P. O. ROWLANDS.

LIQUID FUEL INTERNAL COMBUSTION ENGINE.

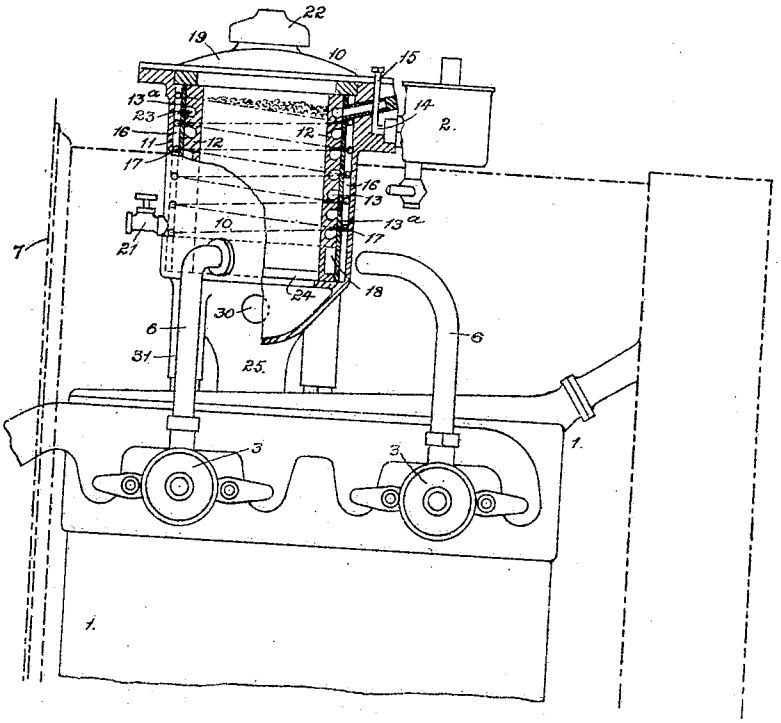
APPLICATION FILED JULY 2, 1918.

1,381,434.

Patented June 14, 1921.

2 SHEETS—SHEET 1.

FIG. 1.



Inventor

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By [signature]

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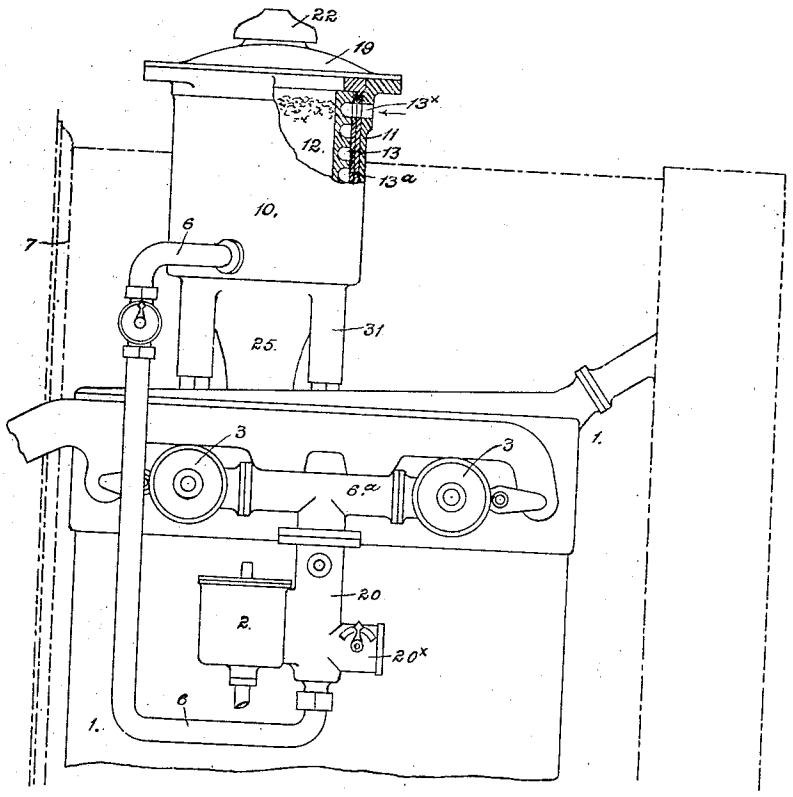
APPLICATION FILED JULY 2, 1918.

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Patented June 14, 1921.

2 SHEETS—SHEET 2.

FIG. 2.



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UNITED STATES PATENT OFFICE.

PERCY OCTAVIUS ROWLANDS, OF LIVERPOOL, ENGLAND.

LIQUID-FUEL INTERNAL-COMBUSTION ENGINE.

1,381,434. Specification of Letters Patent. Patented June 14, 1921.

Application filed July 2, 1918. Serial No. 243,088.

