F. E. KUBE.

ENGINE COOLING SYSTEM.

APPLICATION FILED SEPT. 19, 1913.

1,140,987.

Patented May 25, 1915.

3 SHEETS—SHEET 1.

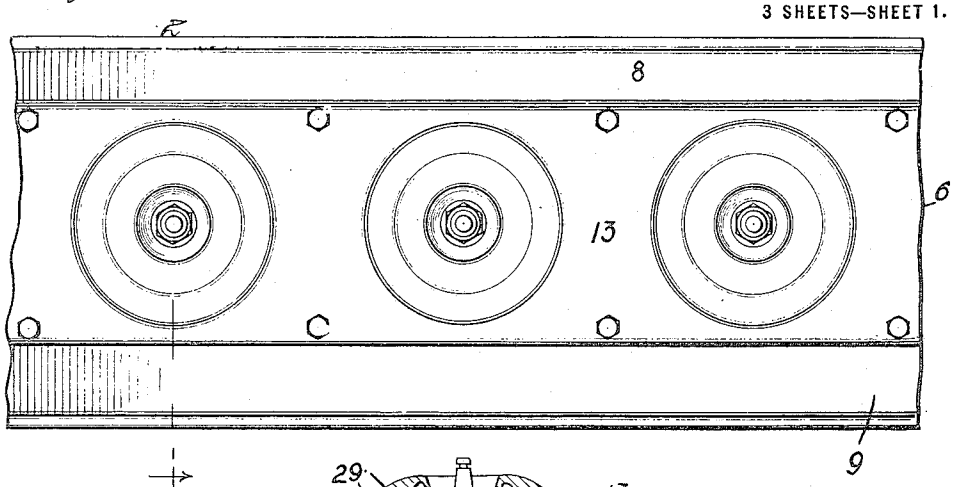


Fig. 1.

