March 13, 1956 W. E. SWENSON 2,737,933

ENGINE

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FIG 1

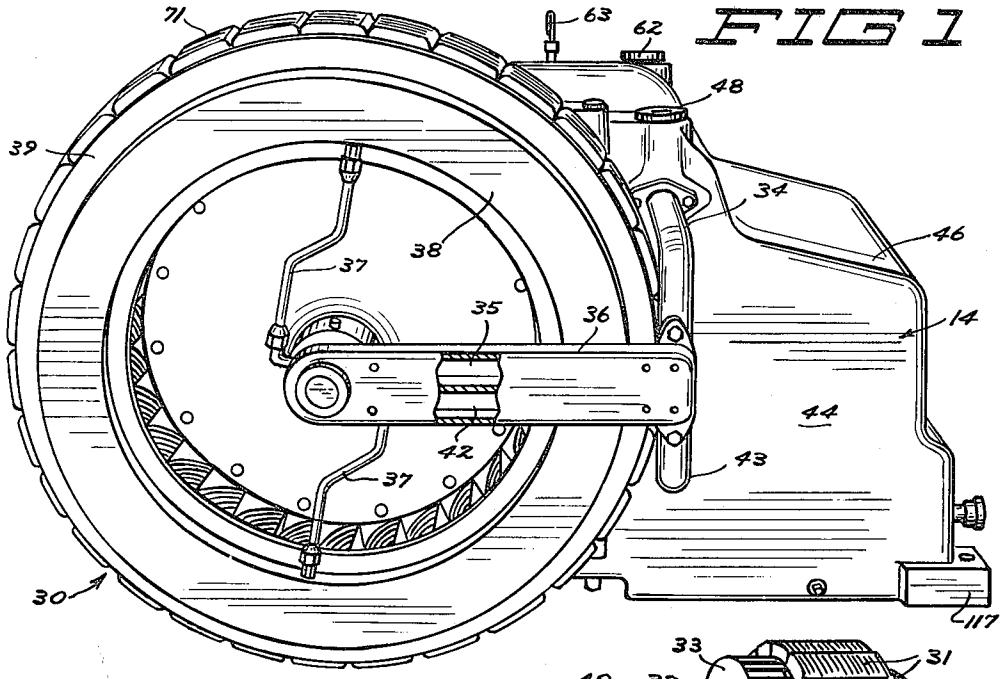
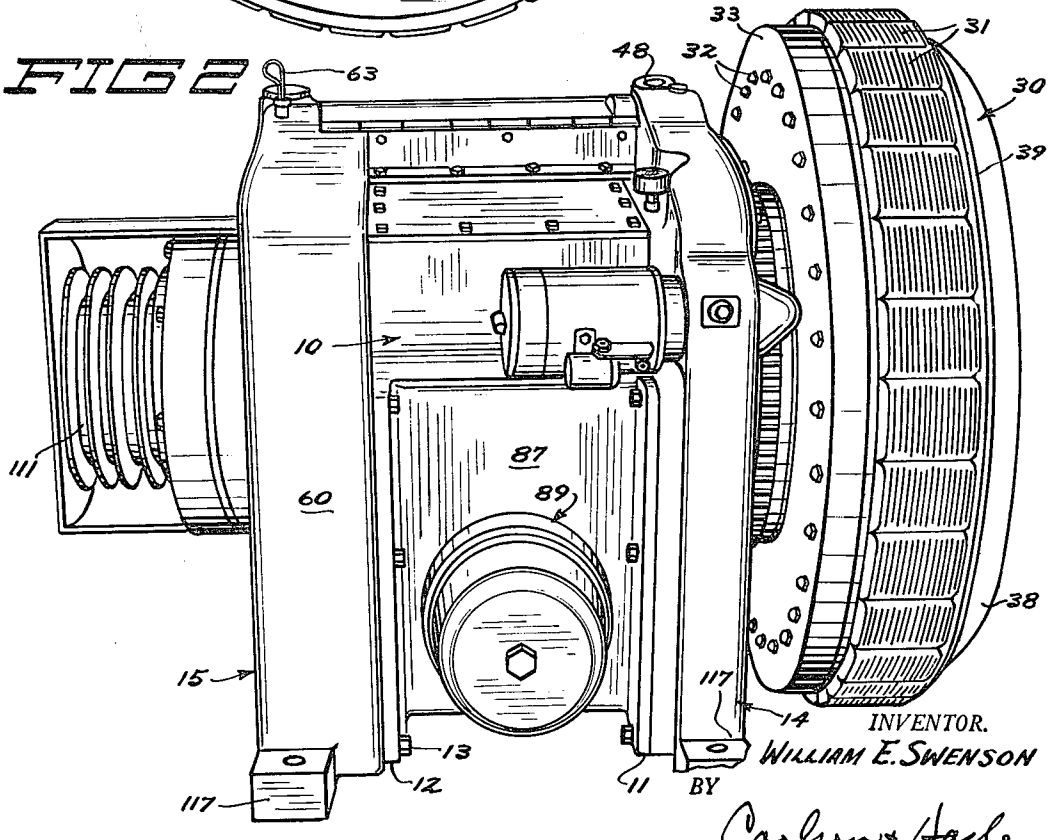


