

March 8, 1932.

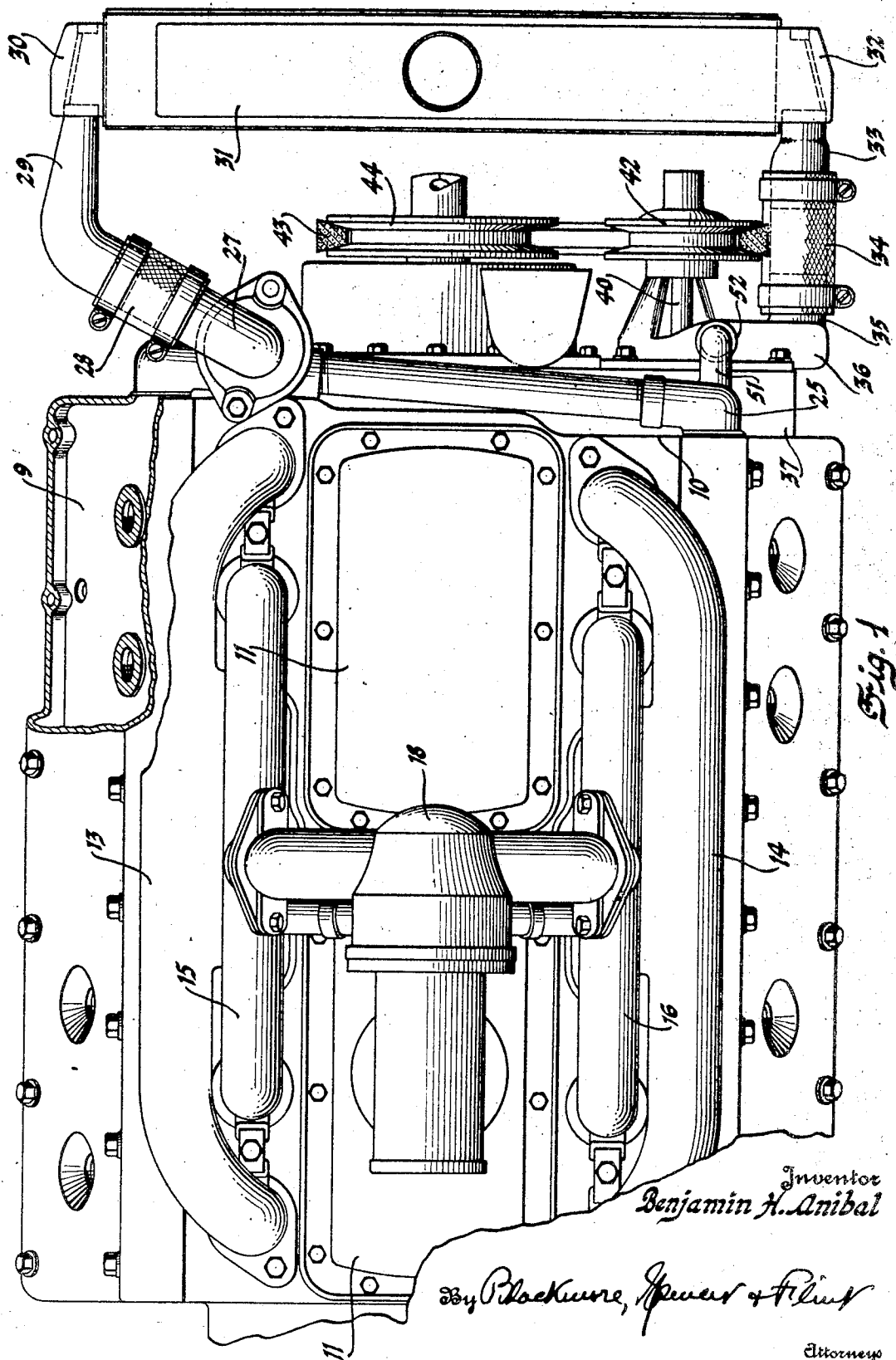
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1,848,987