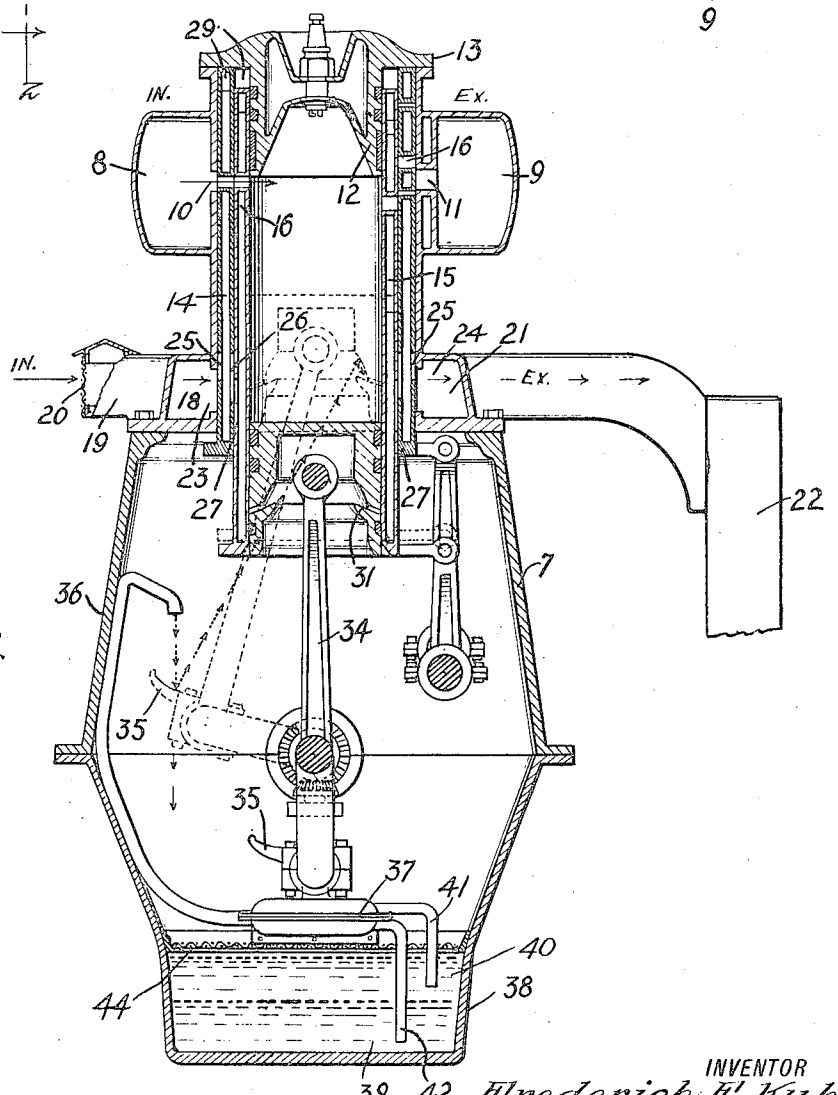


Fig. 2.

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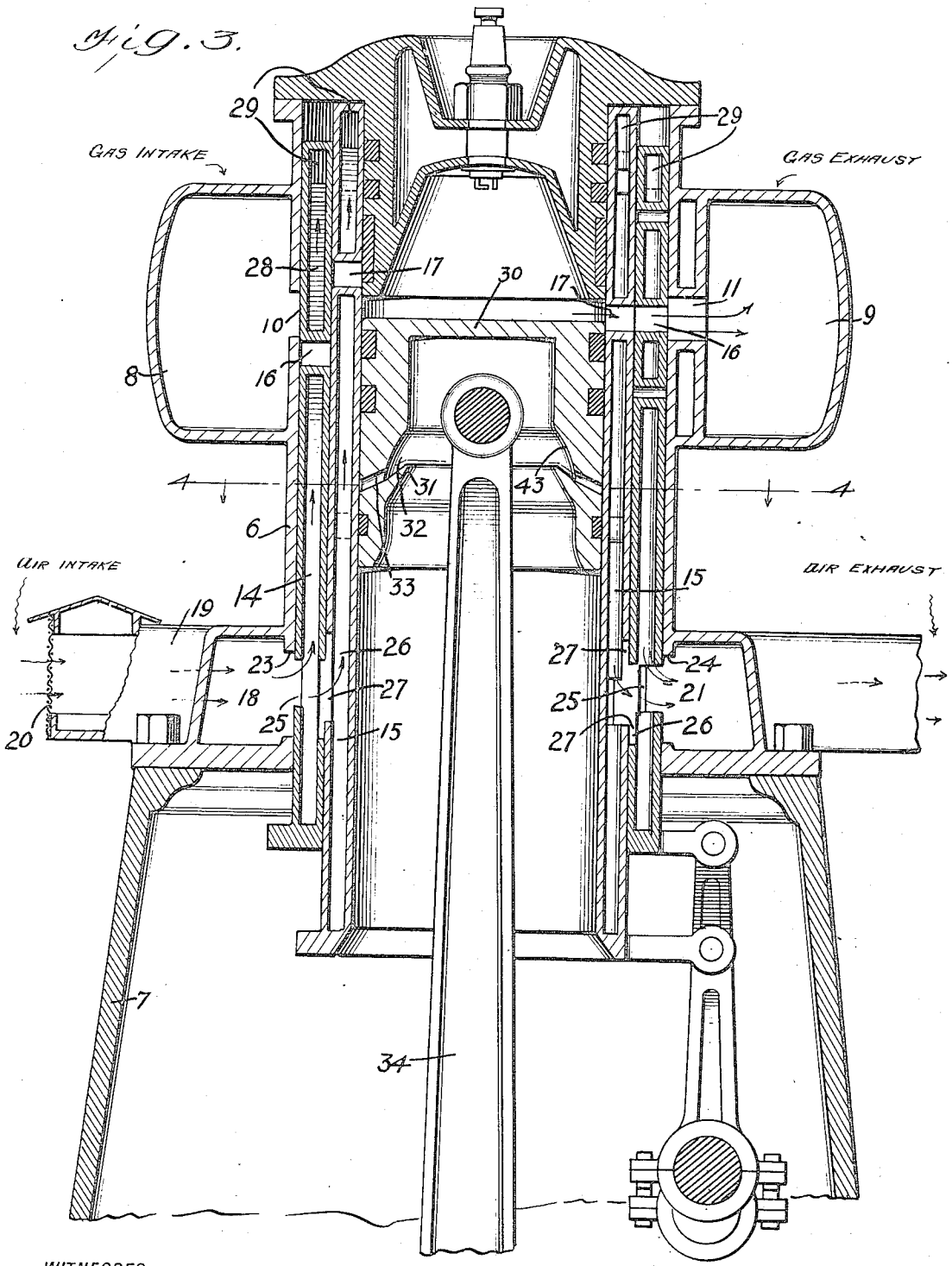
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3 SHEETS—SHEET 2.

