April 24, 1956 L. F. PORTER 2,742,882

ROTARY-TURBINE-EXPLOSION TYPE ENGINE

Filed Feb. 27, 1951 4 Sheets-Sheet 1

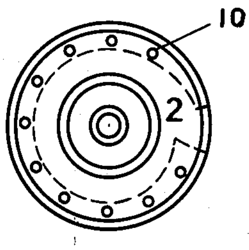


FIG. 8

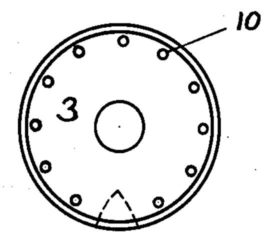
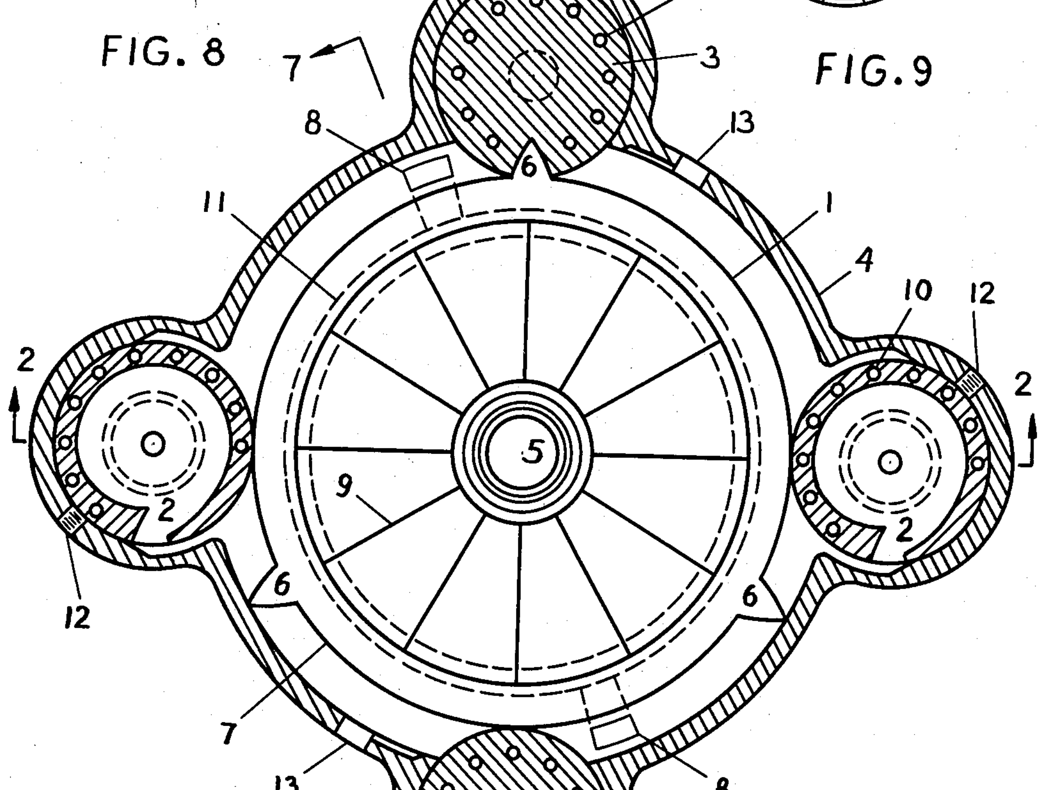


