

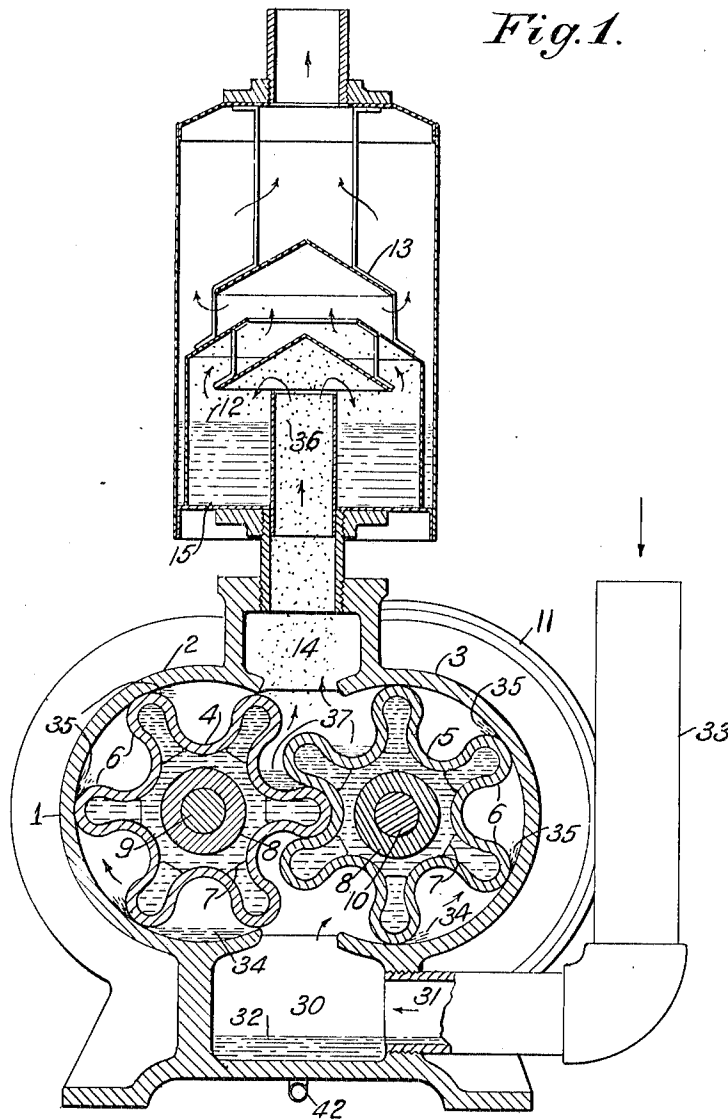
F. W. MACHLET.
ENGINE, AIR PUMP, &c.
APPLICATION FILED OCT. 22, 1908.

1,119,972.

Patented Dec. 8, 1914.

4 SHEETS-SHEET 1.

Fig. 1.



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By his Attorney *B. C. Hickman*