FIG 2



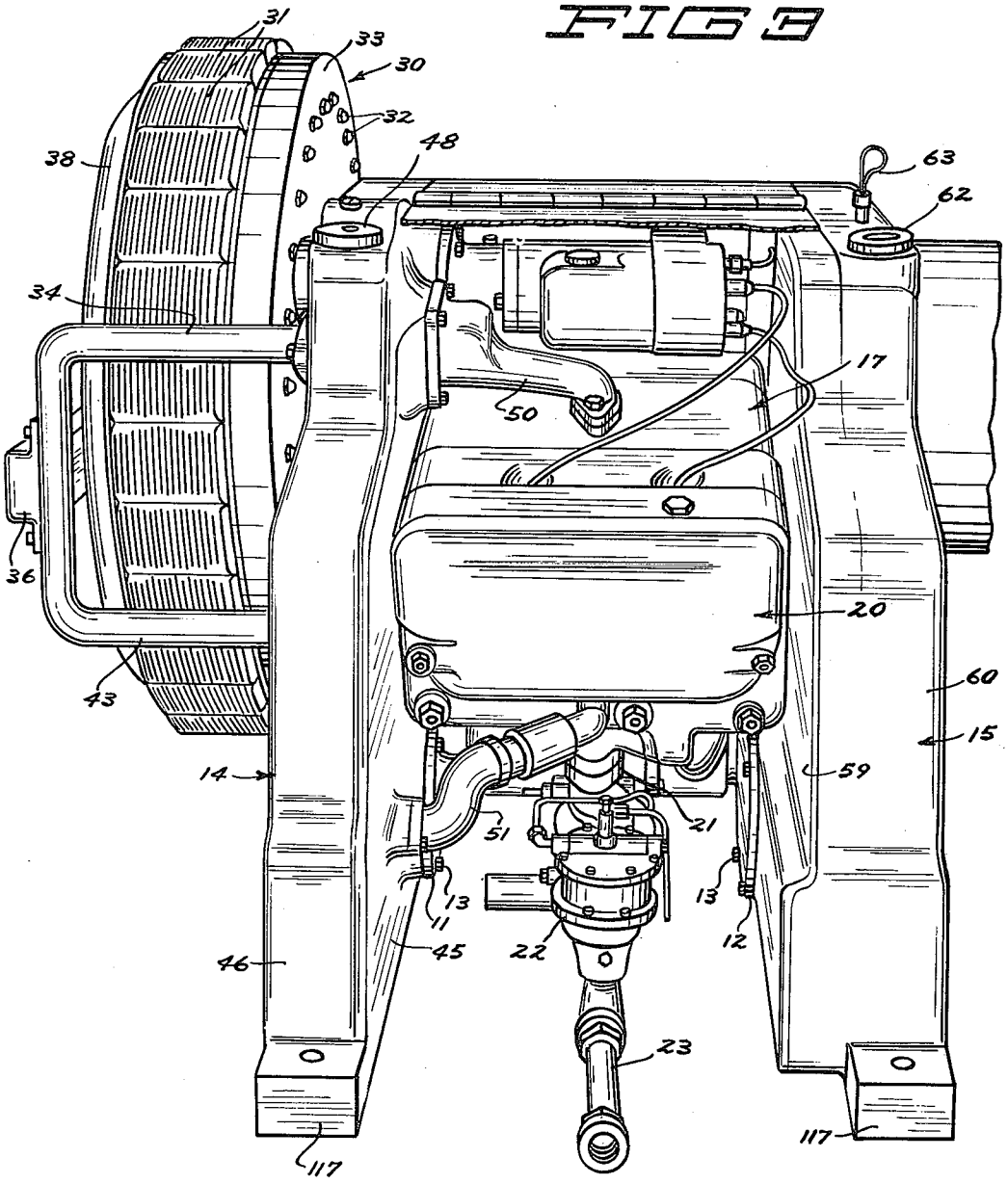
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ENGINE