Fig. 3.



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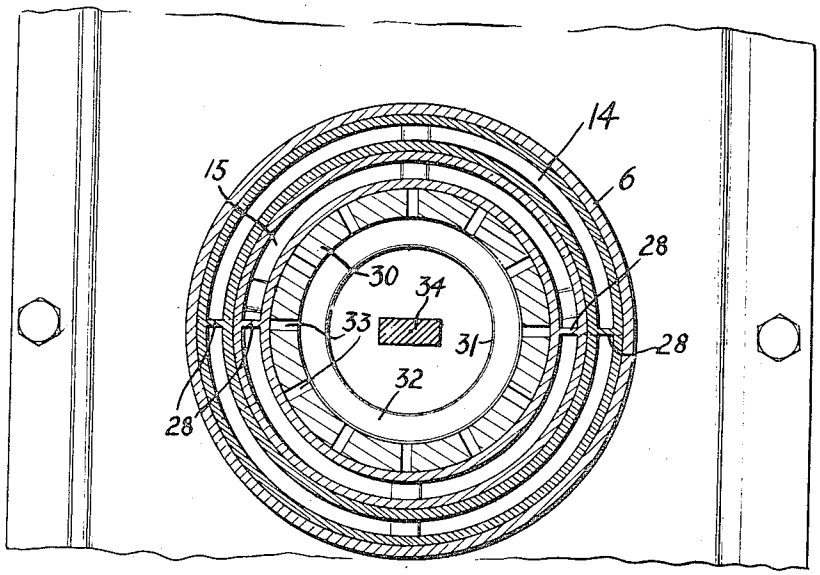
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3 SHEETS—SHEET 3.

Fig. 4.