FIG. 9



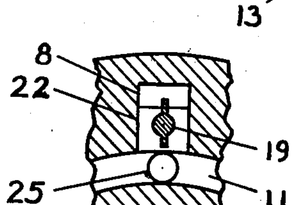


FIG. 10

FIG. 1

Leo F. Porter

April 24, 1956 L. F. PORTER 2,742,882

ROTARY-TURBINE-EXPLOSION TYPE ENGINE

Filed Feb. 27, 1951

4 Sheets-Sheet 2

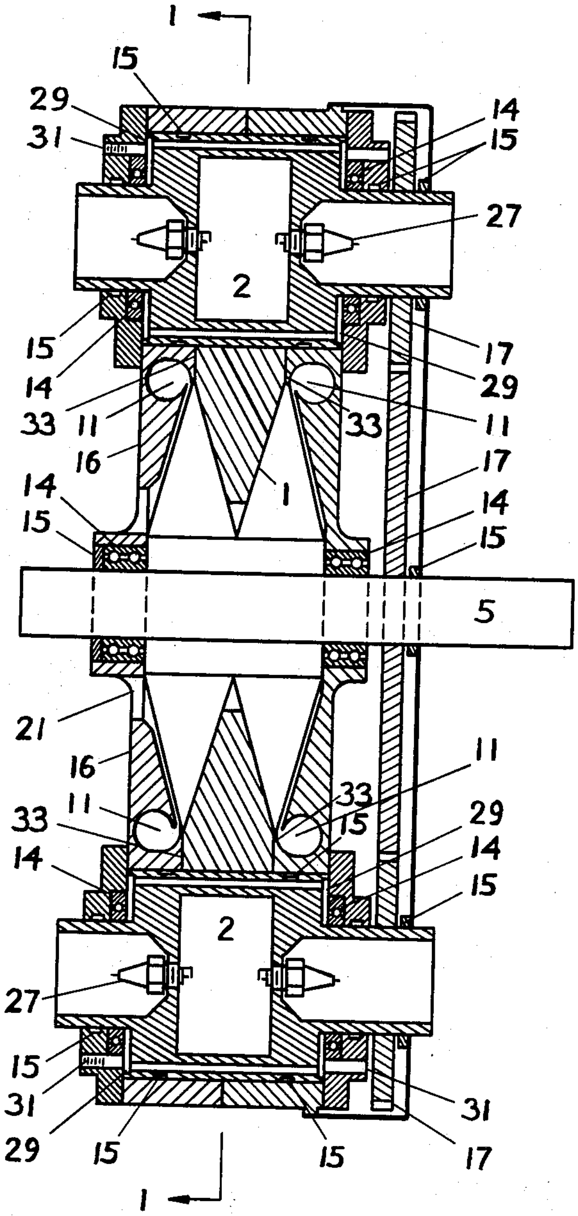


FIG. 2

Leo F. Porter

April 24, 1956 L. F. PORTER 2,742,882

ROTARY-TURBINE-EXPLOSION TYPE ENGINE

