A. L. WOLFF.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED APR. 17, 1916. RENEWED OCT. 22, 1920.

1,386,544. Patented Aug. 2, 1921.

2 SHEETS—SHEET 1.

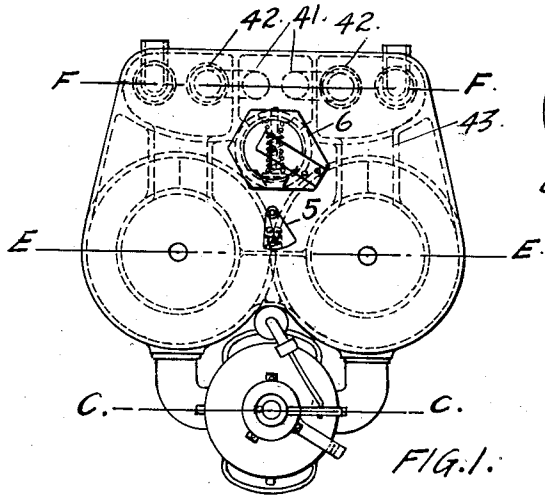


FIG. 1.

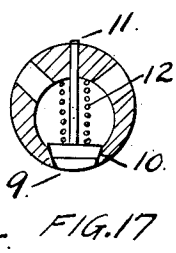


FIG. 17

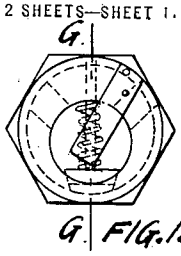


FIG. 15.

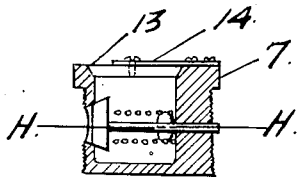


FIG. 16.

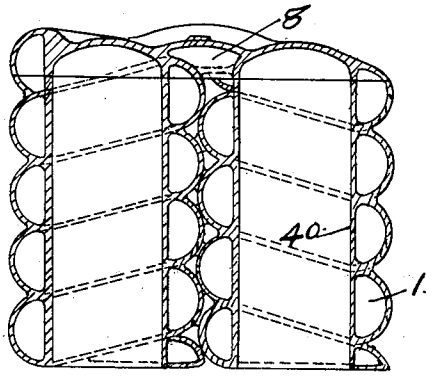


FIG. 13.

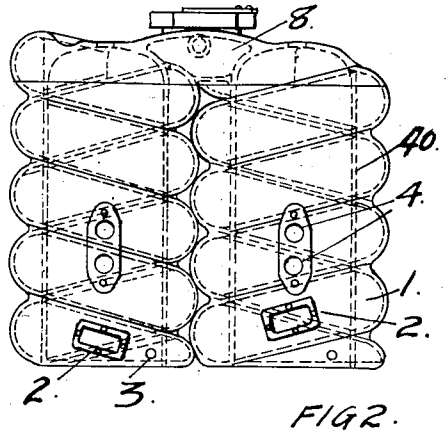


FIG 2.

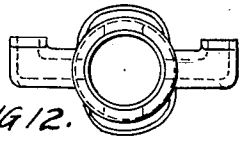


FIG 12.

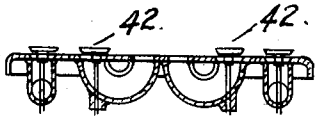


FIG. 14.

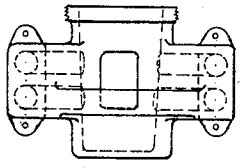


FIG 11.



FIG. 4.

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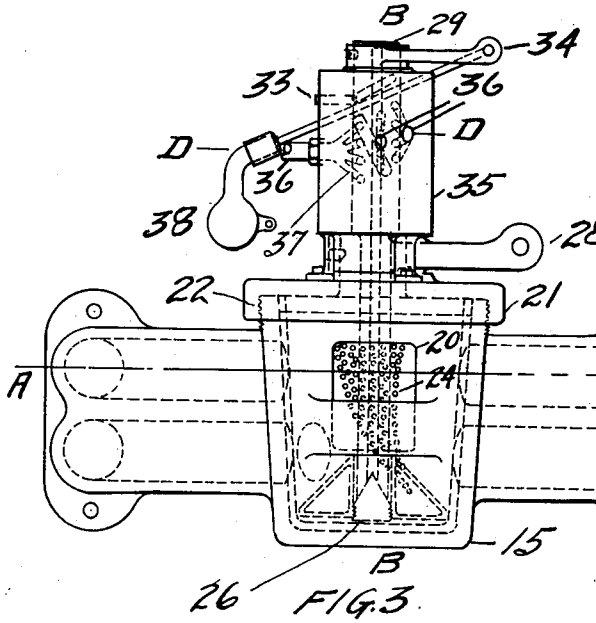


FIG. 3.