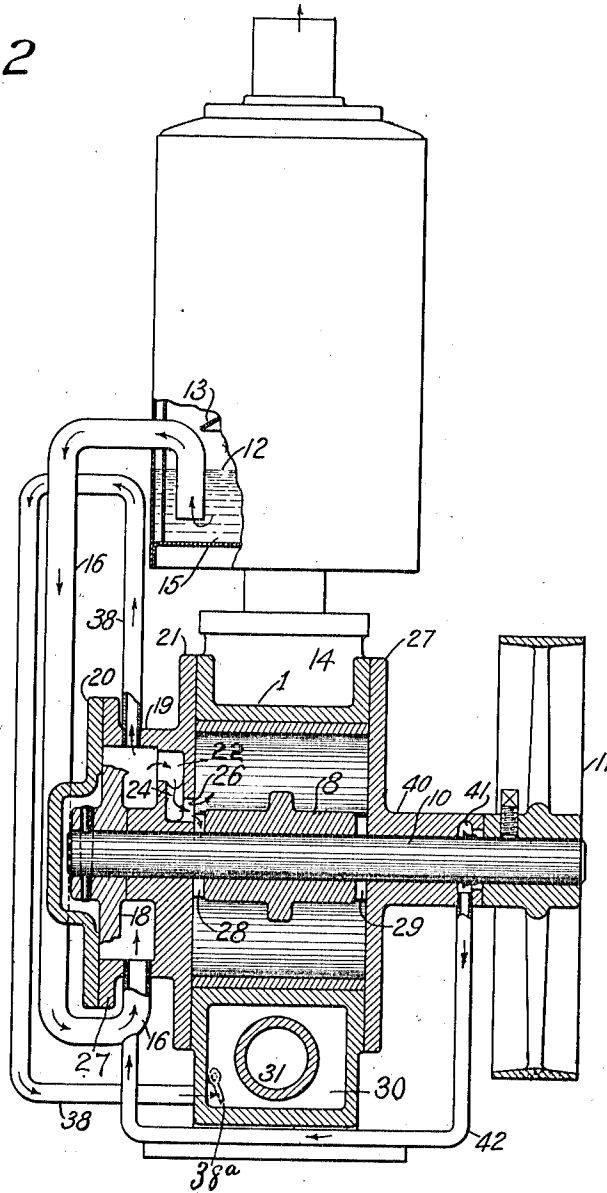
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4 SHEETS—SHEET 2.

Fig. 2



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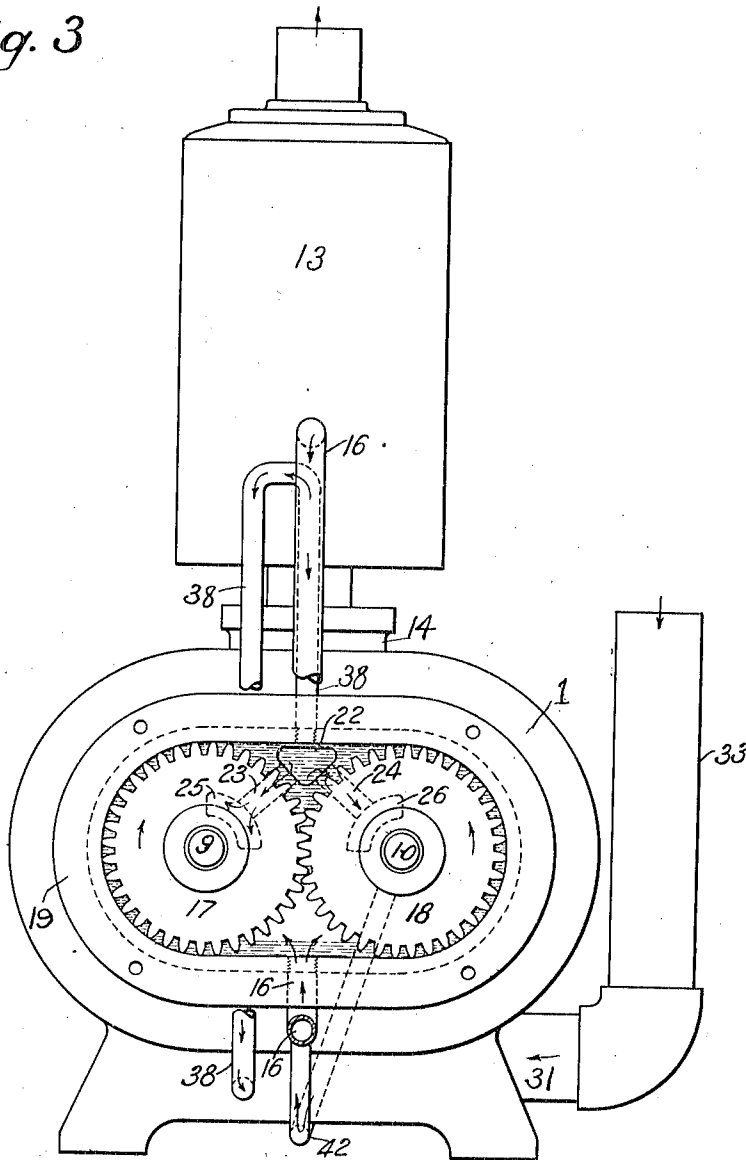
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4 SHEETS—SHEET 3.