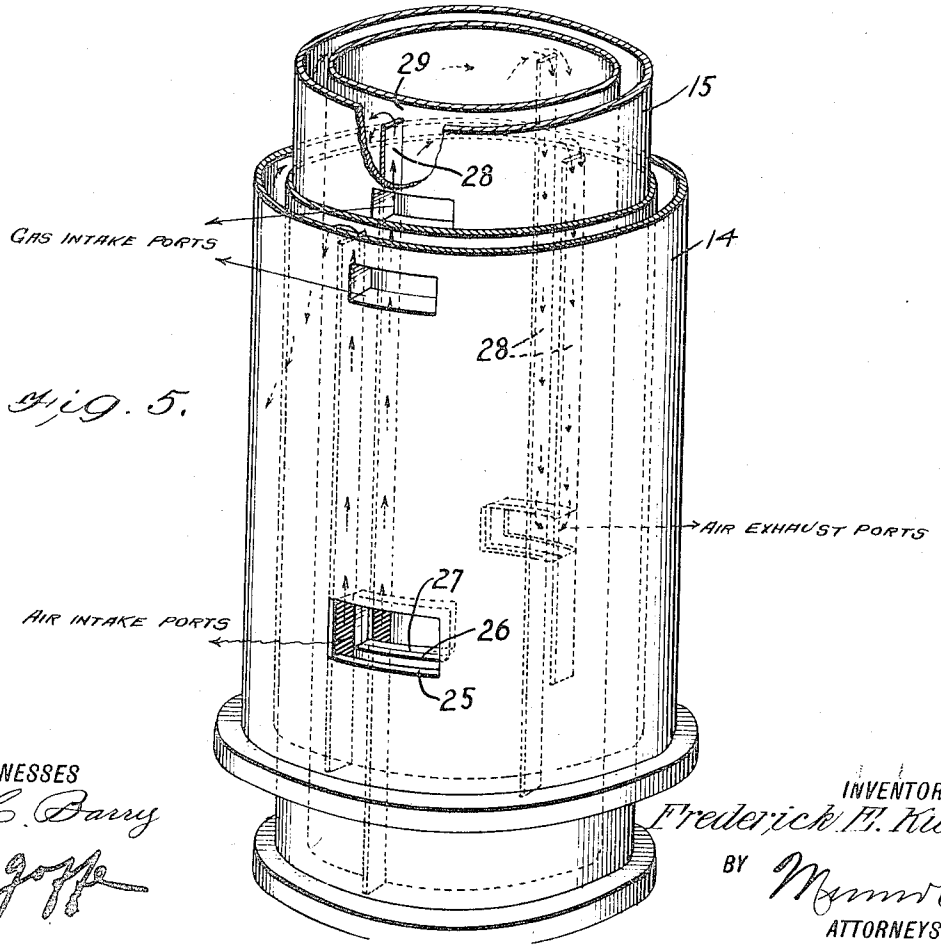


Fig. 5.

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ENGINE-COOLING SYSTEM.

1,140,987. Specification of Letters Patent. Patented May 25, 1915.

Application filed September 19, 1913. Serial No. 790,695.

To all whom it may concern:

Be it known that I, FREDERICK E. KUBE, a citizen of the United States, and a resident of Clinton, in the county of Clinton and State of Iowa, have invented a new and Improved Engine-Cooling System, of which the following is a full, clear, and exact description.

The invention relates to cooling systems for internal combustion engines of the type having sleeve valves; and the object thereof is to provide an inexpensive and efficient system of cooling the sleeves. I obtain this object by providing hollow sleeve valves through which a cooling fluid is made to flow; and also by directing a cooling medium on to the surface of the sleeve engaged by the piston.

The invention consists of the construction and combination of parts to be more fully described hereinafter and fully set forth in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which like characters indicate corresponding parts in all the views and in which:

Figure 1 is a plan view of an engine embodying my invention; Fig. 2 is a section on line 2—2, Fig. 1; Fig. 3 is an enlarged section similar to Fig. 2, showing a different position of the sleeve; Fig. 4 is a section on line 4—4, Fig. 3; and Fig. 5 is a perspective view of the sleeves, sectioned to show the details of construction of the same.

Referring to the drawings, 6 represents a block casting of the cylinders secured in any suitable way to the crank case 7. The block 6 is provided on one side with an inlet manifold 8; and on the opposite side, with an outlet or exhaust manifold 9. Passages 10 connect each of the cylinders of the block with the inlet manifold 8; and passages 11, with the exhaust manifold 9. All of the cylinders receive heads 12 cast in a single block 13. The admission and exhaust of gases to each cylinder is controlled by a pair of coacting double-walled sleeves 14 and 15 respectively. The outer sleeve 14 is provided with openings 16 adapted to register with the openings 10 and 11 of the cylinder. The inner sleeve 15 is provided with similar openings 17 adapted to register with the openings 16 of the outer sleeve. The movement of these sleeves, obtained by means of the eccentrics or any other suitable means controls the admission and exhaust of the cylinder. The block casting 6, adjacent the bottom thereof, is provided at one side with a manifold 18 having an inlet 19 screened by a fabric 20; and at the other side, a manifold 21 connected to a fan structure 22. The cylinders of the block 6 communicate with the manifold 18 by means of openings 23, and with manifold 21 by means of openings 24. Communicating continuously with the openings 23 and 24 are openings 25 in the outside wall of the hollow sleeve 14. The inner wall of the hollow sleeve is also provided with openings 26 adapted always to communicate with openings 27 provided on the outside wall of the inner sleeve 15. That is, the openings 25 communicate always with the manifolds 18 and 21, no matter what the position of the sleeve 14; and similarly the openings 26 and 27 of the inner and outer sleeves register no matter what the relative position of the sleeves. The openings 23 and 24 in the manifolds 18 and 21 being diametrically opposite, the openings in the inner and outer sleeves are also diametrically opposite.