WATER PUMP BY-PASS

Filed March 21, 1930

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2 Sheets-Sheet 2

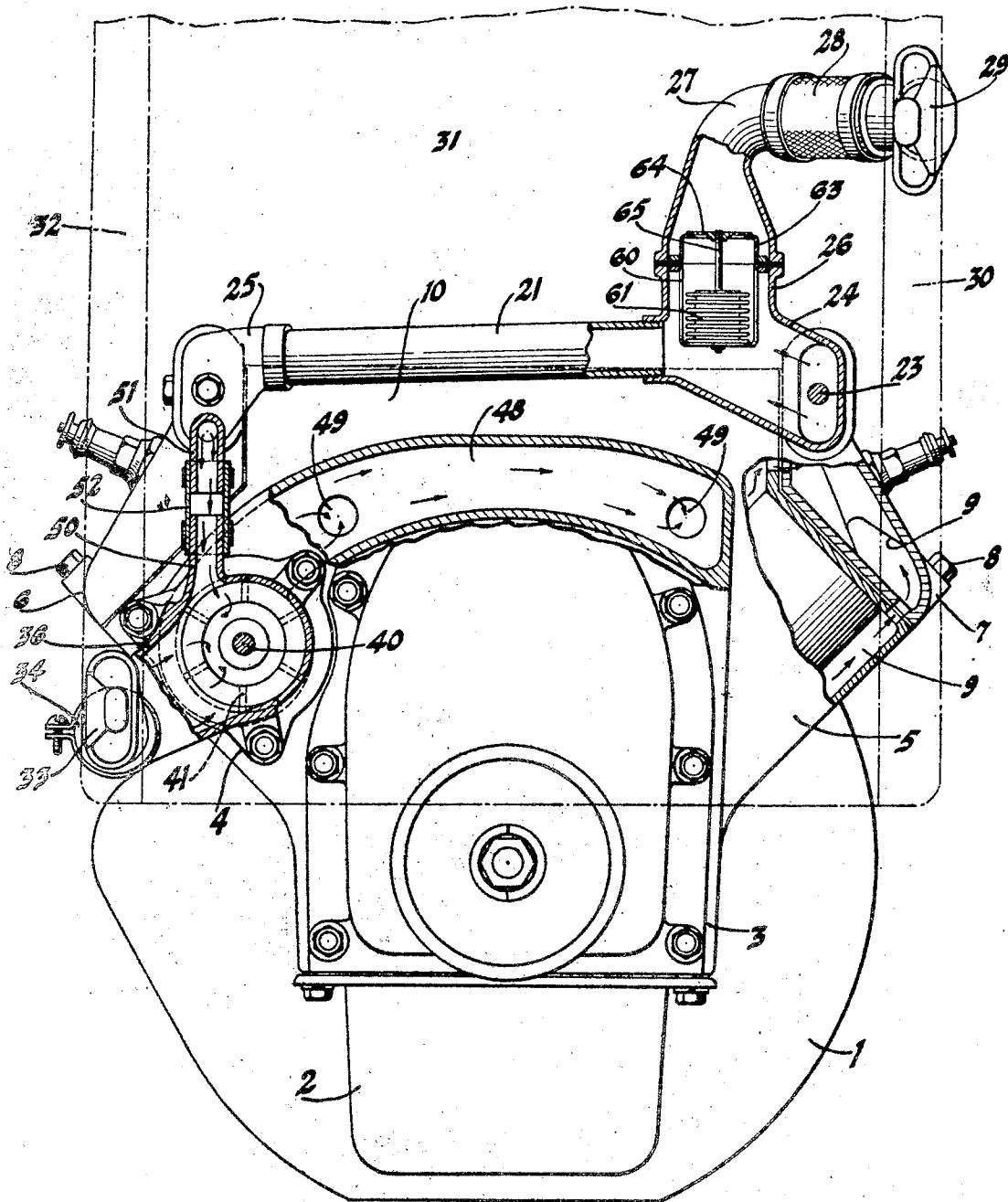


Fig. 2

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WATER PUMP BY-PASS

Application filed March 21, 1930. Serial No. 437,716.