Filed Oct. 11, 1952 6 Sheets-Sheet 2

FIG 3



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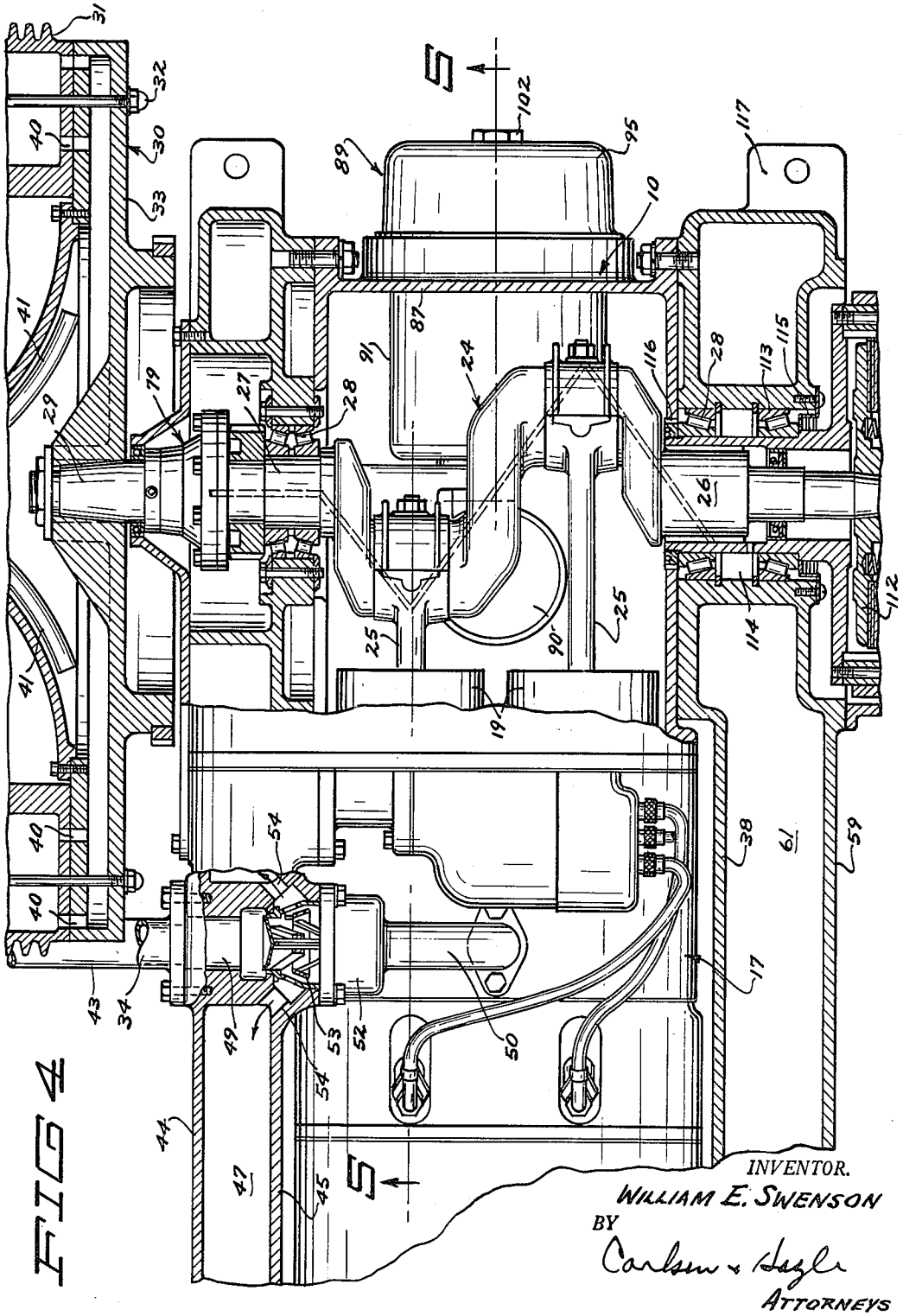


FIG 4

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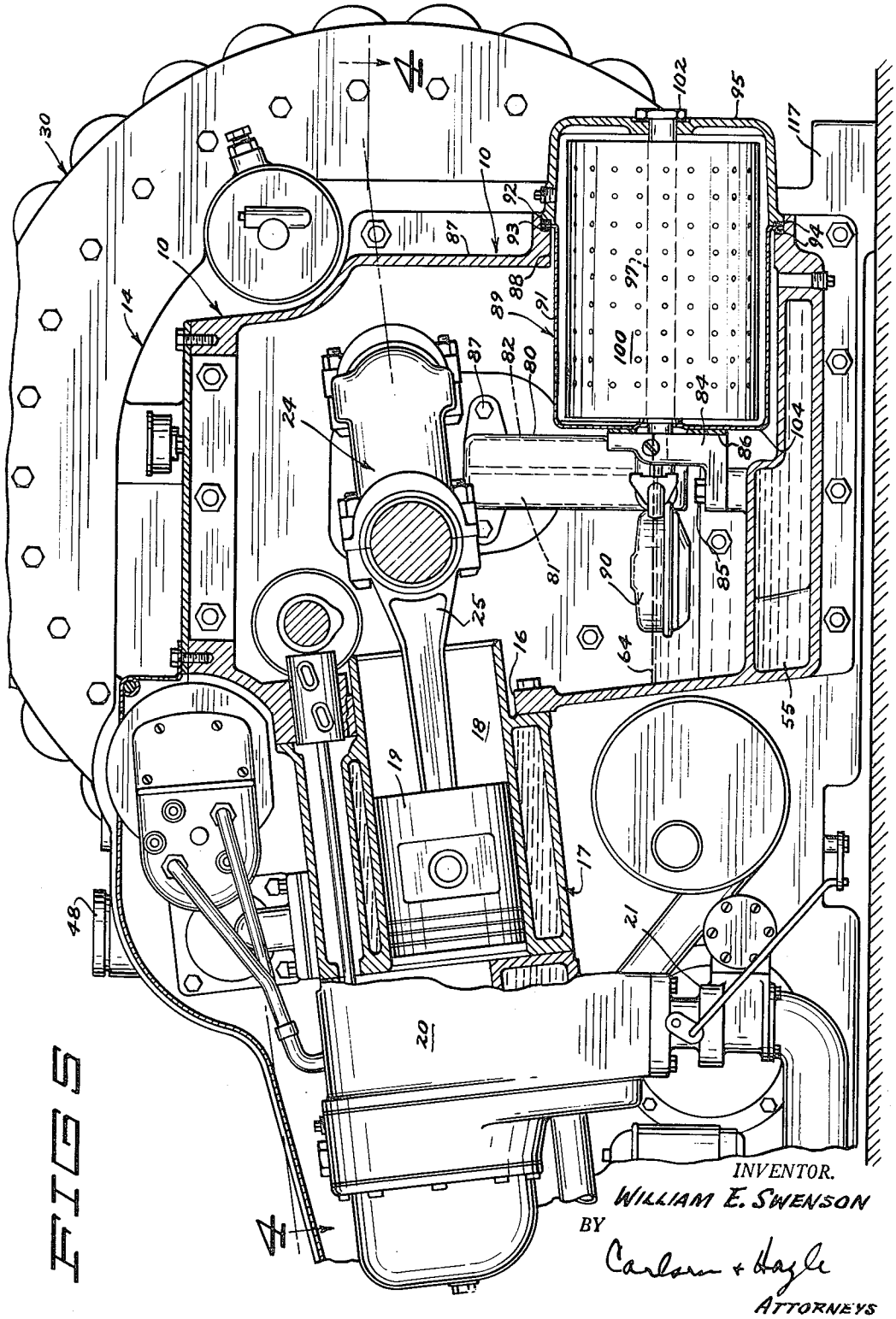