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4 Sheets-Sheet 3

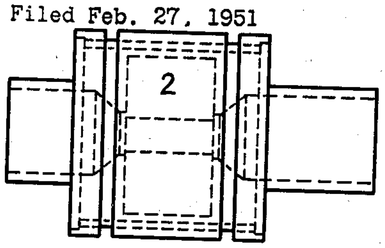

FIG. 5

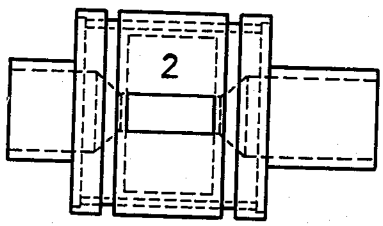

FIG. 6

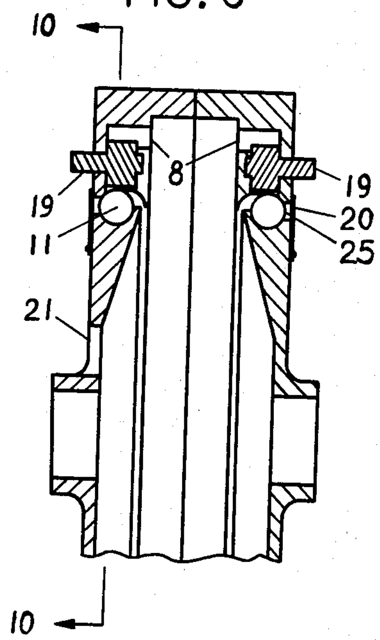

FIG. 7

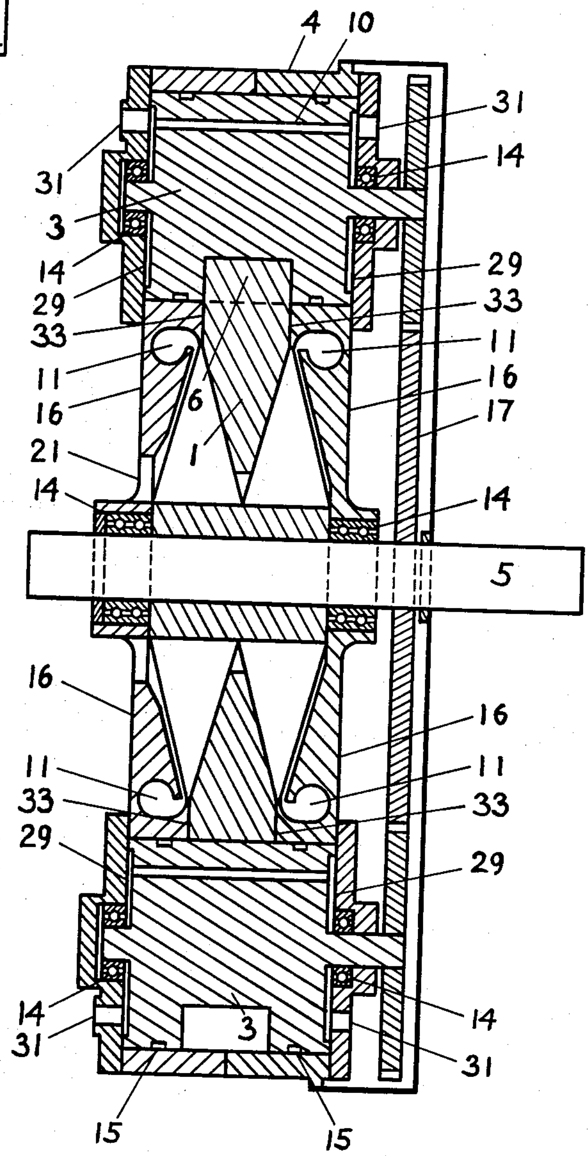

FIG. 3

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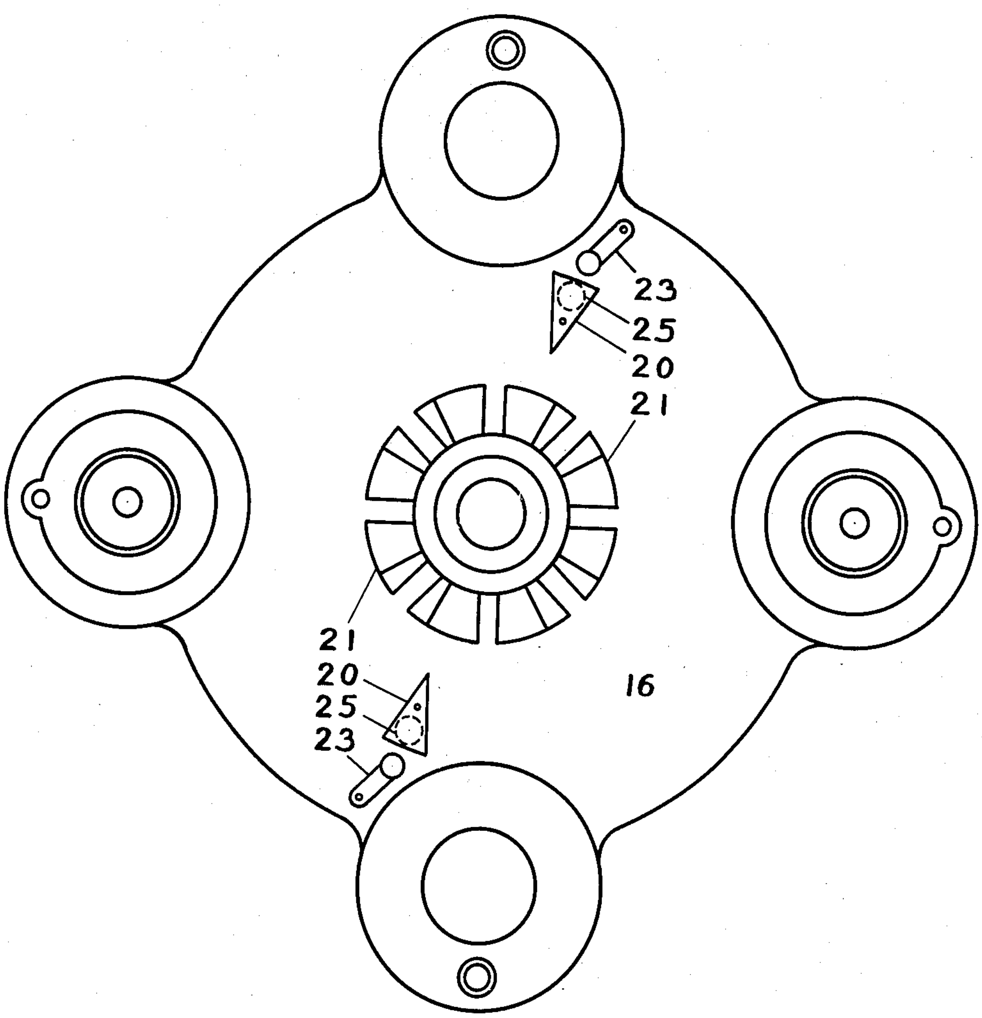

