June 24, 1930. J. G. VINCENT 1,766,858

INTERNAL COMBUSTION ENGINE

Filed Jan. 26, 1924 2 Sheets-Sheet 1

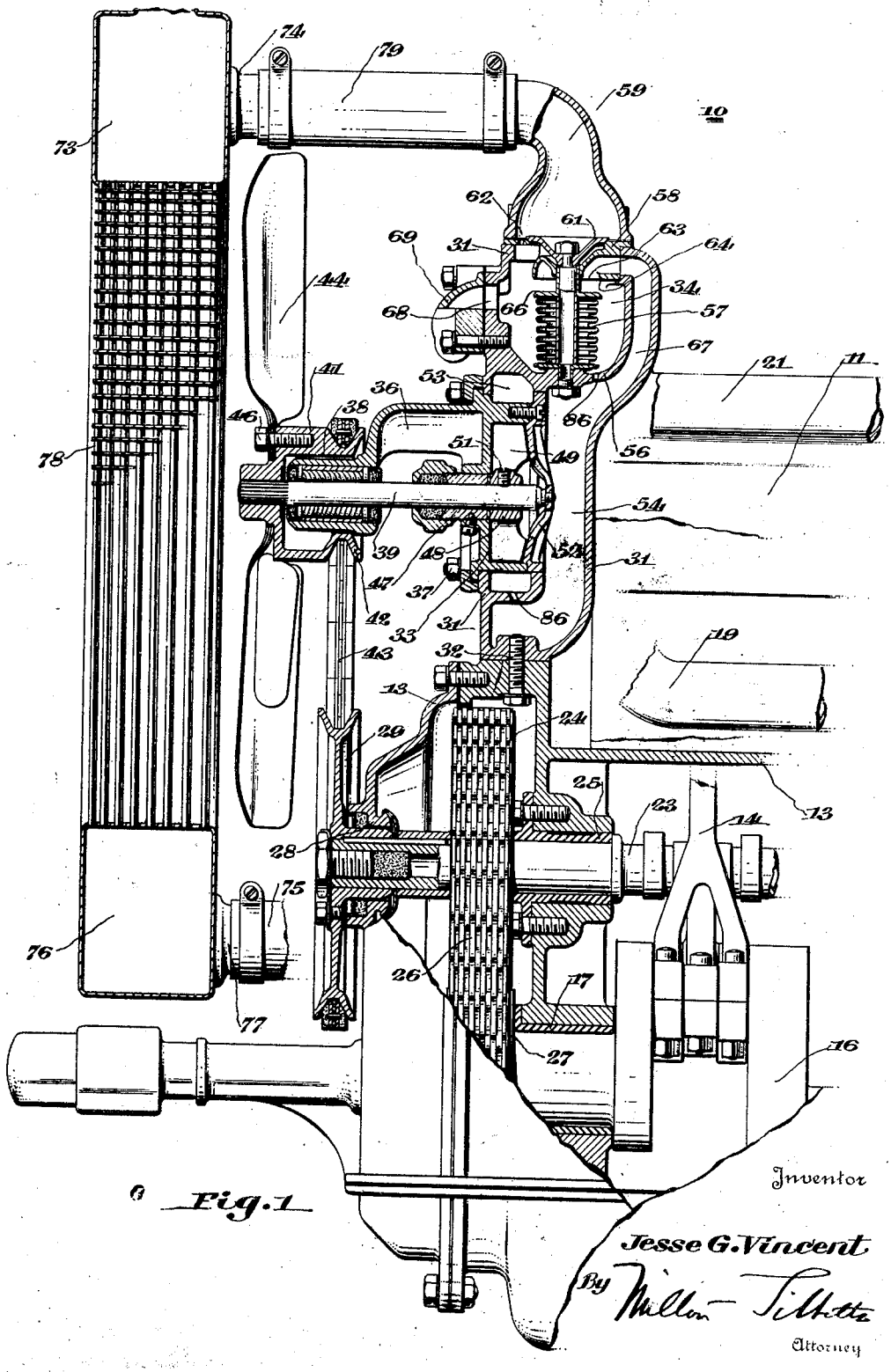


Fig. 1

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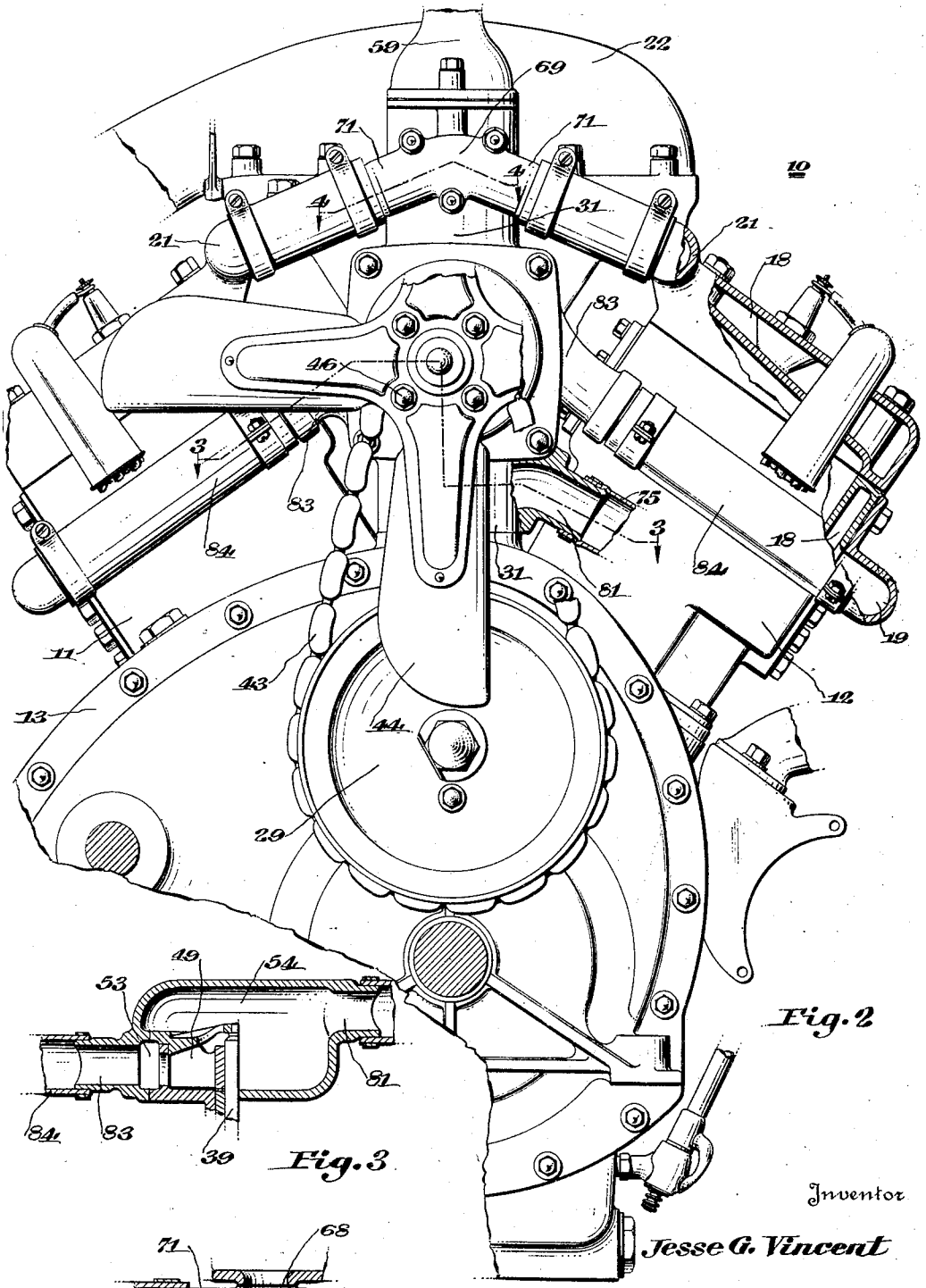


Fig. 2

Fig. 3

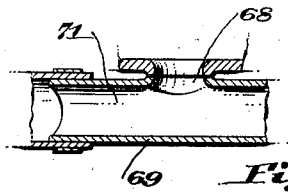


Fig. 4

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UNITED STATES PATENT OFFICE

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INTERNAL-COMBUSTION ENGINE

Application filed January 26, 1924. Serial No. 688,664.

This invention relates to internal combustion engines and more particularly to cooling systems therefor.