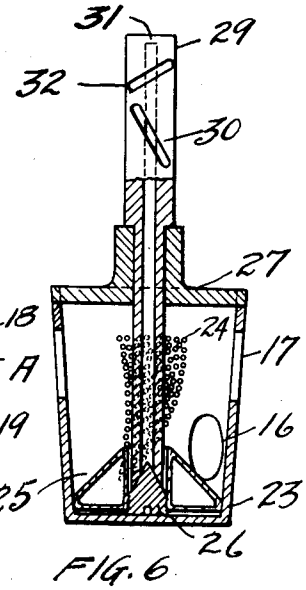


FIG. 6.

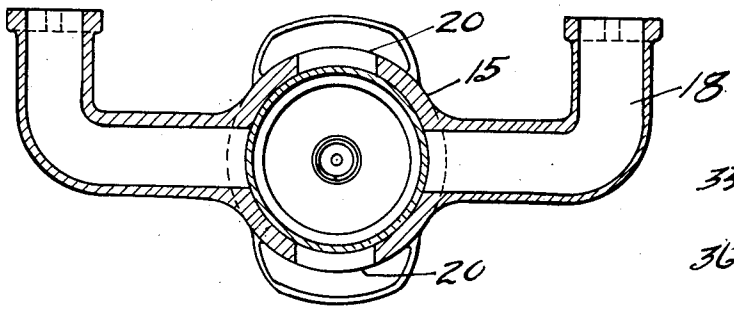


FIG. 5.

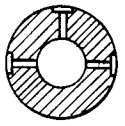


FIG. 8.

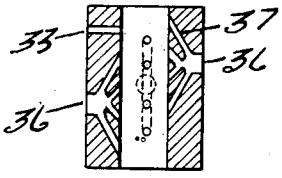


FIG. 7.

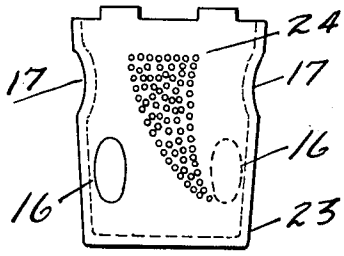


FIG. 10.

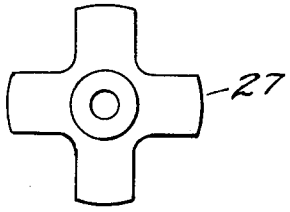


FIG. 9.

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INTERNAL-COMBUSTION ENGINE.

1,386,544. Specification of Letters Patent. Patented Aug. 2, 1921.

Application filed April 17, 1916, Serial No. 91,752. Renewed October 22, 1920. Serial No. 418,766.

To all whom it may concern:

Be it known that I, AUGUST L. WOLFF, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

The present invention relates to a combined cooling and vaporizing system for an internal combustion engine.

The objects of the invention are, first, to provide a means to utilize low grades of liquid fuels; a second object is to provide a means for cooling the cylinders with liquid fuel; a third object is to provide means for utilizing heat directly from the cylinders to vaporize fuel. Another object is to provide a means for supplying automatically, various kinds and various proportions of fuels to a vaporizing system.

Another object is to provide a means of preventing over-vaporization.

Referring to the drawings:

Figure 1, is a plan view showing a device embodying the present invention.

Fig. 2 is a front elevation of the present invention shown with the primary vaporizer removed.

Fig. 3, is a front elevation of a primary vaporizer shown assembled.

Fig. 4, is a plan view of an adjustment plate.

Fig. 5, is a cross section taken on line *aa* Fig. 3.

Fig. 6, is a partial cross section of inner part of primary vaporizer taken on line *bb* Fig. 3.

Fig. 7, is a vertical section of the outer cylinder of multiple fuel supply valve taken on line *cc*, (Fig. 1.)

Fig. 8, is a cross section of outer cylinder of multiple fuel supply valve taken on line *dd*, Fig. 3.

Fig. 9, is a plan view of a spider shown in position in cross-section chamber 23, (Fig. 6).

Fig. 10, is a front elevation of chamber of primary vaporizer shown with a spider removed.