To all whom it may concern:

Be it known that I, PERCY OCTAVIUS ROWLANDS, a subject of the King of England, and residing at Liverpool, in the county of Lancaster, England, have invented improvements in and connected with Liquid-Fuel Internal-Combustion Engines, of which the following is a specification.

My invention relates to apparatus for heating and vaporizing a liquid fuel of heavy specific gravity, prior to its introduction into the cylinder or cylinders of an internal combustion engine.

In the accompanying drawings forming a part of this specification and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is a side elevation of apparatus embodying my invention, parts being shown in central vertical section, and,

Fig. 2 is a similar view of a different form of the invention.

Fig. 1 shows the vaporizing apparatus combined with and practically forming a part of the engine or motor cylinders; 1 generally represents the engine or motor; and 10 the part of the apparatus in which the solid fuel is contained and burned and in this case the liquid fuel vaporized. 2 is a paraffin or liquid fuel supply regulating device, say of the float regulating type; and 3 represents the vapor and air inlet valvular appliances of the engines—of which there are two in the case shown—which may be of any known suitable kind adapted to also admit further air to the engine cylinders, or not, as the case may be. The engine being assumed to be a four cylinder type; and it may be assumed that the conduits conducting the mixed air and vapor to the engine, will be provided with a throttle or regulating valve as usual, by which the rate of supply or feed of liquid up and from the liquid delivery port or nozzle is regulated or governed.

6 are pipes for conveying the hot mixture of vapor and hot air to the inlet valvular device 3, from the end of the conduit of the vaporizing apparatus 10, which say is an annulus; and in the passages or pipes leading to the inlet valves on the engine side of the device 3, the throttle valves may be placed. The dotted lines 7 represent the bonnet of a self-propelled vehicle, within which the engine is disposed, and out of the upper part of which the top of the vaporizer apparatus 10 projects.

The vaporizing apparatus 10 in this case (Fig. 1) comprises an external chamber or vessel 11 proper; an internal metal cylinder or liner 12, having within it a helical liquid fuel conducting tube or way 13, to the upper end of which the oil fuel from the float supply regulating device 2 is delivered through the vertical port 14, which has upon it a supply regulating screw plug 15; and the apparatus may be so arranged to work that little or no fuel will pass from the part 14, and so to the helical way 13, unless a minus pressure exists in it, due to the operation of the engine, that is by the drawing in stroke of the pistons thereof; the engine in this case being assumed to be of the ordinary four cycle type; to which type, however, the invention is not restricted.

The conduit or way 13 is open on the exterior of the cylinder 12, and has a metal covering sleeve 13^a; and between this sleeve and the interior of the wall 11, there is an annular space 16, from the lower part to the top, having within it a spiral septum 17, which forms this annular space into a helical way, to the lower end of which the air to be heated is admitted, and the entrance of which is regulated by a regulating device 21; while the upper end of this air heating helical conduit 16, communicates with the upper portion of the spiral way 13, by an aperture 23 in the lining or cylinder sleeve 13^a.

The lower end of the conduit 13 is connected to the vapor and air supply pipes 6 by an annular port 18 in the lower part of the cylinder 12, into which the conduit 13 leads.

The upper end of the vaporizing apparatus is closed by a cover 19 adapted to be readily placed in position and removed, so as to gain access to the interior of the furnace vessel 12; and in this cover there will be an opening for the escape of products of combustion of the solid fuel burned in the apparatus, which opening may be regulated by a regulatable cap 22 of any known suitable kind, so that the rate of combustion of the solid fuel can be regulated at will, and the temperature of the fire controlled or regulated.

The bottom of the vaporizing vessel 11 has a large opening in it, say practically the

full area of the cylinder 12, and the fuel rests on a grate 24, the ashes and residue from which can fall into an ash conduit 25, which is provided with holes 30 for the entrance of air to the furnace.

In the case shown, the whole vaporizing apparatus is mounted and fixed on the top of the engine 1 by feet 31.

In some cases, at different points of the length of the conduit 13, say some distance below the upper part, the vapors and air can be carried off from the conduit by providing on the inner side of the wall 12, a vertical conduit communicating with conduit 13, and leading down into the annular conduit 18, so that the vapor generated at one part is not compelled to pass through the whole of the conduit 13, but can pass directly away to the engine.

In the form shown in Fig. 1, the liquid fuel is introduced into the upper part of the vaporizing conduit in quantities regulated by the use of the throttle valve or like device which governs the degree of minus pressure or suction acting directly on the liquid fuel nozzle or supply port. The fuel is thus caused to enter the conduit of the vaporizing apparatus, being heated by the solid fuel burning within the apparatus, and the heated air is also supplied to the conduit and passed down and along with the liquid fuel. As the liquid fuel is introduced only by the suction produced by the engine, such fuel will only partially fill the conduit so that the vapor given off the free surface of the liquid will be taken up and absorbed and carried along with the heated air. As the air is preheated by the heat of the solid fuel, partly by carrying it to a conduit on the outside of the liquid fuel conduit and also in passing through said conduit, the liquid fuel is partly heated and vaporized by the hot air flowing in contact with it and partly by the heat due to the combustion of the solid fuel conducted to such liquid fuel through the metal in which the conduit is formed.

