Aug. 19, 1941. W. F. WITTICH 2,253,005

ROTARY FLUID PRESSURE ENGINE

Filed June 10, 1940 2 Sheets-Sheet 1

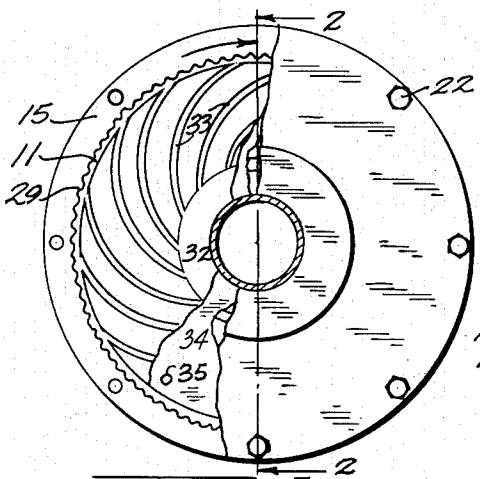


Fig. 1.

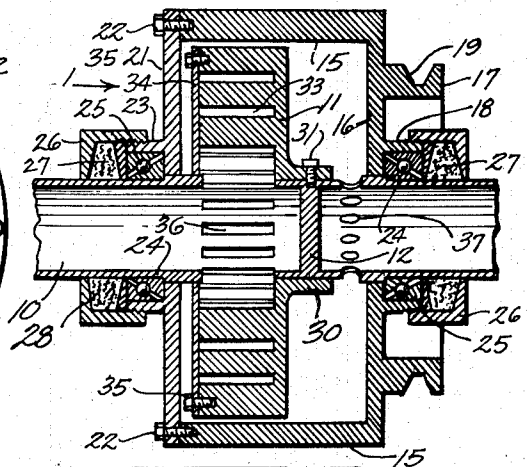


Fig. 2.

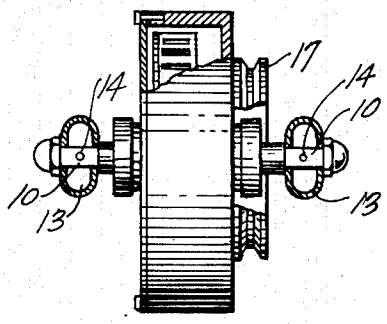


Fig. 3.

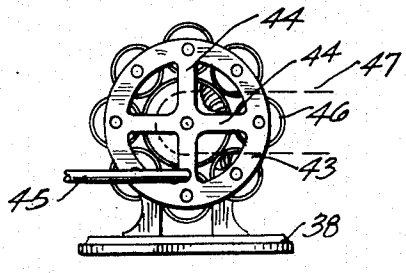


Fig. 4.

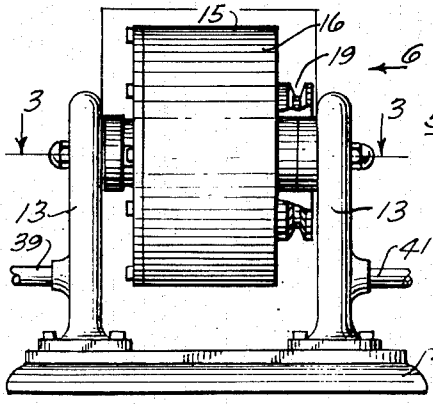


Fig. 5.

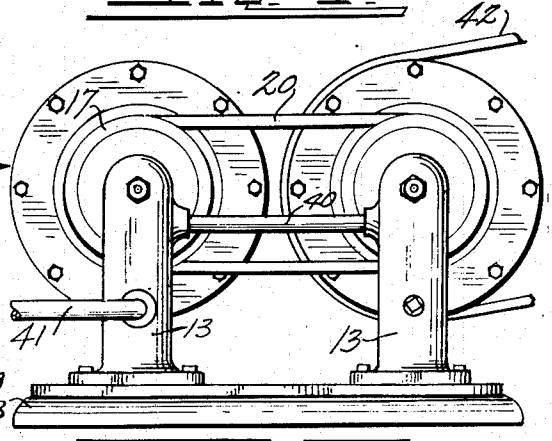


Fig. 6.