Fig. 11, is a front elevation of the outer body of primary vaporizer.

Fig. 12, is a plan view of part shown in Fig. 11.

Fig. 13, is a vertical section taken on line *ee*, (Fig. 1).

Fig. 14, is a vertical section taken on line *ff*, Fig. 1 showing admission and exhaust valves and passages.

Fig. 15, is a plan view of combination back fire check and exhaust valve, (Figs. 1 and 2.)

Fig. 16, is a vertical section taken on line *gg*, Fig. 15.

Fig. 17, is a cross-section taken on line *hh*, Fig. 16.

The device embodying the invention consists essentially of a casing around the cylinder and forming part of the cylinder wall; also forming a vaporizing chamber around the cylinder. Provided in the wall of said chamber is a clean-out opening (2), a drain-cock opening (3) and openings (4) above each other to form a means of connection for a primary vaporizer, shown in Fig. 3, said primary vaporizer to be hereinafter described.

The upper part of said chamber 1, connects with a common passage, 8 Fig. 2, having an auxiliary air valve 5.

Referring to Fig. 3 which illustrates what will be designated as a primary vaporizer consisting of an outer body 15, having a cup-shaped container with openings 16 and 17, Fig. 6, from the sides thereof leading to passages 18 and 19 in the outer body and connecting with vaporizing chambers 1 around the cylinder.

Said cup-shaped container has openings 20 in opposite sides thereof, walls projecting outwardly and upwardly around the lower part of said opening 20 forming a trough. A cover 21 with a hole through the center thereof, is securely fastened over the top of said cup-shaped container by means of a thread 22.

In the cup shaped container a combination fuel-vaporizing and float chamber 23 (Figs. 3, 6 and 10) is rotatively fitted therein, having openings 16 and 17 in opposite sides thereof, opening into passages 18 and 19 of outer body and having perforations 24 in opposite sides thereof to form an inlet through openings 20 in the cup-shaped outer body 15.

A conical shaped float 25 having an opening through the center to receive an adjustable valve part 26 in lower end. Said adjustable valve part is fastened and adjusted therein by means of a thread contained in said float. A cross-shaped spider 27 having a tubular part integral therewith extending upwardly through cover and non-rotatively

mounted on combination fuel vaporizing and float chamber 23; an arm 28, non-rotatively mounted on tubular part of cross-shaped spider extending upwardly through a cover 21, on cup-shaped outer container 15.

A common fuel supply tube 29 extending downwardly through tubular part on the combination fuel vaporizing and float chamber and downwardly into said chamber into float 25 within said chamber, the lower end thereof forming a part of a valve within said float 25, the upper part thereof comprising an inner part of a multiple fuel supply valve and having a slot 30 diagonally cut therein to connect with inner passage 31 therein, leading into the combination fuel vaporizing and float chamber and another slot 32, cut diagonally around to receive a pin 33 to slide therein. An arm 34 is non-rotatively mounted on the upper end. An outer cylinder 35 of a multiple fuel supply valve securely mounted to cover 21, with supply tubes 36 connected on the outer side of the outer cylinder 35 connecting with a number of passages 37, to different positions on the inner side thereof; a pin 33 near the upper end thereof extending through the inner side thereof to slide in a diagonally cut slot 32 around the outer side of common fuel supply tube 29, comprising the inner part of said multiple fuel supply valve, so arranged that rotating the common fuel supply tube 29 raises or lowers common fuel supply tube 29, thus changing the position of the passages 37 opening into slot 30 in common fuel supply tube 29 so as to open one or more passages 37 from on more of the supply tubes 36 and varying numbers of said passages 37, from different supply tubes 36.

Thermostat 38 operated by the heat of the cylinder, securely connected on or adjacent to the cylinder with suitable connections for rotating the arm 34 non-rotatively mounted on common supply tube 29.

Operation is as follows:

Fuel is supplied to one or more supply tubes 36 flowing through one or more passages 37 from one or more tubes 36 opening into slot 30 and flowing through said common fuel supply tube 29 through the valve in float 25 around the lower end of said tube and up around said common fuel supply tube flowing over upper edge of a float 25 around said common fuel supply tube 29 into a combination fuel vaporizing and float chamber 23.

The arm 34, mounted on common fuel supply tube 29 is rotated by thermostat 38 exposed to and operated by the heat from the cylinders.