Fig. 3



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4 SHEETS—SHEET 4.

Fig. 4

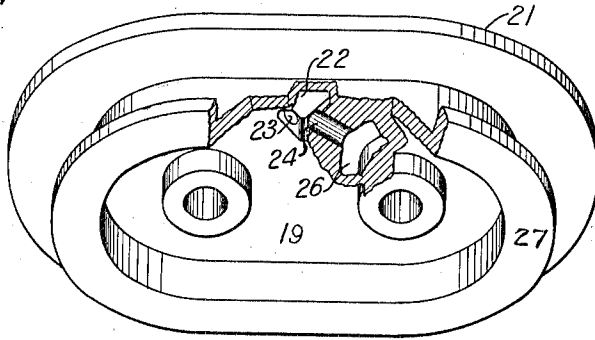
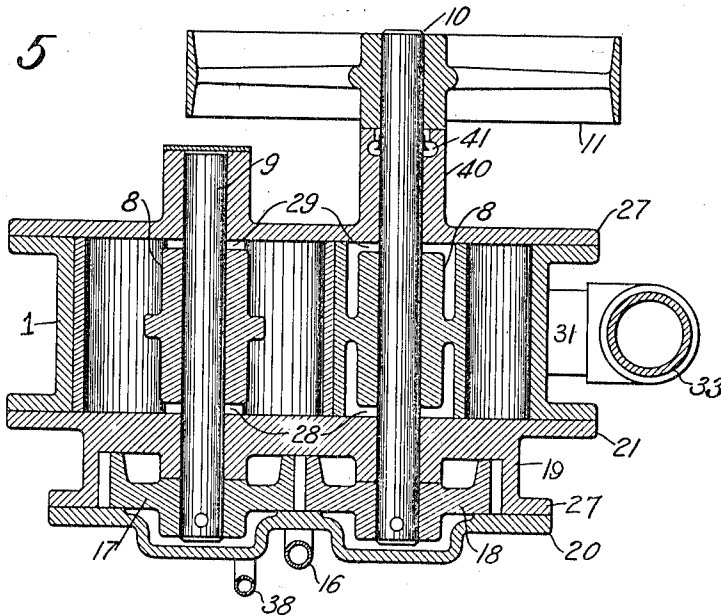


Fig. 5



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UNITED STATES PATENT OFFICE.

FRITZ W. MACHLET, OF ELIZABETH, NEW JERSEY.

ENGINE, AIR-PUMP, &c.

1,119,972.

Specification of Letters Patent.

Patented Dec. 8, 1914.

Application filed October 22, 1908. Serial No. 458,953.

To all whom it may concern:

Be it known that I, FRITZ W. MACHLET, a citizen of the United States, residing in Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Engines, Air-Pumps, &c., of which the following is a specification.

This invention relates principally to means for employing liquid to seal or pack and lubricate pistons of engines operated by steam, gas, compressed air, etc., especially those of the rotary type, and also the pistons of air pumps, gas pumps, blowers, etc.

In my pending United States application No. 448,785 filed August 17, 1908 is illustrated a device for causing approximately constant flow of oil or other sealing and lubricating liquid to the edge or edges of the piston or pistons of a rotary engine to seal said pistons sufficiently to make it practicable to operate them with steam, compressed air or gas of sufficiently high pressure to secure economical results. In said application the operation of pumping or forcing the sealing liquid to the edges of the pistons was performed by the tips of the pistons themselves, each of said tips scooping out a small quantity of liquid from a well, and forcing it to circulate ultimately through the body of the pistons to their edges.