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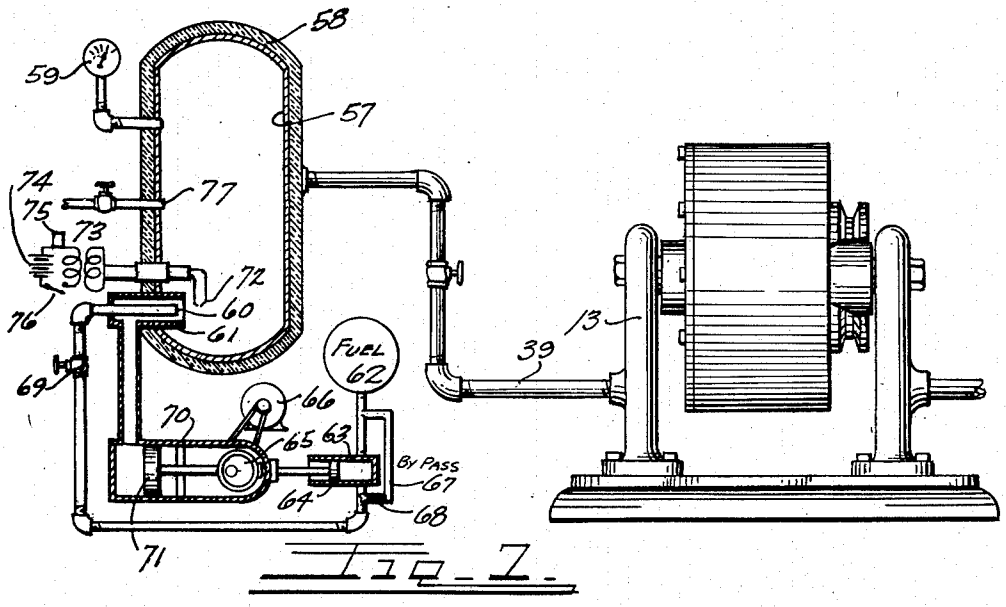


FIG. 7.

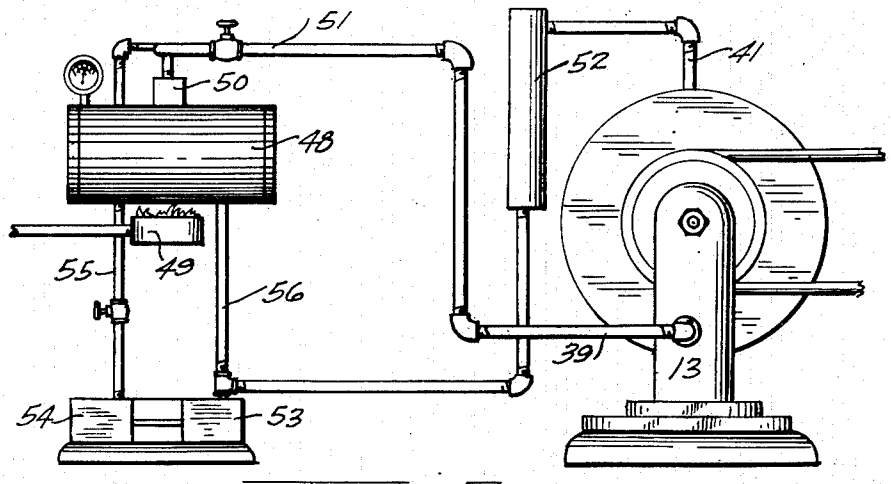


FIG. 8.

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ROTARY FLUID PRESSURE ENGINE

William F. Wittich, Denver, Colo.

Application June 10, 1940, Serial No. 339,745

1 Claim. (Cl. 253—79)

This invention relates to improvements in rotary engines of the type operated by fluid under pressure.

It has long been recognized that the ordinary reciprocating steam and internal combustion engines are subjected to excessive wear and strains caused by the rapid starting and stopping of movable parts of considerable weight which produces great inertia strains that in turn produce wear and friction.

Many attempts have been made to overcome the objectionable features of reciprocating engines by a construction in which the energy contained in the fluid under pressure can be made available by means of an engine which rotates and which is entirely free from reciprocating parts as well as free from valves corresponding to the ordinary slide valves in steam engines.

It is well understood that the potential energy contained in steam or other gas under pressure can be made available for practical use either by allowing the same to expand in a piston containing a movable cylinder in which case the gas expands adiabatically and imparts a moving force to the piston which is the product of the pressure and the number of square inches of the piston.

It is also well known that the potential energy contained in any gas under pressure can be converted into useful work by first converting the energy into velocity by permitting the gas to escape through a nozzle and then directing the nozzle onto vanes in suitably constructed rotors.