The heat of the cylinders through said apparatus 38 automatically rotating common fuel supply tube 29, raising or lowering said tube changing the kinds and proportions of different kinds of fuels flowing from passages 37 through slot in common fuel supply tube 29 and down there through and raising or lowering the float 25 around said tube containing an adjustable valve part 26, within said float and raising a fuel level in a combination fuel vaporizing and float chamber 23 in the primary vaporizer.

Air is drawn by the suction stroke of the pistons in the cylinders or forced into the combination fuel vaporizing and float chamber in primary vaporizer, through openings 20 in the side of cup-shaped container 15 through a number of perforations in the sides of combination fuel vaporizing and float chamber 23, opened and closed by the rotation of said chamber rotated by arm 28 flowing into said chamber and therefrom through openings 16 and 17, simultaneously opened and closed by the same means of rotation of said chamber, flowing into passage 18 above a constant fuel level or through passage 19 through below a constant fuel level contained in said combination fuel vaporizing and float chamber 23 and in passage 19, carrying fuel therewith and being primarily vaporized while passing through said chamber 23, and through said passages 18 and 19 and passing through holes in an adjustment plate, (Fig. 14), controlling the quantity by the sizes of the holes in said plates and then passing into each vaporizing chamber, by the sizes of the holes in said plates. The vaporizing chambers 1 forming part of cylinder walls 40 around the lower end of the cylinder is cooled, and the heat of the cylinders controlled by the conduction of the heat of the cylinder to the fuel around the cylinder wall.

The fuel in the vaporizing chambers 1 around the cylinders is vaporized directly by the heat of the cylinder walls 40 and passes with air through chambers 1, around the cylinder cooling the cylinders and being superheated directly by the heat of the cylinder and passing into a common passage 8 containing an auxiliary air valve 5, through its upper shell, for admitting varying quantities of additional air to weaken a combustible fuel charge, passing through said passage 8 into combination backfire check and exhaust valve opened by the pressure of the suction stroke of the piston in the cylinder, permitting a combustible mixture to pass therethrough and passing through passages 41 to the intake valves 42, and thence through a passage 43, into the cylinders by the suction stroke of the pistons in the cylinders moving to and from the ends thereof; the aforementioned combination back-fire check and exhaust valve forming a passage to passages 41, contains a back-fire check valve, held closed when suction of the pistons in the cylinders ceases and automatically closes when a back-firing charge back-

fires through an intake valve 42 from a cylinder, preventing a back-fire charge entering the vaporizing chamber, the back-fire exhaust valve opening out of the outer side of said combination back-fire check and exhaust valve is held closed by the tension of a spring 14 thereon, and by the suction of the pistons in the cylinders and automatically opens with the pressure of a back-firing charge through an intake valve, exhausting a back-firing charge from said combination back-fire check and exhaust valve.

Claims:

1. In an internal combustion engine including in combination cylinders, a plurality of fuel supply conduits communicatable with the cylinders adapted to supply various qualities of fuel, a thermostat actuated by the heat of a cylinder, a multiple fuel supply valve operated by the thermostat adapted to communicate the conduits with the cylinders to vary the quality of the fuel in communication with the cylinders in proportion to the variation of the heat of the cylinder.

2. An internal combustion engine including in combination cylinders, a plurality of sources of fuel supplies of various qualities communicable with the cylinders, a thermostat actuated by the heat of the cylinders and a valve communicating selectively a plurality of the sources of fuel supplies with the cylinders operated by the thermostat to vary the quality of the fuel supplied to the cylinders in proportion to the variation of the heat of the cylinders.

3. An internal combustion engine including in communication cylinders, a plurality of sources of fuel supplies of various qualities communicable with the cylinders, a thermostat actuated by the heat of the cylinders and a valve operated by the thermostat communicating selectively a plurality of the sources of fuel supply in varying proportions of their individual capacities to vary the quality of the fuel in communication with the cylinders with the heat of the cylinders.

4. An internal combustion engine including in combination cylinders, a plurality of sources of fuel supplies communicable with the cylinders, a thermostat actuated directly by the heat of the cylinders, and valved means communicating a plurality of the sources of fuel supplies with the cylinders in varying proportions of their capacities operated by the thermostat for selecting varying proportions of fuel from various sources with the heat of the cylinders.

5. An internal combustion engine including in combination cylinders, a plurality of sources of fuel supplies communicable with the cylinders, a thermostat actuated by the heat of the cylinders and valved means operated by the thermostat for communicating a plurality of the sources of fuel supplies with the cylinders in varying proportions of their individual capacities and in varying proportions of their collective capacities with the heat of the cylinders.