FIG 5

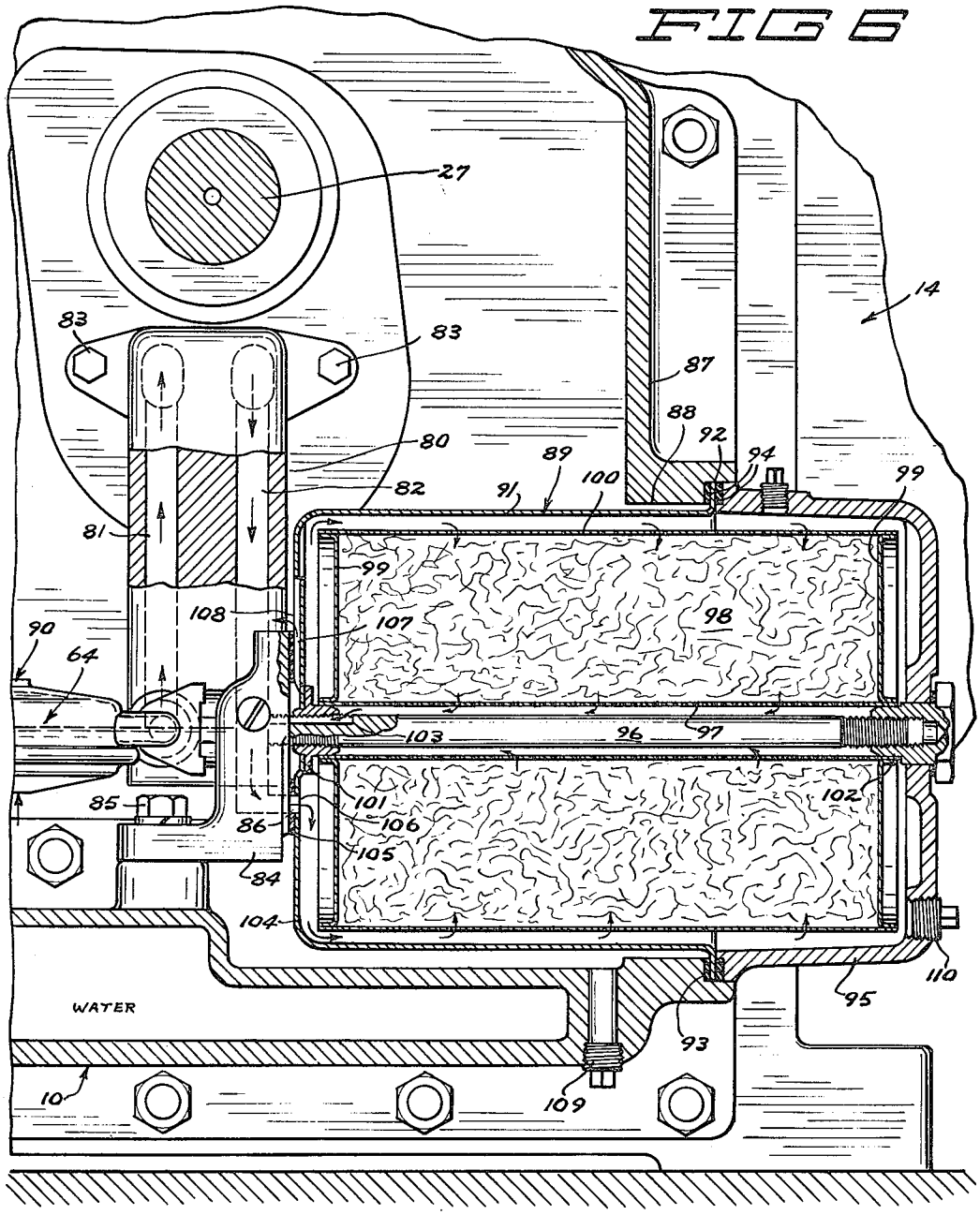
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March 13, 1956 W. E. SWENSON 2,737,933