It is the object of this invention to produce a rotary engine of a very simple construction in which the power is derived from the momentum of gas moving under high velocities and which engine shall be entirely free from reciprocating parts and be so constructed and arranged that the potential energy contained in the gas will be converted into power with a high degree of efficiency.

In order to explain this invention so that it may be readily understood, reference will now be had to the accompanying drawings in which one embodiment thereof has been illustrated, and in which:

Figure 1 is a side elevation of an engine, looking in the direction of arrow 1, Figure 2, portions being broken away to better disclose the construction;

Figure 2 is a diametrical section taken on line 2—2, Figure 1;

Figure 3 is a top plan view of one power element of the engine shown in Figure 5, the hollow supports being shown in section taken on line 3—3, Figure 5;

Figure 4 is a side elevation of a slightly modified form of the invention;

Figure 5 is an end elevation of the engine shown in Figure 6 looking in the direction of arrow 5;

Figure 6 is a side elevation of the engine shown in Figure 5 looking in the direction of arrow 6;

Figure 7 is a diagrammatic view partly in elevation and partly in section showing the engine connected to a gas generating mechanism by means of which the required gas is produced under a predetermined pressure; and

Figure 8 is a diagrammatic view showing the engine connected with a steam boiler, condenser and feed water pump.

In the drawings reference numeral 10 designates a pipe on which the stator 11 is nonrotatably supported. It will be observed that the pipe 10, which may be referred to hereinafter as a tubular shaft, is provided with a transverse partition 12 that divides the interior thereof into two parts.

Referring now more particularly to Figure 3, it will be observed that the pipe 10 extends through the two tubular supports 13 and that it is provided with openings 14 which offer communication between the tubular supports and the interior of the shaft. In Figures 1 and 2, the power unit has been shown disassociated from the supports and comprises in addition to the stator, a rotor whose outer cylindrical wall has been designated by reference numeral 15. The rotor is cup shaped and has a wall 16 that is integral with the side 15 and projecting from the outer surface of this wall are two annular flanges, one of which has been designated by reference numeral 17 and the other by reference numeral 18. Flange 17 is provided on its outer surface with a V-shaped groove 19 for cooperation with a V-type endless belt by means of which power is transmitted and which has been designated by reference numeral 20 in Figure 6. The open end of the rotor is closed by means of a removable cover 21 which is held in place by tap screws 22. The outer surface of the cover has an outwardly extending cylindrical flange 23 corresponding in size and position to flange 18 on member 16. Positioned in the annular recess between the flanges 18 and 23 and the corresponding outer surface of members 16 and 21 are ball bearings whose inner ball races have been designated by reference numeral 24 and whose outer ball races have been designated by reference numerals 25. The outer surfaces of flanges 18 and 23 are threaded for the reception of the caps 26 that form the movable portions of stuffing boxes. Washers 27 having inwardly tapered outer surfaces are positioned against the outer ends of flanges 18 and 23 and serve as the inner abutments for the packing material 28.

It will hereinafter appear that the gas or steam within the rotor is under very light pressure and therefore the stuffing boxes that have just been described are not an essential element as far as the generation of power is concerned, but there will naturally be a slight pressure and unless means is provided to prevent the escape, some of the steam or gas would normally escape through the bearings and this would be somewhat objectionable.

It will be observed from Figures 1 and 2 that the inner surface of the rotor and the outer surface of the stator are spaced a short distance apart and in the preferred form the inner surface of the rotor is provided with longitudinally extending corrugations which have been designated by reference numeral **29**.

In the embodiment illustrated, the stator has been shown as formed from a single piece of metal which may be a casting and for this purpose ordinary cast iron may be employed. The stator has a hub **30** that is splined to the shaft **10** or held against rotation by other means such as by set screws **31**. The surface of the stator opposite from the hub and to the left when viewed as in Figure 2 is provided with a circular recess **32**, which is transformed into an annular chamber by the introduction of the tubular shaft. The wall of the stator between the outer boundary of the annular recess and the periphery of the stator is provided with a plurality of curved passages **33**. The annular recess and the curved passages have their open sides closed by means of a cover **34** which is held in place by means of tap screws **35**. The wall of the shaft **10** is provided with a plurality of longitudinally extending openings **36** that form communicating passages between the interior of the shaft and the annular chamber **32**. The wall of shaft **10** is also provided with a plurality of openings **37** that provide passageways between the interior of the rotor and that portion of the opening in shaft **10** which is shown to the right of partition **12** in Figure 2.