This invention relates to cooling systems for internal combustion engines and the like and is illustrated in the accompanying drawings in a preferred embodiment in connection with the power plant of the 1930 model Oakland automobile.

Conventional water cooled engines for the propulsion of motor vehicles and other similar duty are provided with water jackets around the cylinders connected with a cooling radiator for the continuous circulation therethrough of the water or other cooling fluid which takes up the heat of combustion in the engine and dissipates it in the radiator. Since an engine operates more efficiently when warmed up, it is sometimes found desirable to employ a thermostatically operated valve to prevent circulation through the radiator of the cooling medium when the engine is cold as, for example, when first starting, until the proper predetermined operating temperature is reached. With the circulation entirely cut off and the body of cooling fluid lying dead in the jackets, it will be apparent that as the engine warms up, parts thereof become hotter than others and the temperature of the coolant rises unevenly and the heated portions thereof may become localized with the result that the valve opens either sooner or later than intended.

To improve the cooling system and provide a closed circuit auxiliary to the main cooling circuit and with no appreciable cooling effect for the purpose of circulating cooling fluid in the jacket when the valve is closed and so eliminate the stagnation of water with its resultant hot spots which cause the formation of steam and unequal expansion, is one of the objects of the present invention.

The invention, however, relates more particularly to the cooling system as a whole as designed for and incorporated in the before mentioned Oakland engine which is of the so-called 8-cylinder V-type having two banks or rows of four cylinders each, arranged in angular or V relation with the pistons of both banks connected to a common crankshaft. Because of its short over-

all length, this type of engine affords an abundance of space for jacketing the cylinders and valve seats to provide for efficient cooling, without occupying as much space as a similar engine with its cylinders in line, and thus leaving additional room on the chassis for larger and more comfortable bodies. To further conserve space, reduce weight, simplify construction and effect savings in manufacturing costs and the amount of materials necessary, the two cylinder blocks with the crankcase are preferably formed as an integral unit or single casting with separate and independent jackets for each bank of cylinders. In the further interest of simplicity and reduction in number of bulky extra parts, as well as to improve the appearance, the circulating passages wherever permissible may be formed in the unitary casting itself and all exterior piping and connections called for made in lengths as short as possible.

To this end it is proposed to provide an integral pump impeller casing to one side of the cylinder block and at the front end thereof adjacent the radiator and a cored passage extending transversely across the cylinder blocks from the pressure side of the pump casing and communicating with the respective jackets, thus constituting an inlet manifold for the engine jackets. In addition there is employed a cross flow radiator wherein the inlet and outlet headers are located along opposite vertical sides of the cooling unit of the core so that a comparatively short length connection may be used between the bottom of the side outlet header and the intake of the laterally disposed pump and a similar short length connection between a higher up portion of the side inlet tank of the radiator and an adjacent portion of an outlet engine manifold that extends transversely between the jackets just above the inlet manifold before referred to. The relative location of the inlet and outlet manifolds permits the use of a very short bleeder or radiator by-pass connection between the pump intake and the outlet manifold at the side thereof opposite the connection to the inlet side of the radiator.

These features will all become apparent upon an inspection of the accompanying drawings when taken with the following detailed description of a preferred but not necessarily the only embodiment of the invention.

In the drawings, Figure 1 is a top plan view with parts in section of a power plant embodying the cooling system constituting the present subject matter, and Figure 2 is a front elevation partly in section of the engine:

Referring to the drawings, the reference numeral 1 indicates a flywheel housing at the rear end of the engine, and 2 is the oil pan of the crankcase. The body of the engine, consisting preferably of a one-piece casting, involves a crankcase 3 and right and left cylinder blocks 4 and 5 respectively, the two blocks being shown disposed at an angle of substantially 90° in relation to each other.

Removable heads 6 and 7 are secured as by bolts 8 over the upper surfaces of the cylinder blocks 4 and 5 respectively, although, if desired, the heads may be integral with the blocks, and provide combustion chambers for the several cylinders. Both the cylinders and heads of each block are jacketed to afford spaces as at 9 for the circulation thereof of water or other suitable cooling medium, the cooling jacket of one bank of cylinders being separate and independent of the other.