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FIG 6



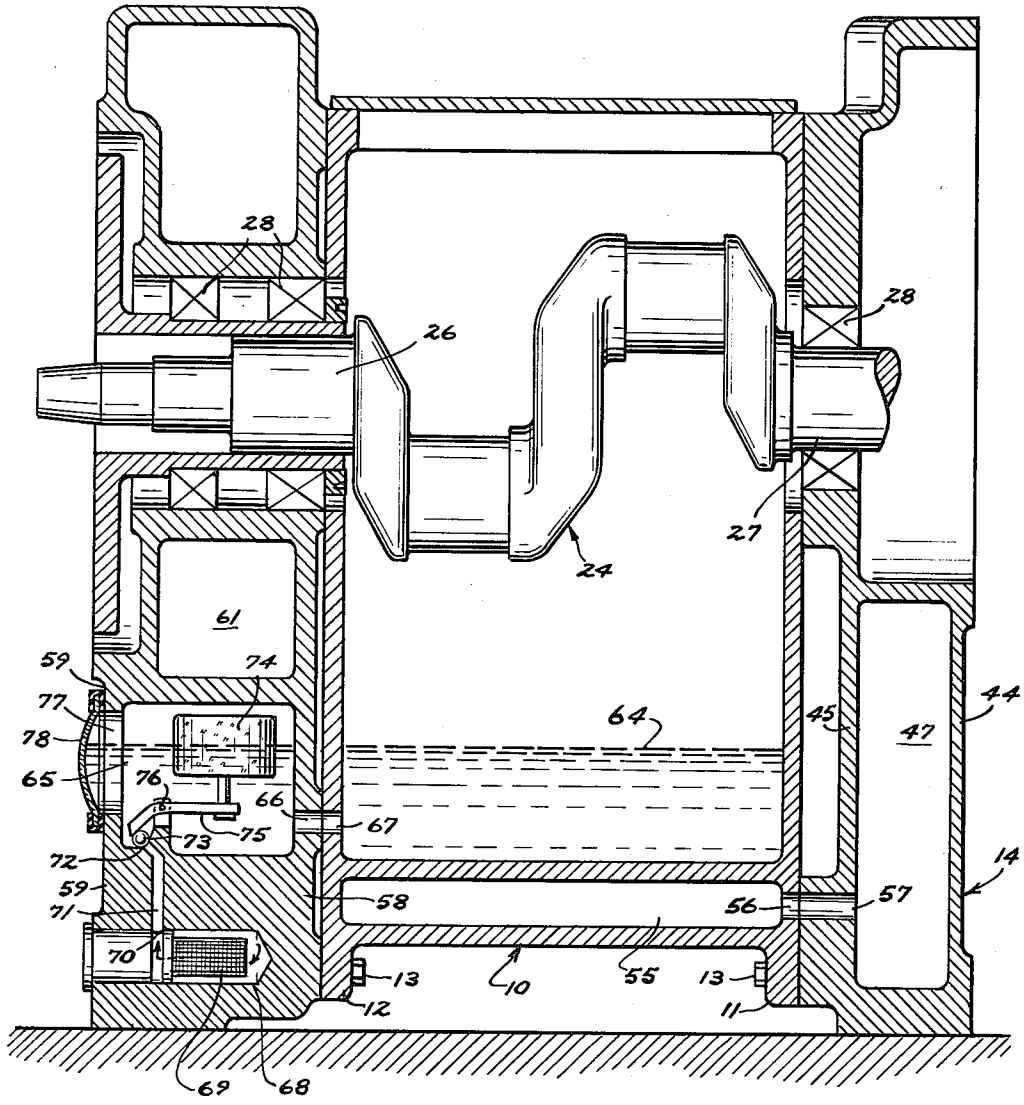
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ENGINE

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FIG 7



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United States Patent Office

2,737,93

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ENGINE

William E. Swenson, St. Paul, Minn., assignor to Minneapolis-Moline Company, Hopkins, Minn., a corporation of Minnesota

Application October 11, 1952, Serial No. 314,310

5 Claims. (Cl. 123—41.33)

This invention relates generally to improvements in internal combustion engines, and more specifically to an engine particularly suited for operation in the oil fields, and other uses where its characteristics are suitable.

The primary object of the invention is to provide an engine so constructed and arranged that it may be laid down as a package unit and, when connected to a suitable source of fuel, will run for a long period of time, for example as long as a year, continuously and without requiring service or attention of any kind. Such operation, as stated, is particularly useful in the oil fields where the engines must run under load for long periods of time and where the fuel supply is no problem, since the natural gas product of the oil field operations may be advantageously used as fuel for the engine. The engine has an extremely efficient cooling system of the type disclosed in my prior application Serial No. 284,682, filed April 28, 1952, and in accordance with this invention and forming a part of the cooling system is a large water reservoir for containing water, anti-freeze or other coolant in a volume sufficient for operation for the stated long periods of time. For lubrication there is also provided a large oil reservoir from which oil is automatically valved as necessary to maintain a working level of lubricant in the engine, as will presently appear.

A further object of the invention is to provide an engine of this general type wherein the crank case is water-jacketed and the cooling water is circulated through the jacket in such fashion as to condition the lubricating oil, as to temperature, for the most efficient lubrication and operation of the engine. This is particularly desirable in an engine which may be subject not only to operation over long periods of time without attention, but also may well be exposed to the elements with but little protection.

A further object is to provide an improved oil filter assembly for internal combustion engines wherein the filter is located in the crank case in the most desirable location with reference to the engine as a whole, but in which provision is made for the removal and replacement of the filter unit, per se, without the escape of and loss of oil from the crank case.

A further object of the invention is to provide various related improvements in engines of this nature, all of which mutually contribute to its advantageous operation and construction, and among which are the location of the belt pulley bearings in a position in which they will be splash lubricated from the crank case; the location of the oil pump in a floating manner directly upon the crank shaft; the use of a thermostatically controlled valve which will return the water circulating to the crank case water jacket directly to the water reservoir where the temperature of the water is such that it needs no cooling, and the like.

These and other more detailed and specific objects will be disclosed in the course of the following specification, reference being had to the accompanying drawings, in which—

Fig. 1 is a frontal elevation and perspective of th engine according to the present invention and also illus trating the combination heat exchanger, pump and fly wheel forming the subject matter of my prior applica tion.