According to the present invention, the sealing liquid is pumped by an outside pump, and forced into the main engine or air pump and into the pistons to seal their edges.

This improvement is shown in connection with the type of engine or pump shown in my other pending application No. 424,689, filed April 1, 1908 in which the pistons are of the intergeared type.

The shafts of the pistons of the main engine or air pump are extended outside of the cylinder or drum of the engine, and on the shafts are fixed intergeared pistons revolving in a casing to constitute a liquid pump, openings or ports extending from the delivery side of the liquid pump through a head of the main pump in position to permit the liquid to flow into the main pistons.

There is also provided upon the delivery side of the main engine or air pump a separator for the liquid carried out with the exhaust or delivery, and a collector for the separated liquid; and a pipe leads from the

collector to the intake side of the delivery pump, thus establishing a circulatory system through which the liquid constantly flows during the operation of the main engine.

There is also provided a relief for the liquid pump, which preferably consists of a pipe extending from the delivery side of the delivery pump to the intake side of one of the liquid and main pumps; preferably the main pump or engine.

Other features and advantages will hereinafter appear.

In the accompanying drawings, Figure 1 is a transverse sectional elevation of one form of blower or compressor, or steam, air or gas engine, to which my improvements are applied, the pistons being shown full of the sealing liquid. Fig. 2 is a longitudinal section of the same. Fig. 3 is a front elevation of the engine from which the cap of the liquid pump has been removed. Fig. 4 is a perspective view of that head of the main drum which forms a part of the casing for the liquid pump; the same being shown partly broken away, to illustrate the openings or ports leading from the liquid pump through said head. Fig. 5 is a sectional plan of the apparatus.

Within a drum 1, comprising two opposed C-shaped segments 2, 3, revolve pistons 4, 5, each having, for instance, six lobes or vanes 6 to intergear with the lobes of the other piston. Each piston is chambered and preferably made in the form of a shell, whose convolutions are united by a web 7 to a hub 8. By means of said hubs, the pistons are secured upon shafts 9, 10, respectively, the shaft 10 carrying a fly-wheel or pulley 11.

The liquid for sealing and lubricating the pistons is seen at 12 within a separator 13 of any suitable type, and conveniently erected upon the top or delivery side of the pump directly over the delivery orifice 14 thereof. The separated and collected liquid is drawn from the collector 15 down through a pipe 16 to the intake side of the liquid pump. The latter comprises intergeared pistons 17 and 18, revolving in a casing 19 having a cap 20; the front head 21 of the main drum forming also the rear wall or head of said casing. The pistons 17, 18 are fixed respectively on the front ends of the shafts 9 and 10, which project forwardly through said head 21. It will be seen that the supply

pipe 16 leads down in front of the pump, and leads into the bottom or intake of the pump.

In the upper part of the head 21, or at the delivery side of the liquid pump, is formed an opening 22 from which branch passages 23 and 24, said passages diverging downwardly in said head, and terminating at their ends respectively in ports 25, 26, formed in the rear side of said head 21; said ports being arched, so as always to be within the contour of the main pistons 4, 5, to permit the liquid to flow from the auxiliary pump directly into the chambers or perforations of the pistons. The pressure exerted by the liquid pump is sufficient to force the liquid to exude from the side edges of the pistons to form films or seals between said edges to the heads 21, 27 of the drum to prevent leakage of steam, compressed air or gas past the same.

As set forth in said application No. 424,689, the end of each hub is cut away to form an open passage 28 upon the end thereof, adjacent to each of the ports 25, 26, so as to increase the facility of communication between each port and all of the chambers or holes in its associated piston. The opposite end of each hub may also be cut away, as at 29, to promote the flow of liquid through the piston.