To cause the air drawn by the fan 22 through the screen 20 to come in contact with the major surface of the hollow of the sleeves, the sleeves are provided within the hollow with partitions 28, not extending entirely to the top of the sleeve. These partitions separate the openings 25 and 27 so that the air can only pass from the opening 23 to the opening 24 by passing through the openings 29 formed by the partitions on the top of the sleeve.

A piston 30 engages the inner sleeve 15 and is interiorly provided with an annular lip 31 forming an annular recess 32. A number of openings 33 lead from the bottom of the recess to the outer lateral surface of the piston. The purpose of these openings will appear hereinafter. The piston is connected to the crank shaft by the connecting rod 34 having a lateral extension 35 forming a deflector for the stream delivered through the pipe 36 positioned within the crank case (see Fig. 2) and connected to a pump 37, preferably positioned also within the crank case and actuated from the crank shaft. The bottom of the crank case 7 is provided with an extension 38 below the pump, and forms a receptacle for water 39 and oil 40, where

the oil will naturally, due to specific gravity, be above the water.

The pump 37 has two suction pipes 41 and 42, one from the oil portion and the other from the water portion, so that the same can deliver water and oil simultaneously to the pipe 36. When the connecting rod is in position shown in dotted line in Fig. 2, the stream of water and oil delivered through the pipe 36 will strike the extension 35 and reflect, as indicated in arrows in Fig. 2, until it reaches the curved surface 43 of the piston where it is deflected to flow into the annular recess 32. From the annular recess, by means of the openings 33, it is conveyed to the inner lateral surface of the inner sleeve 15, thereby cooling the sleeve 15 interiorly, and also oiling the same simultaneously. Each of the sleeves is provided with transverse reinforcing portions 45 provided intermediate the double walls of the sleeve. An aperture 46 is provided in each of the reinforcements 45. The said apertures 46 in the inner sleeve 15 convey the fluid from the inner surface of the sleeve to the outer surface of the same, that is, to the contacting surfaces of the sleeves 14 and 15, from where the fluid is further conveyed by the apertures 46 of the outer sleeve 14 to the outer surface of said sleeve, that is, to the contacting surfaces of the said sleeve 14 with the casing. The said apertures 46 of the two double-walled sleeves, therefore, permit of better lubrication between the said sleeve and the casing, and, furthermore, help to cool the said sleeve by means of the fluid and oil coming from the annular recess 32. The extension 38 of the crank case is separated from the pump and the major part of the case by means of a screen 44, to prevent solid particles from passing back into the oil and water. Similarly, the screen 20 prevents the passage of solid particles with the air drawn by the fan 22.

While the fan 22 draws air continuously through the hollow of the sleeves 14 and 15 respectively, the pump 37 cools the inner surface of the sleeve 15 only intermittently; and while the pump 37, as shown in the drawings, is operated continuously, if it is desired it can be made to operate intermittently just at a time when the connecting rod is in position shown in dotted line in Fig. 2.

It is understood that in place of air, if desired water can be drawn through the hollow of the sleeves 14 and 15.