Fig. 2 is a perspective view at one side of the engin and particularly showing the location of the oil filter.

Fig. 3 is a perspective view from the other side of th engine showing the connection through which fuel i supplied to the engine.

Fig. 4 is an enlarged horizontal sectional and pla view with portions of the engine broken away an omitted, this view being taken substantially along th line 4—4 in Fig. 5.

Fig. 5 is a vertical sectional view through the centra portion of the engine, partially in elevation, and take substantially along the line 5—5 in Fig. 4.

Fig. 6 is a still further enlarged vertical sectional an detail view through the oil filter assembly and relate lubricating elements of the engine, appearing at the lowe right in Fig. 5.

Fig. 7 is a vertical and front-to-back sectional view along the axis of the crank shaft showing the oil an water reservoirs and the crank case with water jacket, bu omitting other elements of the engine for the sake o clarity.

Referring now more particularly and by reference characters to the drawing, the engine is seen to comprise as its primary components a crank case, designated gen erally at **10**, flanged at its opposite ends **11** and **12** an bolted through these flanges at **13** to spaced, hollow reservoirs or reservoir housings, indicated generally a **14** and **15**. As best shown in Fig. 5 the crank case **10** i of irregular but substantially rectilinear shape in cros section and at one side is formed with an opening **1** for the accommodation of a cylinder block **17** wherei the cylinders **18** are formed for the pistons **19**. In thi particular instance the engine is of the two cylinder size but it may, of course, be of any size according to the power required. More or less conventionally the cylinde block **17** is fitted, at the end remote from the crank case, with a cylinder head assembly, designated generally a **20**, wherein are formed the combustion and manifolding chambers and recesses, with provision for the intake and exhaust valves as usual. Fuel is supplied through a manifold **21** at the lower side of the head and connected to a suitable carburetion device **22**. In oil field applications the engine will, in most instances, be powered by natural gas, the supply of which is taken through a fuel connection **23** emerging at one side of the engine in a conveniently accessible location. The ignition system for the engine is not important to an understanding of the present invention and will not be described herein, although it is desirably of the completely water-proof type, since such engines are in many cases exposed to the elements with but little protection. The engine further includes the customary crank shaft, designated generally at **24**, connected by connecting rods **25** to the pistons **19** and the opposed end journals **26** and **27** of the crank shaft are journaled through the reservoirs **14** and **15** and carried by suitable anti-friction bearings, indicated throughout at **28**. At what, for convenience sake, will herein be regarded as the front of the engine the crank shaft **25** is secured at **29** (Fig. 4) to a large circular heat exchanger pump and flywheel unit, designated generally at **30**, which forms the subject matter of my prior application Serial No. 284,682. This unit **30**, of course, revolves with the crank shaft and it includes a plurality of hollow finned fan blades **31** of the sirocco type, which are secured at **32** to a circular back plate **33**, and into and through which the cooling medium, whether it be water alone or a combination thereof with an anti-freeze, is

circulated from a water pipe connection at 34 to the engine, as set forth in the earlier application. Such connection 34 communicates with one duct 35 of a stationary tubular manifold element 36 extending to the axis of rotation of the heat exchanger and from which axis the coolant travels outwardly under the influence of centrifugal force through a plurality of radially located tubes 37. The outer ends of these tubes are connected to an annular intake element 38 communicating with the blades and secured to a front plate 39, between which plates and the aforesaid back plate 33 the blades 31 are mounted. The water or other coolant emerges from the blades through openings, appearing at 40 in Fig. 4, and is returned to the engine by stationary scoop tubes 41 leading back to the axis of rotation and communicating with another duct 42 in the member 36, as in Fig. 1. The said duct 42 is in turn connected to a return pipe 43 having connection to the engine. As pointed out in detail in the earlier application this heat exchanger unit 30 not only cools but centrifugally circulates the cooling medium, acting in itself as a water pump for the engine, and finally utilizes the weight of the coolant, as it flows through the hollow blades 31, for its flywheel effect, combining all of these functions in the one assembly.

The forward reservoir 14 carries a supply of water or other coolant for circulation through the heat exchanger 30 and through the engine for cooling the same. Said reservoir for this purpose is hollow, as best shown in Fig. 7, with spaced front and rear walls 44 and 45 and a surrounding water-tight wall portion of irregular shape indicated at 46, thus forming an enclosed chamber 47. This chamber may be filled from the top by the filler plug 48 and the aforesaid water pipe connections 34 and 43 are made to the forward wall 44 of the reservoir. In the case of the pipe 34 through which the water is taken for cooling in the heat exchanger 30, the same communicates through a passage 49, appearing in Fig. 4, which is in turn connected by a manifold connection 50 for circulating the water through the cylinder block 17 as well as the cylinder head. Another pipe connection is made at 51, as seen in Fig. 3, from the cylinder block and through the rear wall 45 of the reservoir 14 and the circulating system is thus so arranged that the heat exchanger 30, which as described acts also as a pump, will draw water from the reservoir 14 through the connection 51 and through the cylinder block and head and after the water has passed in heat exchanging relation for cooling the engine the water will be drawn through the connection 50 and passage 49, out through the pipe 34 for circulation through the heat exchanger and finally for return through the pipe 43 to the reservoir. It will, of course, be obvious that this pipe connection 43 is made directly through the forward wall 44 to communicate with the chamber 47. Located at 52 in the pipe 50, through which water is drawn from the engine, is a conventional thermostat (not shown) which operates a valve 53 and this valve may bypass the water directly through the ports 54 back to the reservoir chamber 47 when the temperature is such that it needs no cooling by the heat exchanger 30, as will be readily understood.