In the modification shown in Fig. 2, air is heated by the heat due to the combustion of solid fuel in the apparatus 10, and the hot air produced acts directly upon the paraffin or liquid fuel in a "carbureting" type of appliance 20 of any suitable known kind, which in the case shown, is placed near the inlet valvular appliances 3, and to which the hot air is conducted from the air heating furnace 10 by the conduit 6, which is directly connected to the oil carbureting or atomizing appliance, to which the liquid fuel is fed through float regulated feed device 2; and the comminuted or vaporized fuel passes from the "carbureter" apparatus 20, to a conduit 6^a which extends right and left to the two inlet valvular devices 3; a suitable regulating throttle or like valve being employed in the carbureter 20, or engine inlet valve conduits, as in the case described with reference to Fig. 1. The hot air, heated by the means and in the manner stated, insures the liquid fuel being converted to such a vaporous or analogous state, that its combustion in the engine cylinders is rendered certain and complete, and effective.

In this case—Fig. 2—the hot air supplied from the solid fuel furnace apparatus 10 for the conversion of the hydrocarbon fuel to the required vaporous or analogous state, may be a part of that necessary and used for supporting combustion of the fuel within the engine, and a part may be supplied to the apparatus 20 through an air supply branch 20^x, which will have suitable regulating valve or means on it. Or, in some cases, the hot air used for the conversion of the liquid hydrocarbon fuel may constitute the whole of the air necessary for supporting combustion of the fuel vapor within the engine, in which case the air opening or entrance 20^x will be closed, or the apparatus 20 may have no separate air inlet.

The air to be heated in the furnace apparatus 10 in Fig. 2 is admitted by an opening 13^x at the upper part of the conduit 13, and in passing through this conduit, which is formed in the liner 12 similarly as in the arrangement shown in Fig. 1, it is heated.

In this case, no annular space outside the cylinder 13^a is necessary, but the space may be packed with asbestos or other insulating material; but if desired, an annular space may be provided, similarly as in the arrangement in Fig. 1, and formed into a spiral air conduit, to which air is admitted similarly as in Fig. 1, it being connected at the upper part of the apparatus with the upper part of the helical way 13.

What is claimed is:—

1. In apparatus of the character described, an inner shell adapted for the reception of solid fuel and provided upon its periphery with a spiral groove having its outer side open, a second shell receiving the inner shell and closing the open side of the spiral groove, air inlet means for the spiral groove, and means to cause the air heated within the spiral groove to contact with a liquid fuel to be vaporized.

2. In apparatus of the character described, an inner shell adapted for the reception of solid fuel and provided in its periphery with a spiral groove having its outer side open, a second shell receiving the inner shell and closing the outer side of the spiral groove, means for supplying air to the spiral groove, means to supply liquid fuel to the spiral groove, and an outlet conduit having communication with the spiral groove to receive the gaseous mixture discharging therefrom.

3. In apparatus of the character described, an inner shell adapted for the reception of a heating medium and provided in its pe-

riphery with a spiral groove having its outer side open, an intermediate shell receiving the inner shell and serving to close the outer side of the spiral groove, an outer shell surrounding the intermediate shell in spaced relation for providing an air chamber having means of communication with the intake end of the spiral groove, means to supply a liquid fuel into the intake portion of the spiral groove, and a conduit connected with the outlet portion of the spiral groove.

4. In apparatus of the character described, an inner shell adapted for the reception of a heating medium and provided in its periphery with a spiral groove having its outer side open, an intermediate shell receiving the inner shell and serving to cover the outer side of the spiral groove, an outer shell surrounding the intermediate shell in spaced relation for providing an air chamber, a spiral member arranged between the outer and intermediate shells for providing a spiral air passage having means of communication with the intake portion of the spiral groove, means to supply liquid fuel to the intake portion of the spiral groove, and an outlet conduit connected with the outlet portion of the spiral groove.

5. In apparatus of the character described, an inner shell adapted for the reception of a heating medium and provided in its wall with a spiral groove, means to supply air to the intake end of the groove including an outer shell surrounding the inner shell in spaced relation and the spiral member within the outer shell for forming a spiral air passage, and an outlet conduit connected with the outlet end of the spiral groove.

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

PERCY OCTAVIUS ROWLANDS.

Witnesses:
SHELAGH DONALDSON,
BARBARA JAQUES.