The space above and between the two banks of cylinders is closed at the front and rear by transversely extending walls, the front wall being indicated at 10, and the top of the central space is closed by removable cover plates 11. Enclosed within the central space may be located the valve mechanism for controlling the flow of gases to and from the combustion chambers of the several cylinders. For this flow of gas there are provided a pair of exhaust manifolds 13 and 14 and a pair of intake manifolds 15 and 16 secured on the top surface of the casting in communication with the valved ports, one set of intake and exhaust manifolds being provided for each bank of cylinders and extending along the sides thereof in a fashion to give free access to the removable cover plates 11 at times as when it may be necessary to inspect or adjust the valve mechanism. The two exhaust manifolds 13 and 14 lead downwardly through the center of the block in a manner not shown, to a common exhaust pipe connected with a muffler, while the two intake manifolds 15 and 16 are joined by transverse extensions to a carburetor 18 which may be of the down draft type.

At the front of the engine and extending transversely between the cylinder heads is an outlet manifold, removably secured in place as by studs or bolts 23, and which comprises a fitting 24 communicating with the cylinder head jacket at one side and a fitting

25 communicating with the other jacketed head, with a pipe or tube 21 connecting the two fittings. The fitting 24 has an upstanding extension 26 to which may be removably secured an elbow 27 coupled by a short hose section 28 to the intake pipe 29, forming a part of the inlet header tank 30 at one side of the cross flow radiator 31. Along the opposite side of the radiator is the outlet header 32 having near its bottom an outlet pipe 33 coupled by a short hose section 34 to a forward tubular extension 35 on the removable cover or cap 36 of the pump housing 37, which housing is shown as being formed in the front wall 10 of the engine block at the side thereof adjacent the outlet header 32. The cap 36 also provides a bearing for the shaft 40 carrying the impeller 41 which projects within the casing 37 on the inner side, and a pulley 42 on the exterior of the cap for the driving engagement therewith of a suitable belt 43 driven by pulley 44 mounted on an engine shaft. The belt may also pass around a pulley for driving the usual radiator fan (not shown). Extending laterally from the pressure side of the pump and transversely between the cylinder blocks immediately below the outlet manifold is a cored passageway 48, formed in the front wall 10 and provided with outlet openings 49—49 leading to the respective water jackets. The pump cover 36 is also provided with an upstanding nipple 50 in alinement with a downwardly directed nipple 51 formed on the fitting 25 and joined therewith by a short length of flexible tubing or hose 52 constituting an unobstructed bleeder or bypass around the radiator and connecting the outlet manifold with the pressure side of the pump.

Between the abutting attachment flanges of the extension 26 and elbow 27 may be secured an automatic temperature control valve unit, shown as comprising a cage 60 carrying and positioning a thermostatic bellows 61 in the outlet manifold for the flow of cooling medium therearound and also a tubular element 63 against which is seated the valve 64 connected to one end of the thermostat by an actuating rod 65.

Assuming that the engine and the cooling liquid in the water jackets are cold, and that the valve 64 is in closed position, if the engine is now started there can be no circulation through the radiator but the pump, which is immediately set in operation by reason of its connection with an engine shaft, tends to force water in the inlet manifold 48 thru the respective cooling jackets around each bank of cylinders, and into the outlet manifold with the coolant entering the fitting 24, flowing around the thermostat 61 and across the tube 21 mixing or joining with the coolant entering the fitting 25, for passage through the bleeder or by-pass back to the pressure

side of the pump. This circulation continues until such time as the cooling fluid in the jackets reaches a predetermined temperature, at which time the action of the heat on the thermostat will open the valve 64 and permit a flow through the radiator and back to the pump for circulation through the jackets. Since the size of the bleeder is comparatively small, the amount of coolant recirculated therethrough when the valve 64 is open will have no appreciable effect on the proper cooling of the engine.

It will be apparent, therefore, that regardless of the position of the thermostat valve there will always be circulation through the water jackets and a more uniform cooling throughout both jackets during the warming up period is assured, and that further, since the thermostat is positioned directly in the flow of cooling medium in the by-pass circuit, the thermostat opening temperature is more accurately gauged, the temperature of the water flowing past the thermostat representing the average water jacket temperature.