It is also important to note that, as shown in Figs. 5 and 7, the crank case 10 is water jacketed, forming water chambers indicated throughout at 55 and communication is provided between this water jacket and the water reservoir, as by means of aligned ports 56 and 57 in the meeting surfaces of the crank case and reservoir. Thus the water may also circulate in intimate heat exchanging relation with that portion of the crank case in which the lubricating oil stands, in order to utilize the temperature of the water for conditioning the oil for best lubrication and most efficient operation of the engine.

The oil reservoir 15 is similar in shape and construction to the water reservoir 14, having spaced front and rear walls, indicated at 58 and 59, joined by a surrounding edge wall 60 to define a fluid-tight chamber 61. This chamber may be filled with oil at the plug 62 and an ordinary but rather elongated dipstick 63 is also provided for measuring the level of the oil in the reservoir. It will, of course, be apparent that provision is made for the reception of the ends of the crank shaft 25 in both of the reservoirs 14 and 15, through which these crank shaft ends project, by the suitable formation of the castings making up the reservoirs.

An operating level, indicated at 64, of oil is continuously maintained in the crank case 10 from the supply in the reservoir 15 and for this purpose, as seen in Fig. 7, the lower part of the reservoir 15 is formed with a float chamber 65 isolated from the reservoir chamber 61 but communicating through ports 66 and 67 with the crank case, so that oil will stand in this chamber at the same level as that in the crank case itself. Located below the float chamber 65 there is a cylindrical recess 68 which communicates with the reservoir chamber 61, and oil entering this recess 68 passes through a screen 69 which is screwed into the recess from the outside of the reservoir. After passing through the screen, which removes any chips or other foreign matter, the oil emerges at 70 into a passage 71 communicating with the float chamber 65. This passage 71 is formed with a valve seat 72 against which a ball 73 is normally seated by the action of a float 74, and this float is connected to a lever 75 fulcrumed at 76 in such manner that as the float rises the lever will press the ball 73 to its seat. Obviously, therefore, when the oil level 64 drops in the crank case, as it will during the continuous operation of the engine, the float 74 will descend in the float chamber 65 allowing the valve ball 73 to move off its seat 72 and additional oil will then be drawn from the reservoir chamber 61 through the screen 69 and passage 71 to replenish and maintain the oil level in the crank case. In order to observe the level of the oil level in the crank case from outside the engine the rear wall 59 of the reservoir is provided with an inspection opening 77 closed by a transparent sight glass 78.

In addition to the normal splash lubrication of the operating parts of the engine, the oil in the crank case is also circulated by an oil pump, designated generally at 79, to bearings or wherever required and in accordance with this invention this oil pump 79 is arranged to float upon the forward journal 27 of the crank shaft 24. The pump rotor is operated by the crank shaft, whereas the housing thereabout is held stationary by inlet and outlet port means which communicates with an oil manifold 80 having intake and discharge ducts 81 and 82. This manifold is bolted at 83 to the reservoir 14 and depends therefrom downwardly below the level of the crank shaft and below the crank case oil level 64. At its lower end the manifold 80 is formed with an offset bracket extension 84 which is bolted at 85 to the bottom of the crank case for holding this assembly stationary, and at its lower end the discharge duct 81 for the pump opens at 86 through the face of this bracket extension 84, toward the adjacent side wall 87 of the crank case. In alignment with the bracket extension this wall 87 is provided with a large, circular and flanged opening 88 for accommodating an oil filter assembly, designated generally at 89, shortly to be described. The lower end of the intake duct 82 from the pump communicates with the crank case through a commercially available type of combination screen and float, designated generally at 90, and no description should be necessary herein.

The oil filter assembly 89 includes an inside cup-like container 91 having an open outer end marginally flanged at 92 to fit an enlarged counterbore 93 in the aforesaid opening 88 through the crank case wall. This flange 92 is disposed between gaskets 94 and is held in place by an outer cover 95, also of cup-like formation, but shorter than the container 91. Extending axially through this

cylindrical assembly is an elongated mounting stud **96** over which is loosely fitted the perforated core **97** of a filter element **98** of suitable fibrous material enclosed between imperforate ends **99** and an outer cylindrical and perforated cover **100**. Centering nuts **101** and **102** are screwed upon the opposite ends of the stud **96** for centering the filter element within the receptacle and the inner end of the stud **96** is also screwed into the bracket **84** so that the entire assembly may be held stationary within the engine and the cap **95** pulled tight against the gaskets. The outward opening **86** of the discharge duct **82** aforesaid communicates with an opening **106** in the adjacent end **104** of the filter unit (Fig. 6) so that oil will enter the filter and then flow from outside in, as shown by the arrows. The filtered oil emerges from the filter through a keyway **103** cut in the stud **96**. The inner end **104** of the container **91** is pulled tight against a gasket **105** but this end **104** has an upwardly, radially extending and shallow channel **107** communicating with keyway **104**. As designated at **108** this channel **107** opens upwardly above the gasket **105** so that oil, after passing through the filter and after being forced through the filter material **98** by the pump, may return to the crank case and so that there is a continuous circulation of the oil. Obviously the filter element will need occasional replacement and this may be readily accomplished by removing the nut **102** at the outside of the engine so that the cap **95** may be taken off and the filter unit pulled off the stud **96** for replacement. It will be noted, however, that because the point **108** at which the interior of the container **91** communicates with the crank case is considerably above the oil level **64**, the oil cannot escape even when the filter unit is removed. This is a distinct advantage in servicing this part of the engine, as will be readily realized. As best shown in Fig. 6 there are separate drain plugs **109** and **110** for the crank case and filter unit for obvious purposes.