FIG. 4

Leo F. Porter

2,742,882

ROTARY-TURBINE-EXPLOSION TYPE ENGINE

Leo F. Porter, Clearfield, Utah

Application February 27, 1951, Serial No. 212,944

6 Claims. (Cl. 123—13)

My invention relates to internal combustion engines and objects of my improvements are to provide an improved rotary engine of the rotary turbine explosion type, of which the following are the basic fundamental principles: Three working parts housed in suitable cases supported by bearings and timed together with suitable timing gears, chains, or combinations of both. These three principal working parts are (*a*) a specially designed abutment wheel, (*b*) a specially designed revolving firing chamber with built-in revolving spark plug(s) **27**, and (*c*) a revolving blocking cylinder. Air enters near the hub of the abutment wheel **1**. Centrifugal force forces the air into channels **11** located in end housing **16**. Air passes from channels **11** through intake port **8** located near revolving blocking cylinder **3**. Abutment **6** forces air from intake port **8** into revolving firing chamber **2**. Liquid fuel may be injected into revolving firing chamber **2** before air starts to enter or air and fuel may be mixed before entering cylinder. Abutment **6** forces the air into the revolving chamber **2** and follows the air into the recess in the chamber. On or about top dead center ignition occurs, the expanding gases then must escape through the same recess or opening and apply their pressure on the opposite surface of the abutment **6** thus causing abutment wheel **1** to rotate, burnt gases then escape freely through an exhaust port **13** located near the blocking cylinder **3**. Any remaining gases left by previous explosion will be ejected by the next abutment tooth **6**.

In the drawings:

Fig. 1 is a sectional view of the engine shown on line 1—1 of Fig. 2.

Fig. 2 is a sectional view of the engine through the combustion chambers shown on line 2—2 of Fig. 1.

Fig. 3 is a sectional view of the engine through the blocking cylinders shown on line 2—2 of Fig. 1.

Fig. 4 is a front view of the engine.

Fig. 5 is a side elevation of a combustion chamber showing a port.

Fig. 6 is a side elevation of the combustion chamber with the port facing away.

Fig. 7 is a partial sectional view through the throttle chamber shown on line 7—7 of Fig. 1.

Fig. 8 is an end view of a combustion chamber.

Fig. 9 is an end view of a revolving blocking cylinder.

Fig. 10 is a sectional view of the throttle chamber on line 10—10 of Fig. 7.

Referring to item **1** shown in Figures 1, 2 and 3, the abutment wheel **1** is a wheel supported by main shaft **5** and bearing **14**. The spokes **9** of wheel are similar to a super charger blade. They serve a quadruple purpose:

(*a*) They support the outer rim of abutment wheel.

(*b*) Through the principle of centrifugal force they take in outside air through the inlet openings **21** and force it into channels **11** located in front and rear cases. This pressurized air serves as air intake. Surplus air will be vented outside through relief ports **20**. A suitable control or butterfly valve **19** allows a control of air.

(*c*) Air also serves the purpose of controlling abutment wheel **1** temperature.

(*d*) The air compressed by centrifugal compressor blades **9** acts as a fluid seal and helps prevent exploded gases from escaping around the sides of wheel **1**.

As previously stated, the air discharged by compressor blades **9** is forced into the annular channels **11** as shown in Figures 1 and 7. These channels **11** are connected to the intake ports **8** by means of radial passages **22**. The butterfly valves **19** are positioned on these passages **22** to control the amount of air which will pass through the passages and thus be admitted through intake ports **8**. The control arms **23** shown in Figure 4 are connected to the stems of valves **19** to provide for rotative adjustment of the position of the valves. Channels **11** are connected to the atmosphere through vent ports **25** which are controlled by the pivoted valves **20**. In order to vent some of the compressor discharge to atmosphere when valves **19** are partially closed, valves **20** may be rotated for opening ports **25** as valves **19** are rotated for closing passages **21**.