It is understood that the engine can be provided with a cooling system embodying the two, that is, the air drawn between the walls of the sleeve, also the pump supplying the fluid to the sleeves as described; or, if desired the air cooling system can be used without using the cooling system provided within the cylinder, and vice versa.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. In an internal combustion engine cooling system, a piston having an inner annular recess forming a receptacle, said receptacle having an outlet to the outer lateral surface of the piston; a double-walled sleeve valve engaging the piston; means for directing intermittently a cooling medium into said recess from the crank casing of the engine, said sleeve having means for conveying the said fluid from the inner to the outer surface; and means for circulating a fluid in the space formed by the double walls of the sleeve valve.

2. In an internal combustion engine cooling system, a piston having an inner annular recess forming a receptacle; a sleeve valve engaging the piston, said receptacle having an outlet to the sleeve through the piston; means associated with the piston movement and adapted to direct a cooling medium into said receptacle from the crank case of the engine.

3. In an internal combustion engine cooling system, a piston having an inner annular recess forming a receptacle; a sleeve valve engaging the piston, said receptacle having an outlet to said sleeve through said piston; means for causing the circulation of a cooling medium in the crank case of the engine; and means associated with the piston motion and adapted to come across the circulating medium and direct the same into said receptacle, substantially as and for the purpose set forth.

4. In an internal combustion engine cooling system, a piston having an inner annular recess forming a receptacle; a sleeve valve engaging the piston, said receptacle having an outlet to said sleeve through said piston; a pump for forming a jet of a cooling medium in the crank case; and means associated with the movement of the piston and adapted to cause said jet to be deflected into said receptacle, substantially as and for the purpose set forth.

5. In an internal combustion engine cooling system, a piston having an inner annular recess forming a receptacle; a sleeve valve engaging the piston, said receptacle having an outlet to said sleeve through said piston; a connecting rod for the piston; a pump for forming a jet of a cooling medium in the crank case; and means carried by the connecting rod and adapted to come across said jet in the crank case and direct the same into said receptacle, substantially as and for the purpose set forth.

6. In an internal combustion engine cooling system, a cylindrical casing; hollow interengaging sleeves in said casing, said casing having an air inlet and an air outlet; means for exhausting the air outlet, said sleeves having openings registering with said

inlet and outlet and the casing whereby the air flowing through the inlet of the casing is passed through the hollow of the sleeve before entering the outlet of the same, said hollow sleeve having means therein for directing the flow of air; a piston engaging one of said sleeves; means positioned in the crank case of the engine adapted to form a jet of a cooling medium; and means associated with the movement of the piston adapted to direct the jet to the surface of the sleeve engaged by the piston.

7. In an internal combustion engine cooling system, a casing having an inlet and an outlet; a hollow sleeve valve engaging said casing and having openings adapted always to register with the inlet and outlet of the casing; a second hollow sleeve valve engaging the first sleeve valve and having inlets into the hollow always adapted to communicate with the inlet and outlet of the casing; means for causing a fluid to flow from the inlet to the outlet of the casing through said sleeves; means in the hollow of said sleeve valve for directing the flow of fluid therein; a piston engaging the second-mentioned sleeve and having an inner annular recess forming a receptacle, said receptacle having an outlet to the sleeve engaging the piston; a pump for forming a jet of a cooling medium in the crank case; and means associated with the movement of the piston and adapted to come across the said jet and deflect the same into the said receptacle, substantially as and for the purpose set forth.

8. In an internal combustion engine cooling system, the combination of a double-walled sleeve valve, a piston engaging said sleeve valve, means for causing a fluid to flow through the space formed by the double walls of the sleeve, means for supplying to said piston a cooling medium, said piston having means for conveying said cooling medium to the surface engaging the piston, said sleeve having means for conveying the cooling medium received from said piston to the outer surface of said sleeve.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FREDERICK E. KUBE.

Witnesses:
M. G. MULLIGAN,
J. T. RAHMANN.