanying drawings Fig. 1 shows a longitudinal section on the line 1—1 on Fig. 2, of a pump that embodies this invention. Fig. 2 shows an end view of the pump.

The pump illustrated, as far as the rotors and their co-operation is concerned is of the type shown and described in Patent #1,505,707 issued to me August 19, 1924.

In the pump illustrated the casing 1, which is generally circular in outline, contains a cylindrical pumping chamber 2 that is closed on one end by a head 3 which is fastened to the casing by any suitable means. The casing has an air intake passage 4 on one side and a discharge passage 5 on the

other side, while the head has an air intake port 6 leading from the intake passage to the pumping chamber and a discharge port 7 leading from the pumping chamber to the discharge passage.

Rotatably fitting and having a slight movement axially in the pumping chamber is a rotor 8. The hub 9 of the rotor is mounted on anti-friction bearings 10 the inner ring 11 of which is fastened to the hub while the outer ring 12 is fitted so that it may have a slight axial movement in the casing. The driving shaft 13 is splined in the hub of the rotor so that while the shaft will drive the rotor it will not interfere with the axial movement of the rotor.

Fastened in the rotor 8 is an internally toothed gear or annular 14, and engaging the teeth of this gear are the teeth of an externally toothed gear or pinion 15. The pinion is mounted on anti-friction bearings 16 that are supported by a stud 17 fastened in the head. This stud is positioned out of axial line with the driving shaft so that the axis of the pinion will be eccentric to the axis of the annular. The pinion, preferably, has one less tooth than the annular and the teeth coast to cause the opening and closing of the pockets 18 which effect the pumping or compression of the fluids in the well known manner.

A spring 19 is arranged in a cavity 20 in the casing that communicates with the pumping chamber, in such manner that the spring thrusts against the outer race ring 12 and through the bearing presses the edge of the rotor and the faces of the pumping gears toward the inner face of the head. Lubricant is introduced into this cavity. Leading from the reservoir 21 which is connected with the discharge and into which the fluid is pumped, to the cavity containing the spring may be a pipe 22. The function of this connection is to admit discharge pressure to the cavity and permit it to be exerted on the back of the rotor. This connection also is adapted to conduct back lubricant which has passed through the pump. Any common type of packing 23 may be arranged in the end of the casing to prevent leakage from the spring cavity around the driving shaft.

In carrying out this invention a port 24 is made through the casing head to the path

of the rotor pockets. This port is located between the air intake port, above described, and the discharge port some distance from the latter, on the intake side as the gears rotate, the gears being assumed to turn in the direction indicated by the arrow on Fig. 2. On this side the pockets open as the gears turn. A pipe 25 leading from the source of fluid supply, such as fuel oil, is connected by a fitting 26 with this port, a needle valve being arranged in this fitting to control the flow of fluid therethrough.

With this arrangement of ports a slight vacuum is created in the pockets before they reach the first or fluid port. This tends to draw in oil, if oil be the fluid, through the port 24 into the pockets as they reach it, the amount being regulated by the needle valve. If desired the oil could be supplied under some outside initial pressure but for ordinary uses there is sufficient vacuum created to draw in the proper quantity of oil for the purpose desired. When the pockets reach the air intake port air is drawn in the pockets containing the oil. As the gears move beyond this point and the pockets decrease in volumetric capacity, the oil and air become mixed and compressed and when the pockets reach the discharge port the mixture is forced out under such pressure that the oil is atomized. Under normal conditions heat is generated by the compression of the air and this tends to vaporize the oil and render it more readily inflammable. The vapor may be discharged into a tank as shown or may be led directly to the place of use. With the connections illustrated pressure from the tank will be exerted on the back of the rotors to balance the pressure on the front of the rotors, and as the air which exerts that pressure contains oil lubrication will be supplied to the backs of the rotors. The oil that is drawn in by the pump lubricates the front of the rotors and acts to seal the joints and ensure efficient pumping action. With this invention a single pump may be employed for delivering oil and air immediately to a burner beneath a boiler or other heater, properly mixed and vaporized, and with uniform velocity to produce the required even heat when ignited.

The invention claimed is:

1. A rotary pump comprising a casing containing a pumping chamber, an annular toothed rotor and a pinion rotor rotatable in said chamber, said annular and pinion intermeshing and mounted in eccentric relation with the latter having fewer teeth than the former, whereby pockets that open and close are produced between the teeth as the rotors turn, a discharge port opening through the casing from the path of contracting pockets, and a plurality of intake ports opening through the casing to the path

of the pockets, between the teeth as said pockets expand.

2. A rotary pump comprising a casing containing a pumping chamber, an annular toothed rotor and a pinion rotor rotatable in said chamber, said annular and pinion intermeshing and mounted in eccentric relation with the latter having fewer teeth than the former, whereby pockets that expand and contract are produced between the teeth as the rotors turn, a discharge port opening through the casing from the path of the pockets adjacent to the locality of greatest contraction of said pockets and a plurality of intake ports opening through the casing to the path of the pockets, both of said intake ports being so located with relation to the path of the pockets that the pockets are expanding and a partial vacuum results in the pockets before they reach the ports as the rotors turn.

3. A rotary pump comprising a casing containing a pumping chamber, an annular toothed rotor and a pinion rotor rotatable in said chamber, said annular and pinion intermeshing and mounted in eccentric relation with the latter having fewer teeth than the former, whereby pockets that expand and contract are produced between the teeth as the rotors turn, a discharge port through the casing from the path of the pockets adjacent to the locality of greatest contraction of said pockets, an intake port through the casing to the path of expanding pockets, and an intake port through the casing to the path of the expanding pockets between the discharge port and the first mentioned intake port, on the intake side as the rotors turn.

4. A rotary pump comprising a casing containing a pumping chamber, an annular toothed rotor and a pinion rotor rotatable in said chamber, said annular and pinion intermeshing and mounted in eccentric relation with the latter having fewer teeth than the former, whereby pockets that expand and contract are produced between the teeth as the rotors turn, a discharge port through the casing from the path of the pockets, adjacent to the locality of greatest contraction of said pockets, an intake port through the casing to the path of expanding pockets, an intake port through the casing to the path of expanding pockets between the discharge port and first mentioned intake port, on the intake side as the rotors turn, and a valve for controlling the passage to said intermediate intake port.

5. A rotary pump comprising a casing containing a pumping chamber, an annular toothed rotor and a pinion rotor rotatable in said chamber, said annular and pinion intermeshing and mounted in eccentric relation with the latter having fewer teeth than the former, whereby pockets that expand

and contract are produced between the teeth as the rotors turn, a discharge port opening through the casing from the path of contracting pockets, and two intake ports opening through the casing to the path of expanding pockets whereby liquid may be first drawn into the pockets through one intake port and air then drawn into the pockets through the other intake port by a vacuum pull, and discharged under pressure in an intermingled vaporized condition through the discharge port, as the rotors turn.

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