The water pump and connections heretofore used in internal combustion engines, particularly in engines of the V type, have been complicated and inaccessible, and have necessitated a considerable amount of outside piping which is exposed to temperature changes and to the danger of mechanical injury.

One object of the present invention is to provide a cooling system of an internal combustion engine of the V type in which the length of outside piping shall be reduced to a minimum.

Another object is to provide such an engine with a pump and a thermostat, respectively for the circulation and control of the cooling fluid, which shall be housed as a unit in an accessible location on the engine.

Another object of the invention is to provide an improved and simpler actuating mechanism for the driven units included in the engine cooling system.

Other objects of the invention will appear from the following description taken in connection with the drawings, which form a part of this specification, and in which:

Fig. 1 is a view, partially in section and partially in side elevation, of a portion of an internal combustion engine of the V type illustrating an application of this invention;

Fig. 2 is a front elevation, partially in section and partially broken away, of the engine illustrated in Fig. 1, the view being taken from behind the radiator.

Fig. 3 is a section substantially on the line 3—3 of Fig. 2, and

Fig. 4 is a section substantially on the line 4—4 of Fig. 2.

Referring to the drawing, at 10 is shown an internal combustion engine of the V type having two inclined cylinder blocks 11 and 12, mounted on a common crank case 13. Each of the blocks 11 and 12 is composed of a number of cylinders, arranged in a row and adapted to contain the usual pistons (not shown). These are connected by rods 14 to a crank shaft 16, journaled in appropriate bearings 17 in the crank case 13. As this structure is very well known in the art to which this invention relates, further description thereof is deemed unnecessary.

The cylinders in each of the blocks 11 and 12 are provided with suitable cooling jackets 18, by means of which cooling fluid, preferably water, is circulated around the cylinders in the well known manner. The cooling jackets 18 are provided with suitable inlet manifolds 19 and outlet manifolds 21, by means of which the cooling water is led to and removed from the jackets, and the circulation therein maintained.

The engine 10 is also provided with an exhaust manifold 22, and with an intake manifold (not shown) through which fuel is admitted to the cylinders under the control of suitable valves, operated by a cam shaft 23 in the usual manner. The cam shaft 23 is journaled in bearings 25 in the crank case 13 in the usual manner, and is provided near its forward end with a sprocket pinion 24, by means of which it is connected through a driving chain 26 to a similar pinion 27 mounted on the crank shaft 16, in a manner well understood in this art. The forward end of the cam shaft 23 passes through a packing gland 28 in the front wall of the crank case 13 and is provided at its outer end with a suitable pulley 29.

Suitably mounted on the crank case 13, and secured thereto in any well known manner, as by the bolts 32, is a housing 31, arranged to extend upright between the cylinder blocks 11 and 12 at the forward end thereof. The housing 31 is provided with suitable walls and partitions defining a pump chamber 33 and a thermostat chamber 34. The front wall of the housing 31 supports a forwardly projecting bracket 36, secured as by the bolts 37, which carries at its outer end a suitable bearing 38 in which is journaled a horizontally disposed shaft 39. The forward end of the shaft 39 is rigidly secured to a driving hub 41, which overhangs the bearing 38 and is provided with a pulley grove 42, preferably directly over the center of the bearing 38, and in line with

the cam shaft pulley 29, to which it is connected by a suitable belt 43. The hub 41 also carries a fan 44, secured to the forward face thereof as by means of screws 46.

The rear end of the shaft 39 passes through a packing gland 47, mounted in an opening in the front wall of the housing 31, into the pump chamber 33, and is secured in the hub 48 of an appropriate water circulating pump 49, in any convenient manner, as by the set screw 51.

In the rear wall of the pump chamber 33 is a pump intake opening 52, which communicates with a suction passage 54 formed within the housing 31, and a peripheral discharge chamber 53 which surrounds the chamber 33 in the usual manner.

Located above the pump chamber 33 and separated therefrom by suitable partitions including a floor 56, is the thermostat chamber 34, in which is mounted a thermostat 57, of any appropriate construction, capable of responding by changes in its length to changes in the temperature of the surrounding medium. As illustrated, this thermostat is of the well known bellows type, but any suitable temperature responsive device may be used. The chamber 34 also has a partition 58 which is provided with an outlet 59, controlled by a valve 61 which is adapted to operate against a seat 62 formed on the partition, and operated by the thermostat 57 in a well known manner. Located below and in line with the valve seat 62 is a port 63, having a valve seat 64 adapted to be closed by a valve 66 also located on the stem of the thermostat 57, which port 63 communicates by means of a passage 67 with the intake passage 54 of the pump and constitutes a by-pass, as will presently appear.