On the rim of the wheel **1** are located one or more projections known as abutments **6**. As abutment **6** passes intake port **8** it compresses air before it into revolving chamber **2** where it mixes with fuel previously injected thus forming compression stroke.

Abutment **6** enters firing chamber **2** further compressing gases, creating a point known as top dead center. This point occurs when abutment **6** ceases to enter firing chamber and starts to leave.

On or about top dead center, ignition occurs causing an explosion of the highly compressed gases. The force of this explosion is applied against rear surface of abutment **6** thus causing rotation, an action commonly known as a power stroke. The forward surface of abutment **6**, after leaving rotating firing chamber **2**, forces any remaining burnt gases from preceding explosion out exhaust port **13**.

Item **2** on Figures 1, 2 and 6, is a specially designed rotating firing chamber, cylindrical in shape, supported by bearings **14** and fitted with oil seals **15**. It has one or more spark plugs **27**, which revolve with cylinder. Lubrication of bearings **14** and cooling of firing chamber **2** is accomplished by pumping oil, under pressure, through passageways **10** in cylinder walls of revolving firing chamber **2** and blocking cylinder **3**.

Rotating chamber **2** and cylinder **3** are geared to abutment **1**, ratio depending on number of abutments **6** on wheel **1**. Chamber and cylinders rotate in a counter direction to abutment wheel **1**. Liquid fuel is injected into chamber **2** through opening some time after exhaustion of previous explosion, or fuel may be mixed with air before entering chamber.

Item **3** on Figures 1 and 3 is known as a revolving blocking cylinder **3**, supported by bearings **14**, lubricated, cooled and geared to abutment wheel **1** in a like manner as the firing chmaber **2**. Its purpose is to prevent exhaust gases from mixing with intake gases.

Item **4** is an outside case or housing, cylindrical in shape. It has cylindrical protrusions enclosing firing chambers and blocking cylinders. It may be fitted with cooling fins or a coolant jacket. It is fitted with end plates and housing **16** shown in Figures 4 and 5. It is fitted with exhaust ports **13**.

The cylindrical members **2** and **3** have opposite end surfaces which are spaced from the casing **4** to form chambers **29**. Bearings **14** between the cylindrical members and the casing are exposed to said chambers **29** and the chambers on opposite sides of each of the cylindrical members **2** and **3** are interconnected by the passageways **10**. The casing **4** has a plurality of ducts **31** adapted for connection to a conventional oil pump system, not shown. Each duct **31** opens into one of the chambers **29** so that cooling and lubricating fluid may be pumped into the chamber **29** at one end of each of the cylindrical members **2** and **3**, thereby lubricating the adjacent bearing **14** and cooling the exposed end surface of the cylindrical member; then through passageways **10** thereby cooling the interior of the cylindrical member; and finally through the chamber **29** at the opposite end of the cylindrical member, thereby lubricating the other bearing **14** and cooling the opposite end surface of the cylindrical member.

As shown in Figures 2 and 3, there is a close running fit between the sides of wheel **1** and the casing **4** to form a running seal along the lines marked **33**. The outer extremities of the centrifugal compressor blades **9** terminate adjacent the radially inner extremities of said running seals. Thus, it will be seen that the radially inner extremities of the running seals are exposed to the high pressure discharge of the centrifugal compressor. In this manner, the compressor discharge forms a fluid seal which assists in preventing leakage past said running seals.

I claim:

1. A rotary abutment internal combustion engine comprising an engine casing, an abutment wheel rotatably supported in said casing, said wheel having a rim, an abutment tooth supported on the peripheral surface of said rim, the sides of said rim forming an annular running seal with said casing, said casing including a first chamber formed radially outward of said surface and being generally concentric with said surface, a generally cylindrical firing chamber rotatably supported within said first chamber and position for rolling engagement with said surface, an aperture in the wall of said firing chamber to receive said abutment tooth as said tooth passes said firing chamber when said wheel is rotated, a blocking cylinder spaced circumferentially from said firing chamber and rotatably supported in said first chamber in rolling engagement with said surface, said cylinder being recessed to receive said abutment tooth as said tooth passes said cylinder when said wheel is rotated, said abutment wheel having a series of radially arranged blades forming a centrifugal compressor, said casing having an inlet opening for said compressor with the radially outer extremity of said opening being positioned substantially radially inward of the radially outward extremities of said blades, a passage provided in said casing toward the outer ends of said blades, whereby upon rotation of said wheel air is pumped to said passage in said casing, a passage communicating between said first chamber and said passage provided in said casing, the outer extremities of said blades being in flow communication with and radially inwardly of the radially inner periphery of said running seal, whereby the high pressure delivered by said blades will help prevent leakage through said seal, and means for rotating said abutment wheel, said firing chamber and said blocking cylinder in timed relationship to one another.