The drip from the pistons and the walls of the main engine is caught in a basin 30 formed below the intake orifice 31 thereof, so that the accumulated drip, seen at 32, may be taken up by the steam, air or gas, which enters through the inlet pipe 33, and delivered to the lobes or vanes of the pistons, as indicated at 34, to be swept around thereby, as at 35; the films of liquid forming between the tips or ends of the vanes and the inner periphery of the segments 2, 3 of the drum. These films are sufficient to prevent leakage of air or gas. Each film affords a substantial obstacle to leakage; and when the lobes of each piston are numerous, as illustrated, so that there are always three or four films around the drum between the delivery and intake sides thereof, loss of air pressure through leakage is practically avoided; and the same holds true as to the sides of the pistons, there being always many films at the side edges to cooperate to prevent loss of compressed air.

At Fig. 1, the particles of liquid are indicated at 36 in the column of ascending air or steam; and it will be understood that said particles may sometimes settle between the intermeshing lobes, as at 37, to join the liquid 35 swept around by the tips of the pistons, which forms seals between the intermeshing convolutions of the pistons, so that leaking of air through such intermeshing portions is minimized or avoided.

It will thus be seen that a constant circu-

lation of the liquid is maintained from the separator 13 through the pump and engine and back to the separator.

To avoid any difficulty that might arise from excessive liquid pressure effected by the liquid pump, there may be provided a relief in the form of a pipe 38 leading up from the delivery side of the liquid pump, and then down to the well 30 in the main engine or air pump; this by-pass taking care of any surplus liquid that may be pumped from the collector 15. The pipe 38 extends up to give a sufficient head to insure a proper flow of the liquid into the hollowed or perforated pistons. If desired, the relief pipe 38 may lead to the intake side of the liquid pump; although the illustrated construction is preferred. Pipe 38 may in some cases be provided with a back check valve 38^a.

In the boss or bearing 40 carrying the main shaft 10 is formed an interior recess 41 around the shaft, and a pipe 42 leads from said recess to the intake side of the liquid pump, thus insuring that a film of liquid shall tend to flow out from the main pump, and constantly surround the shaft 10 in the bearing to form a seal to prevent leakage of steam, air or gas.

Variations may be resorted to within the scope of the invention, and portions of the improvements may be used without others.

Having thus described my invention, I claim:

1. The combination with a rotary air or gas pump or engine having a cylinder or drum, and a rotary piston having an internal passage, of means, including a pump exterior to the drum in communication with said passage, for forcing liquid through the piston to its edge to seal and lubricate the same, a joint being provided between a part of the piston that contains said internal passage, and a stationary part of the pump or engine, said joint having a passage in communication with both said exterior pump and the internal passage in said piston.

2. The combination with a rotary air or gas pump or engine having a casing inclusive of a cylinder or drum, and also having a rotary piston provided with an internal or closed passage, of means, including a pump exterior to the drum in communication with said passage, for forcing liquid through the piston to its edges to seal the same, said exterior pump contained within said casing.

3. A rotary engine, gas or air pump or blower comprising a drum, intergearing hollow or perforate pistons revolving within the drum, and a pump exterior to said drum for forcing liquid or lubricant into the pistons to cause it to exude from the edges of the pistons to form seals of packings therefor; said liquid pump compris-

ing a pair of intergeared pistons connected respectively to the pistons in the main engine or pump.

4. A rotary engine, gas or air pump or blower comprising a drum, intergeared hollow or perforate pistons revolving within the drum, a pump exterior to said drum for forcing liquid or lubricant into the pistons to cause it to exude from the edges of the pistons to form seals or packings therefor; said liquid pump comprising a pair of intergeared pistons connected respectively to the pistons in the main engine or pump, and a casing in which said liquid-pump pistons revolve being provided upon the drum of the main engine or pump.

5. A rotary engine, gas or air pump or blower comprising a drum, intergeared hollow or perforate pistons revolving within the drum, and a pump exterior to said drum for forcing liquid or lubricant into the pistons to cause it to exude from the edges of the pistons to form seals or packings therefor; said liquid pump comprising a pair of intergeared pistons, the pistons in the main engine or pump being provided with shafts, and the liquid-pump pistons being fixed upon said shafts.