The front wall of the thermostat chamber 34 is provided with a port 68, which communicates with a fitting 69, suitably secured thereon, having laterally disposed branches 71, adapted for connection with the outlet manifolds 21 of the cylinder water jackets.

Forwardly of the engine 10 is arranged a radiator of the usual form, consisting of an upper tank 73, having an inlet 74, and a lower tank 76, having an outlet 77, the tanks 73 and 76 being connected through a suitable radiating element 78. A connection 79 is provided between the outlet 59 of the thermostat chamber 34 and the inlet 74 of the radiator tank 73. The housing 31 also has an intake port 81, communicating with the lower part of the pump intake passage 54 and connected in any well known manner with the outlet 77 of the lower radiator tank 76, as at 75.

Laterally disposed in the side walls of the housing 31 are outlet ports 83, communicating with the pump discharge chamber 53 and having suitable connections, as at 84, to the inlet manifolds 19 of the block cooling jackets 18 respectively. The thermostat chamber 34 and the pump discharge chamber 53 may be provided with drain holes 86 if desired.

The operation of this device will now be apparent. When the water in the cooling system is at normal operating temperature, the cooler water from the lower radiator tank 76 is drawn by the pump suction through the outlet 77 and the intake port 81 into the pump intake passage 54, from which passage it enters the pump chamber 33 axially and is forced by the pump laterally into the discharge chamber 53 in the usual manner. Here it divides, and passes through the outlet ports 83 and connections 84 into the inlet manifolds 19 of the cooling jackets 18, and circulates therethrough in the usual way. After leaving the jackets 18 through the outlet manifolds 21, the streams of water unite in the fitting 69 and pass into the thermostat chamber 34. Under normal operating conditions this water is sufficiently heated to maintain the thermostat 57 expanded, and the valve 61 is consequently open, so that the water passes through the outlet 59 and the connection 79 into the upper radiator tank 73. From this point it descends through the radiator 78 and is cooled in the ordinary manner.

After a considerable idle period, or when for any other reason the water in the cooling system has become cooled off, the thermostat 57 is contracted and the valve 61 is consequently closed and the valve 66 open. In this case, on starting the engine the water entering the thermostat chamber 34 cannot pass into the radiator but enters the passage 67 through the port 63, which thus constitutes a by-pass to the pump intake. As the water warms up, the thermostat 57 expands, thus gradually opening the valve 61 and permitting an increasingly greater portion of the water to pass through the radiator.

It will be seen that this structure provides a cooling system in which the greater portion of the water passages are formed on the interior of the housing 31, and the water is not subjected to sudden changes in temperature.

It will also be seen that this invention provides a simple distribution of the cooling water to each of the cylinder blocks, necessitating only one connection from the radiator to the housing 31, and only one connection from the housing to the radiator inlet. The path of circulation of the water is thus much simplified and shortened, the complicated outside piping hitherto used in the cooling systems of engines of this type is much simplified, and the pump and thermostat are conveniently and accessibly located on the engine. At the same time a separate drive for the pump is obviated.

It will be understood that various forms of the invention other than those described above may be used without departing from the spirit or scope of the invention.

What is claimed is:

1. The combination with an internal combustion engine having a pair of cylinder blocks arranged to form a V and each having cooling jackets, of a housing supported between the blocks at one end thereof, a pump in said housing, a radiator, a single connection from the outlet of the radiator to the pump inlet, a connection from the pump outlet to each of the jacket inlets, a chamber carried by the housing, a connection from each of the jacket outlets to the chamber, and a single connection from said chamber to the radiator inlet.

2. The combination with an internal combustion engine having a pair of cylinder blocks arranged to form a V, of a housing supported between the blocks defining a pump chamber and a thermostat chamber, a radiator, a cooling jacket for each cylinder block, a connection from the radiator outlet to the housing communicating with the pump inlet, a connection from each of the cooling jackets communicating with the thermostat chamber, and a single connection from the radiator inlet to the housing communicating with said thermostat chamber.

In testimony whereof I affix my signature.

JESSE G. VINCENT.