While the foregoing description has been more or less specific as to the exact embodiment, it will be understood that the invention is not to be limited to specific details, but that such modifications may be made as come within the scope of the appended claims.

I claim:

1. In combination, a cross flow radiator having vertically disposed inlet and outlet headers along opposite sides thereof, an internal combustion engine comprising a pair of divergent cylinder blocks integral with a crankcase and cast as a unit with independent cooling jackets, jacketed heads removably secured on the respective blocks with their jacket spaces in communication with said cooling jackets, a cored passageway in the casting unit communicating with both jackets and constituting an inlet manifold, a pump impeller in said cored passageway at one end thereof adjacent the outlet header of the radiator, a relatively short connection between the intake side of the pump and the outlet header, an outlet manifold extended between and removably secured to both cylinder heads directly over the inlet manifold, a relatively short connection between the radiator inlet header and one end of the outlet manifold adjacent said inlet header, a thermostatically operated valve in the last mentioned connection to control circulation thru the radiator in accordance with engine temperature, and a comparatively short passage between the pump intake and an adjacent part of said outlet manifold to insure circulation thru the engine jackets at all times.

2. In an engine cooling system, the combination with a radiator and an engine having its cylinders arranged in angular relation, of separate cooling jackets for the respective cylinders, of inlet and outlet connections com-

mon to the jackets and leading from and to the radiator, and together with the jackets and radiator constituting a main circulatory system, a circulating pump in one of the connections, a thermostatic valve in the other connection automatically controlling circulation thru the main circulatory system in accordance with engine temperature conditions, and an unobstructed passageway between the last mentioned connection and the pump to constitute with said jackets and connections an auxiliary circulatory system, that is open at all times regardless of the position of said valve, to insure constant circulation thru said jackets.

3. In an engine cooling system, the combination with a cross flow radiator having inlet and outlet headers at opposite sides thereof and an engine having a pair of separate and angularly arranged cylinder blocks, each provided with an independent cooling jacket, of an outlet manifold leading from the jackets, transversely of the engine, and having a single connection at the side thereof adjacent the radiator inlet header, with said inlet header, an inlet manifold between the jackets, a pump associated with the inlet manifold at the side thereof adjacent the outlet header of the radiator and provided with an intake connection leading from the said outlet header, a thermostatically operated valve in said inlet header connection governing flow thru the radiator in accordance with temperature conditions and a passageway between the intake side of the pump and the outlet manifold at the side thereof adjacent the outlet header to provide circulation thru both jackets regardless of the position of said valve.

4. In an engine cooling system, the combination with a cross flow radiator having inlet and outlet headers at opposite sides thereof and an engine having a pair of separate and angularly arranged cylinder blocks, each provided with an independent cooling jacket, of an outlet manifold leading from the jackets, transversely of the engine, and having a single connection at the side thereof adjacent the radiator inlet header, with said inlet header, an inlet manifold between the jackets, a pump associated with the inlet manifold at the side thereof adjacent the outlet header of the radiator and provided with an intake connection leading from the said outlet header.

5. In an engine cooling system, the combination with a radiator and an engine having a pair of angularly related and jacketed cylinder blocks connected by a wall at the end thereof adjacent the radiator, a passageway in said wall communicating each jacket, a pump enclosed within the passageway and adapted to force cooling liquid through the passageway to the jackets and a connection between the pump and said radiator.

6. In an engine cooling system, the combination with a radiator and an engine having

a pair of angularly related and jacketed
cylinder blocks connected by a wall at the end
thereof adjacent the radiator, a passageway
in said wall communicating each jacket, a
5 pump enclosed within the passageway and
adapted to force cooling liquid through the
passageway to the jackets, an outlet manifold
leading from the jackets to the radiator, a
temperature controlled valve governing flow
10 to the radiator, a connection between the
radiator and pump, and means unaffected by
said valve for the direct flow of cooling liquid
from the outlet manifold to the pump.

In testimony whereof I affix my signature.

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