Let us now assume that the interior of the shaft or pipe **10** is connected with a source of steam or other gas under high pressure. The fluid will flow through the opening in the shaft, thence through the openings **36** into the annular recess **32** from whence it will pass through the curved passages **33** and emerge from these openings at a high velocity. The gas thus escaping will strike the corrugated inner surface of the rotor and produce a torque tending to turn the same in the direction of the arrow shown in Figure 1. Since the potential energy contained in the steam or gas has been converted into kinetic energy by its flow through the curved passages **33**, this energy will, in turn be converted into a torque tending to rotate the rotor as above described. Since there are a large number of passages **33**, the total of the torque thus produced will be the sum of the torque forces produced by each of the separate streams of gas. After the gas has escaped from the passages **33** and had its velocity reduced to substantially zero, it will pass into the space to the right of the stator, when viewed as in Figure 2, and will pass from thence through the openings **37** and escape through the hollow shaft.

At this point attention is called to the fact that the rotor and the stator can be respectively made the stator and the rotor as the engine is reversible in this sense. The reason the tubular pipe or shaft **10** has been shown as stationary instead of rotary is that by having this member stationary, a gastight seal can be more readily effected between the tubular supports **13** which contain the high pressure gas. With the arrangement illustrated and described, the only pressure to be guarded against is the greatly reduced pressure after the gases have expanded their energy and this simplifies the construction. On the other hand, if the member that is now shown as a stator is made to rotate and the present rotor is held against rotation, a slightly greater amount of power might be abstracted from the gas due to the fact that in changing its direction while passing through the curved passages, the amount of energy necessary to effect this change would be converted into useful work, whereas, in the present embodiment any forces due to this change of direction are resisted by the stationary material.

Since each one of the power units are complete in the form shown in Figure 1 they can be employed singly or in multiple as occasion requires.

In Figures 5 and 6 an engine has been shown in which there is a base **38** from the upper surface of which extends a plurality of pairs of tubular supports **13**. Between each pair of supports is positioned a power unit in the manner shown in Figure 3. Steam or other gas under pressure is admitted into the support **13**, to the left when viewed as in Figure 3, through a pipe **39** and the various supports are interconnected by means of pipes **40**, the gas or steam, after exhausting, escaping through the pipe designated by reference numeral **41**. Where several units are combined in one engine, they can be interconnected by means of a belt as shown in Figure 5 and the power can be taken off from the last power unit by means of a belt **42**. Where more than two power units are to be connected in series in the manner shown in Figure 6, it is necessary to provide the cover **21** with a grooved pulley similar to that indicated by reference numeral **17** or the latter may have two belt grooves instead of one.

In Figure 4 an embodiment has been illustrated in which the tubular supports **13** have been replaced by a hollow circular member **43** having diametrical hollow spokes **44**. The steam is admitted to one of these hollow members through the pipe **45** and since the hollow member **43** corresponds in every particular except shape to the tubular support **13**, the steam or gas will flow through the several power units in the manner above explained.

Continuing the description of Figure 4, it will be seen that in this embodiment eight power units have been arranged in a circle and another power unit has been positioned at the center. In the embodiment illustrated, the centrally positioned power unit has been illustrated as larger than the others, but this is not essential, but it must necessarily be larger in order to contact a large number of enclosing units. The outer peripheries of the several power units are provided with leather friction surfaces **46** and the power generated by the outer row of units will therefore be transmitted to the periphery of the center power unit and can be transmitted from the latter to the machine or machinery which is to be operated by means of a belt **47**. The embodiment illustrated in Figure 4 is intended to show how readily a large number of power units can be assembled into one engine so as to obtain a large amount of power. The arrangement illustrated in Figure 4 is also adapted for use in connection

with motor vehicles or other places where space must be concerned. It is also evident that a number of units like the one shown in Figure 4 can be placed side by side in the direction of the axis of the center power unit and in this way a very large number of these power units can be fitted into a comparatively small space.

Since this engine is designed more particularly to operate from a fluid such as gas or steam under a constant pressure and since it is desirable to be able to operate it either with gas or with steam, two alternative constructions have been illustrated in Figures 7 and 8.