6. A rotary engine, gas or air pump or blower comprising a drum, intergeared hollow or perforate pistons revolving within the drum, a pump exterior to said drum for forcing liquid or lubricant into the pistons to cause it to exude from the edges of the pistons to form seals or packings therefor; said liquid pump comprising a pair of intergeared pistons connected respectively to the pistons in the main engine or pump, a casing in which said liquid-pump pistons revolve being provided upon the drum of the main engine or pump, and means upon the delivery side of the main engine or pump to separate and collect the liquid, said collecting means being in communication with the intake side of the liquid pump.

7. The combination with an air or gas pump or engine, having a cylinder or drum, and a piston therein of means, including a pump exterior to the drum, for forcing liquid to the edges of the piston to seal and lubricate the same, the main engine or pump including a shaft carrying a wheel or pulley, and mounted in a bearing provided with an interior recess, a duct for surplus liquid leading from said recess to the intake side of said liquid pump.

8. A rotary engine, gas or air pump or blower comprising a drum, intergeared hollow or perforate pistons revolving within the drum, a pump exterior to said drum for forcing liquid or lubricant into the pistons, to cause it to exude from the edges of the pistons to form seals or packings therefor, and openings or ports leading from the delivery side of the liquid pump through a

head of said drum to the interior of the main engine or pump, to supply the liquid to its pistons.

9. A rotary engine, gas or air pump or blower comprising a drum, intergeared hollow or perforate pistons revolving within the drum, a pump exterior to said drum for forcing liquid or lubricant into the pistons, to cause it to exude from the edges of the pistons to form seals or packings therefor, and openings or ports leading from the delivery side of the liquid pump through a head of said drum to the interior of the main engine or pump, to supply the liquid to its pistons; said openings or ports having such positions as to be constantly within the contours of the main pistons.

10. A rotary engine, gas or air pump or blower comprising a drum, intergeared hollow or perforate pistons revolving within the drum, a pump exterior to said drum for forcing liquid or lubricant into the pistons, to cause it to exude from the edges of the pistons to form seals or packings therefor, and openings or ports leading from the delivery side of the liquid pump through a head of said drum to the interior of the main engine or pump, to supply the liquid to its pistons; said openings or ports branching from a single opening at the delivery side of said liquid pump and leading one to each of said pistons.

11. The combination with a main rotary engine, air or gas pump, or blower, comprising a drum and a hollow or perforate piston revolving upon a support within the drum, of a liquid pump exterior to the drum, and a passage leading from the delivery side of said exterior pump to the support portion of said piston, to permit liquid from the liquid pump to flow through the piston to its edges to seal and lubricate the same.

12. The combination with a main rotary engine, air or gas pump, or blower, comprising a drum and a hollow or perforate piston revolving upon a support within the drum, of a liquid pump exterior to the drum, a passage leading from the delivery side of said exterior pump to the support portion of said piston, to permit liquid from the liquid pump to flow through the piston to its edges to seal and lubricate the same, and a collector on the delivery side of the main engine in communication with the intake side of said liquid pump.

13. The combination with a main air or gas pump or engine having a cylinder or drum, of means, including a pump exterior to the drum, for forcing liquid to the edges of the piston to seal and lubricate the same, and a by-pass extending from the delivery side of said liquid pump to the intake side of one of said pumps.

14. The combination with an air or gas

5 pump or engine having a cylinder or drum, of means, including a pump exterior to the drum, for forcing liquid to the edges of the piston to seal and lubricate the same, and a by-pass extending from the delivery side of said liquid pump to the intake side of said main pump or engine.