2. A rotary abutment internal combustion engine comprising an engine casing, an abutment wheel rotatably supported in said casing, said wheel having a rim, an abutment tooth supported on the peripheral surface of said rim, the sides of said rim forming an annular running seal with said casing, said casing including a first chamber formed radially outward of said surface and being generally concentric with said surface, a generally cylindrical firing chamber rotatably supported within said first chamber and positioned for rolling engagement with said surface, an aperture in the wall of said firing chamber to receive said abutment tooth as said tooth passses said firing chamber when said wheel is rotated, a blocking cylinder spaced circumferentially from said firing chamber and rotatably supported in said first chamber in rolling engagement with said surface, said cylinder being recessed to receive said abutment tooth as said tooth passes said cylinder when said wheel is rotated, said abutment tooth extending radially into proximity to the outer wall of said first chamber intermediate said firing chamber and said blocking cylinder, an exhaust port comprising an aperture provided in said first chamber intermediate said firing cylinder and said blocking chamber, said abutment wheel having a series of radially arranged blades forming a centrifugal compressor, said casing having an inlet opening for said compressor with the radially outer extremity of said opening being positioned substantially radially inward of the radially outer extremities of said blades, a passage provided in said casing toward the outer ends of said blades, whereby upon rotation of said wheel air is pumped to said passage in said casing, a passage communicating between said first chamber and said passage provided in said casing, the outer extremities of said blades being in flow communication with and radially inwardly of the radially inner periphery of said running seal, whereby high pressure delivered by said blades will help prevent leakage through said seal, and means for rotating said abutment wheel, said firing chamber and said blocking cylinder in timed relationship to one another.

3. A rotary abutment internal combustion engine comprising an engine casing, an abutment wheel rotatably supported within said casing, a fuel expansion chamber provided in said casing radially outward of said abutment wheel, said abutment wheel having a series of radially arranged blades forming a compressor, a passage in said casing toward the outer ends of said blades, whereby, upon rotation of said wheel, air is pumped to said passage in said casing, a passage communicating between said fuel expansion chamber and said passage in said casing, and a manually operated valve positioned in said last named passage, said valve being operable independently of the angular position of said wheel.

4. A rotary abutment internal combustion engine comprising an engine casing, an abutment wheel rotatably supported within said casing, a fuel expansion chamber provided in said casing radially outward of said abutment wheel, said abutment wheel having a series of radially arranged blades forming a compressor, a passage in said casing toward the outer ends of said blades, whereby, upon rotation of said wheel, air is pumped to said passage in said casing, passage means communicating between said passage in said casing, the said fuel expansion chamber, and the atmosphere, and valve means positioned in said passage means for proportioning air passed from said passage in said casing to said fuel expansion chamber and the atmosphere, respectively.

5. In a rotary abutment internal combustion engine comprising an engine casing, an abutment wheel rotatably supported within said casing, a fuel expansion chamber provided in said casing radially outwardly of said abutment wheel, said casing and the sides of said wheel forming a running seal for said chamber, and an air compressor driven by said wheel and having its high pressure discharge connected with said running seal on the opposite side of said seal from said chamber, said compressor also having its high pressure discharge connected to said expansion chamber and forming the final compression stage between the atmosphere and said chamber.

6. In a rotary abutment internal combustion engine, an engine casing, an abutment wheel rotatably supported within said casing, an abutment tooth supported on the peripheral surface of said wheel, a generally cylindrical member supported in said casing in rolling engagement with said peripheral surface, said member having a recess in its cylindrical wall to receive said tooth as it passes said member, said cylindrical member having opposite end surfaces spaced from said casing to form chambers between said end surfaces and said casing, said recess extending only part way between said end

surfaces, passage means separate from said recess extending through said cylindrical member and interconnecting said chambers, bearing means between said cylindrical member and said casing, said bearing means being in communication with said chambers, and said casing having ducts connected to said chambers, whereby cooling and lubricating fluid may be forced into one of said chambers, through said passage means and out of the other of said chambers.

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