Power is taken from the engine off the rear end **26** of the crank shaft in any suitable manner, but as here shown is by a belt pulley **111** and controlled connection is made between the crank shaft and the belt pulley through an intermediate clutch, a portion of which appears at **112** in Fig. 4. Bearings **28** and **113**, by which this end of the crank shaft and the pulley are supported, are located in an opening **114** traversing the oil reservoir **15** and this opening, while it is sealed at its outer end as indicated at **115**, communicates at its inner end through an annular passageway **116** with the interior of the crank case. Thus these bearings are lubricated by crank case splash in addition to the force lubrication through the ordinary crank shaft borings shown in dotted lines in Fig. 4.

It is believed that the operation of the engine will be readily apparent from the foregoing and basically, of course, the operation is identical with that of the common types of internal combustion engines. Of chief importance is the fact that the crank case assembly **10** is bolted between the reservoirs **14** and **15** and these reservoirs are large enough in capacity to contain water and oil, respectively, in a volume sufficient to operate the engine over long periods of time without attention. In fact, the engine will require little servicing under any conditions. The oil filter location and construction as described is advantageous from the service aspect also. Not only do the reservoirs **14** and **15** supply the needed coolant and lubricant materials for the engine but they also act as supporting bases for the engine as a whole, being provided with the feet **117** shown in the various views for this purpose. Splash lubrication of the belt pulley bearings contributes to the ability of the engine to operate over long periods of time without attention and the temperature conditioning of the lubricating oil by the water jacket crank case is also important in maintaining the engine in the best operating condition under all conditions.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claims.

Having now therefore fully illustrated and described my invention, what I claim to be new and desire to protect by Letters Patent is:

1. An internal combustion engine construction including a crankcase having openings at its opposite ends and a crankshaft extending from said openings, spaced apart hollow reservoir housings arranged in upright positions and one at each end of said crankcase, means securing said housings to the crankcase ends to serve as direct supports for the crankcase, the said housings having bearings through which said crankshaft is journaled, one of said housings serving as a reservoir for cooling fluid for the engine and the other as a reservoir for lubricating oil for the engine.

2. In an internal combustion engine having a crankcase with openings at its opposed ends and a crankshaft having its ends extruding loosely out through said openings, a pair of upright housings larger than said crankcase and disposed directly against said opposed ends thereof, means securing the crankcase to said housings whereby the housings act as supports for the crankcase, the said housings having bearings aligned with the openings in the opposed ends of the crankcase and rotatably supporting the said ends of the crankshaft, and the said housings being hollow and serving as reservoirs for cooling and lubricating fluids for the engine.

3. In an internal combustion engine having a crankcase with openings at its opposed ends and a crankshaft having its ends extruding loosely out through said openings, a pair of upright housings larger than said crankcase and disposed directly against said opposed ends thereof, means securing the crankcase to said housings whereby the housings act as supports for the crankcase, the said housings having bearings aligned with the openings in the opposed ends of the crankcase and rotatably supporting the said ends of the crankshaft, the said housings being hollow and serving as reservoirs for cooling and lubricating fluids for the engine, the said crankcase having water jackets and means providing direct communication between the jackets and the interior of the housing which serves as a reservoir for cooling fluid, means providing communication between the other housing and the interior of the crankcase itself, and a valve for controlling the supply of lubricating liquid from said other housing to the crankcase.

4. In an internal combustion engine having a crankcase with openings at its opposed ends and a crankshaft having its ends extruding loosely out through said openings, a pair of upright housings larger than said crankcase and disposed directly against said opposed ends thereof, means securing the crankcase to said housings whereby the housings act as supports for the crankcase, the said housings having bearings aligned with the openings in the opposed ends of the crankcase and rotatably supporting the said ends of the crankshaft, the said housings being hollow and serving as reservoirs for cooling and lubricating fluids for the engine, the said crankcase having water jackets and means providing direct communication between the jackets and the interior of the housing which serves as a reservoir for cooling fluid, means providing communication between the other housing and the interior of the crankcase itself, and a valve for controlling the supply of lubricating liquid from said other housing to the crankcase, said last mentioned means comprising a float controlled valve completely enclosed within the housing which acts as a reservoir for the lubricating fluid.

5. An engine construction which comprises a crankcase having a surrounding wall and front and rear aper-

tured ends, a crankshaft extending through the crankcase and projecting at its ends through the apertured ends of the crankcase, front and rear housings having surrounding walls and inner and outer end walls and supporting feet, the front to rear dimensions of said housings being less than that of the crankcase, the housings being disposed in upright positions at the front and rear respectively of the crankcase with the inner end walls of the housings against the ends of the crankcase, means securing the housings against the adjacent ends of the crankcase to thereby support the crankcase, bearings isolated from the interior of the housings but opening front and rear through the housings to journal the ends of the crankshaft, and the interiors of the housings providing storage reservoirs for cooling and lubricating fluids for operation of the engine.

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