10 15. The combination with a main air or gas pump or engine having a cylinder or drum, of means, including a pump exterior to the drum, for forcing liquid to the edges of the piston to seal and lubricate the same, and a by-pass extending from the delivery side of said liquid pump to the intake side of said main pump or engine, said by-pass being in the form of a pipe rising from said delivery side well above the piston of the main engine or pump, to give sufficient head to the liquid to cause it to flow through the piston in said main engine or pump.

20 16. The combination with a rotary air or gas pump or engine, having a cylinder or drum, and a rotary piston device mounted upon a shaft device and having an internal or closed passage, of means including a pumping device also mounted on said shaft device exterior to the drum, and in communication with said passage, for forcing liquid through the piston to its edge to seal the same.

25 17. The combination with a rotary air or gas pump or engine having a cylinder or drum, and a rotary piston device mounted upon a shaft device and having an internal or closed passage, of means including a pumping device also mounted on said shaft device exterior to the drum and in communication with said passage, for forcing liquid through the piston to its edge to seal the same, said engine comprising a casing which is inclusive of said cylinder or drum, and said exterior pumping device being contained within said casing.

30 18. The combination with a rotary gas pump or engine, having an induction orifice and having a cylinder or drum, and also having a rotary piston provided with a passage, of means for causing liquid to flow through the piston to its edge to seal and lubricate the same, said engine provided with a well 30 below the induction orifice to take up the accumulation of drip from the piston, whereby said accumulation may be taken up by the fluid entering said cylinder or drum.

35 19. The combination of a rotary air or gas pump or engine having a cylinder or drum, and also having a rotary piston device provided with an internal or closed passage, said cylinder or drum having a port in communication with said passage, and means at the delivery side of the pump or engine to separate and collect the sealing liquid; means being provided for causing a closed circulation of the sealing liquid

through said port, said piston and said collecting means.

20. The combination of intergeared pistons provided with internal or closed passages, a drum in which they are mounted, said drum having a port in communication with said passages, and means at the delivery side of the pistons to separate and collect the sealing liquid; means being provided for causing a closed circulation of the sealing liquid through said port, said pistons and said collecting means.

21. The combination of intergeared pistons provided with internal or closed passages, a drum in which they are mounted, said drum having a main port or passage, branch ports in communication with said main port, said branch ports in communication with internal or closed passages in said pistons, and means at the delivery side of the pistons to separate and collect the sealing liquid; means being provided for causing a closed circulation of the sealing liquid through said port, said piston and said collecting means.

22. A rotary engine gas or air pump or blower, comprising a drum, intergeared pistons revolving within the drum, and having internal or closed passages open at the ends of the piston for sealing liquid, said drum having a port in open communication with the passages or openings in both of said pistons, and means at the delivery side of the pistons to separate and collect the sealing liquid; means being provided for causing a closed circulation of the sealing liquid through said port, said piston and said collecting means.

23. A rotary engine, gas or air pump or blower comprising a drum, intergeared hollow or perforate pistons revolving within the drum and open at their ends, a pump exterior to said drum for forcing liquid or lubricant, and means to conduct the liquid from the pump into the pistons, to cause it to exude from the edges of the pistons to form seals or packings therefor.

24. A rotary engine, air or gas pump, comprising a drum, a rotary piston within the drum and having an internal passage extending to its ends to form part of a closed circulatory system for liquid to flow through said opening to seal the ends of the piston, said circulatory system including (a) a separator at the delivery side of the pump or engine, (b) means to collect the separated liquid, and (c) a pump exterior to the drum and in communication with the passage in the piston to pump the separated liquid from said collecting means through said piston to its ends or edges.

25. A rotary air or gas pump or engine, comprising a drum having walls, a piston therein, said piston having ends revolving in contact with said walls, and having an

internal or closed passage for sealing fluid, said passage having openings at the end of the piston, said drum having a port in open communication with said openings and passage, and means upon the delivery side of the piston for separating and collecting the sealing fluid; means being provided to cause a closed circulation of the sealing fluid to flow through said port, said piston passage and said collector.

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