Referring now to Figure 8, reference numeral **48** designates an ordinary steam boiler whose reference numeral **49** designates a gas burner which is representative of any suitable heating means. The steam dome has been designated by reference numeral **50** and from this a pipe **51** extends to and connects with the pipe **39** that projects from the vertical tubular member **13**. After the steam has passed through the engine, it is exhausted through the pipe **41** and into a condenser **52**. The condensed steam flows from thence to a boiler feed pump **53** that is operated by a steam engine **54**. Steam for the pump is provided through the pipe **55** and the condensed water is returned to the boiler through pipe **56**. When a proper condenser is provided, it is evident that the water can be used over and over again as the steam, after it has delivered its power to the engine, is condensed and returned to the boiler. Such an arrangement of parts can easily be adapted for automotive vehicles or small boats, as well as to power plants where large amounts of power are to be generated and used.

It may frequently be desirable to employ gases of combustion instead of steam for operating the engine and when this is the case, the necessary gas under the desired pressure can be obtained by means illustrated in Figure 7. In Figure 7 reference numeral **57** designates a steel tank that is enclosed in a heavy layer of heat insulating material **58**. This tank corresponds to the boiler shown in Figure 8 and may be provided with a pressure gauge **59** to indicate the pressure therein. In order to generate gases of combustion under the desired pressure, the following mechanism is employed. A fuel burner comprising a nozzle **60** and a tubular shield **61**, through which air for combustion enters, are positioned in communication with the interior of the tank and fuel for the nozzle **60** is provided from a fuel tank **62** which is connected with the nozzle **60** through a fuel pump **63** that has been shown as of the reciprocating type and provided with a piston **64**. The piston is reciprocated by means of a rotatable eccentric **65** which is driven by a motor **66**. A by-pass connecting the intake and the exhaust ports of the pump has been designated by reference numeral **67**. This by-pass contains a relief valve **68**. The function of the by-pass is to permit the pump to operate at a predetermined capacity regardless of the amount of fuel being consumed by the burner. The amount of fuel consumed is controlled by means of a valve **69** which has been illustrated as manually controlled but which in the actual embodiment will be automatically controlled by some suitable pressure responsive mechanism in a way now quite common in boiler installations where gas or oil fuel is used. The air for the combustion is provided by an air pump **70** whose piston **71** is reciprocated by the eccentric **65**. A spark gap **72** is adjacent to the discharge of the burner and this is maintained in continuous operation by means of high tension current from a transformer **73**. In the present embodiment current for the transformer has been shown as provided by a battery **74** and where direct current is used an interrupter **75** is introduced into the circuit. A switch **76** controls the operation of the spark. Steam is introduced through a pipe **77** that is connected with a suitable steam generator. The amount of steam introduced varies with the conditions necessary for the most efficient operation. By the means just described, gases of combustion can be generated at any desired pressure and these are then transmitted to the engine through the pipe **39** in the same manner as shown and described in connection with Figure 8.

From the above description it will be apparent that the engine which forms the subject matter of this invention is of extremely simple construction, that it has no reciprocating parts, and that it has no relatively rotatable parts that must be sealed against the escape of high pressure gas and consequently there is a very small amount of friction to be overcome in the engine itself. The several units can be combined in any numbers and in various ways to obtain the total amount of power that may be necessary for the results desired. By combining the power elements in the manner shown in Figure 4, a great concentration of power can be obtained thereby making the engine suitable for automotive vehicles or for small pleasure boats.

Attention has already been called to the fact that this motor is reversible and that the element which is referred to herein as the stator can be employed as a rotator with corresponding changes in the construction and that applicant therefore considers his invention as embodying not only the specific construction shown and described but also any obvious variations thereof which involve merely the carrying forward of the ideas herein described or the substitution of mechanical equivalents.

Having described the invention what is claimed as new is:

A rotary expansible fluid engine comprising, in combination, a base having two spaced supports, a tubular shaft extending between the supports with its ends nonrotatably mounted in the supports, the shaft having a partition dividing its interior into two sections, the wall of the shaft having openings on opposite sides of the partition, a cylindrical stator nonrotatably attached to the shaft, one side of the stator having a plurality of outwardly radiating curved passages whose inner ends are in communication with one section of the shaft opening, a removable plate secured to the stator forming a closure wall for one edge of the curved passages, a cylindrical rotor housing rotatably mounted on the shaft and enclosing the stator, the inner surface of the cylindrical wall of the housing being spaced from the outer cylindrical wall of the stator and roughened, the rotatable housing having one side removable, and means carried by the housing for cooperating with a belt, the space between the stator and the inside of the rotatable housing being in communication with the interior of the other section of the opening in the shaft which serves as a fluid exhaust.

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