6. An internal combustion engine including in combination cylinders, a plurality of sources of fuel supplies communicable with the cylinders, a thermostat actuated directly by the heat of a cylinder, and a valve operated by the thermostat for communicating selectively a plurality of the sources of fuel supplies with the cylinders in varying proportions of their individual capacities and in varying proportions of their collective capacities with the heat of the cylinder.

7. An internal combustion engine including in combination cylinders, a plurality of sources of fuel supplies, each supplying a fuel of different quality, a thermostat actuated directly by the heat of a cylinder and valved means operated by the thermostat to vary the quality of the fuel in communication with the cylinders in proportion to the variation of the heat of the cylinders.

8. An internal combustion engine including cylinders, a plurality of sources of fuel supplies communicable with the cylinders each supplying a fuel of different quality and means adapted to vary the quality of the fuel in communication with the cylinders in proportion to the variation of the heat of the cylinder.

9. An internal combustion engine including cylinders, a plurality of sources of fuel supplies communicable with the cylinders and means adapted to thermostatically communicate a plurality of the sources of fuel supplies with the cylinders.

10. An internal combustion engine, including in combination a cylinder, a thermostat, a plurality of fuel conduits communicable with the cyinder, a multiple fuel supply valve adapted to communicate and excommunicate the fuel conduits with the cylinder operated with the thermostat actuated by the heat of the cylinder to vary the quality of the fuel supplied to the cylinder in proportion to the variation of the heat of the cylinder.

11. An internal combustion engine, including in combination, a cylinder, a thermostat, a plurality of fuel conduits communicable with the cylinder, a multiple fuel supply valve adapted to communicate and excommunicate the fuel conduits with the cylinder operated with the thermostat actuated by the heat of the cylinder.

12. An internal combustion engine including cylinders, a fuel holding casing vaporizing fuel by conducting the heat of the cylinders to the fuel, means for thermostatically supplying varying proportions of fuel of different qualities to said casing and means for thermostatically controlling the heat of the cylinders.

13. An internal combustion engine including cylinders, a fuel-holding vaporizing casing vaporizing fuel by conducting the heat of the cylinders to the fuel and means adapted to vary the quality of fuel supplied to the casing in proportion to the variation of the heat of the cylinders.

14. An internal combustion engine including cylinders, a multiple fuel supply valve, a fuel holding vaporizing casing exposed to the heat of the cylinders vaporizing fuel for consumption in the cylinders and to cool the cylinders, and means for supplying fuel of varying qualities to the casing with the fuel supply valve operated with a thermostat actuated by the heat of the cylinders.

15. An internal combustion engine including cylinders, a fuel vaporizing casing exposed to the heat of the cylinders, cooling the cylinders by conducting the heat of the cylinders to the fuel to vaporize the fuel for consumption in the cylinders, and means for controlling the heat of the cylinders and the quality of fuel supplied to the casing with the heat of the cylinders.

16. An internal combustion engine including a cylinder; a fuel holding vaporizing casing exposed to the heating action of the cylinder to vaporize liquid fuel by conducting the heat from the cylinder to the fuel to cool the cylinder; and a thermostatically controlled float with a valve therein, in a float chamber connected with said vaporizing casing for controlling the fuel level in said chamber.

17. An internal combustion engine including a cylinder, a fuel holding vaporizing casing exposed to the heating action of the cylinder to vaporize liquid fuel by conducting the heat from the cylinder to the fuel to cool the cylinder; and a thermostatically operated multiple fuel supply valve to supply varying proportions of different fuels of varying cooling qualities to said casing.

18. An internal combustion engine including a cylinder; a fuel vaporizing chamber exposed to the heating action of the cylinder to vaporize liquid fuel by conducting the heat from the cylinder to the fuel to cool the cylinders; a multiple fuel supply valve to supply varying proportions of different fuels of varying cooling qualities to said chamber, operated by a thermostat exposed to the heating action of the cylinder to supply fuel of suitable cooling quality.

19. In an internal combustion engine, a fuel vaporizing chamber around a cylinder containing liquid fuel serving to cool the cylinder by conducting the heat of the cylinders to the fuel to vaporize the fuel for consumption in the cylinder; means for obtaining access to said chamber; means for draining said chamber; means for controlling the fuel level in said chamber, means for controlling the heat of the cylinder with the kind of fuel supplied to said chamber, and means for supplying automatically different kinds of fuel to said chamber, with a multiply fuel supply valve operated with a thermostat operated by the heat of a cylinder.

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Witnesses:
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