No. 690,610. Patented Jan. 7, 1902.

A. D. RICHARDSON.

HYDROCARBON ENGINE.

(Application filed Feb. 2, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

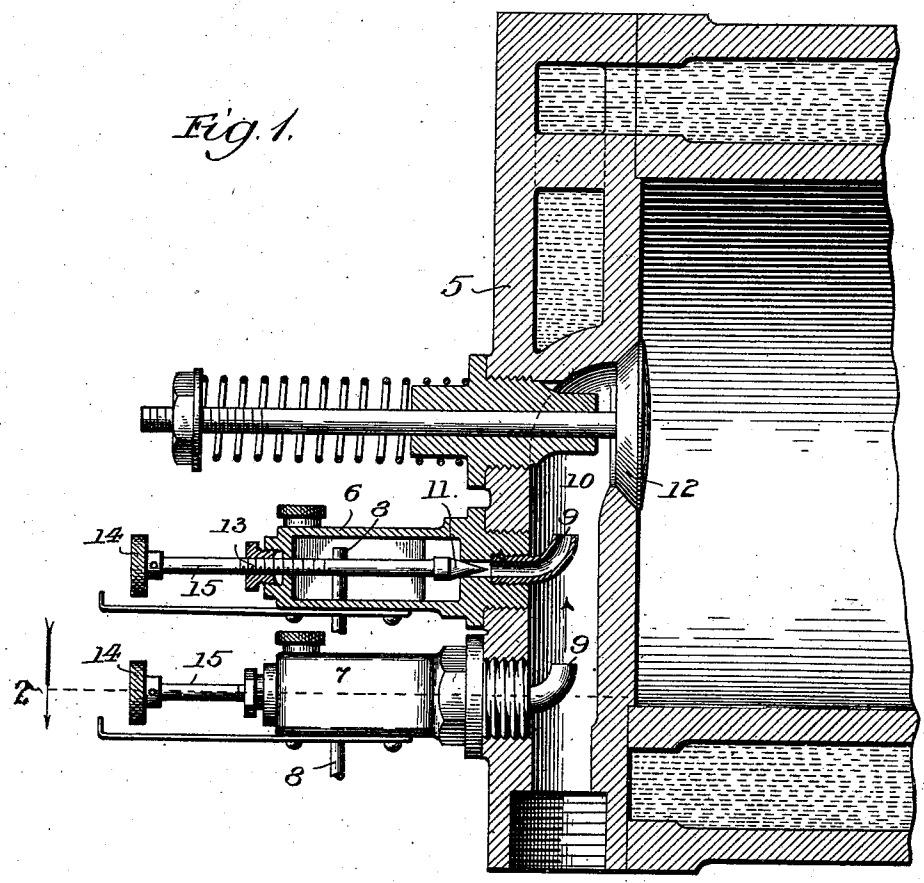

Fig. 2.

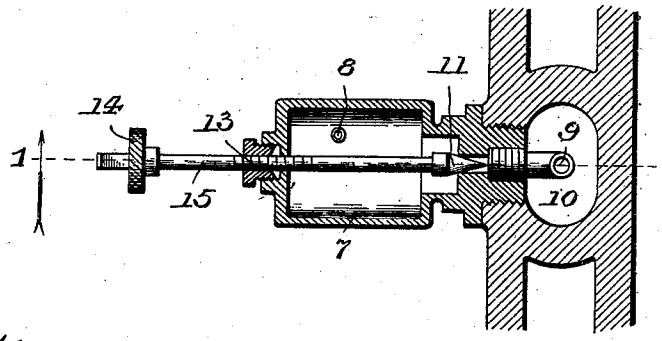

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Fig. 3.

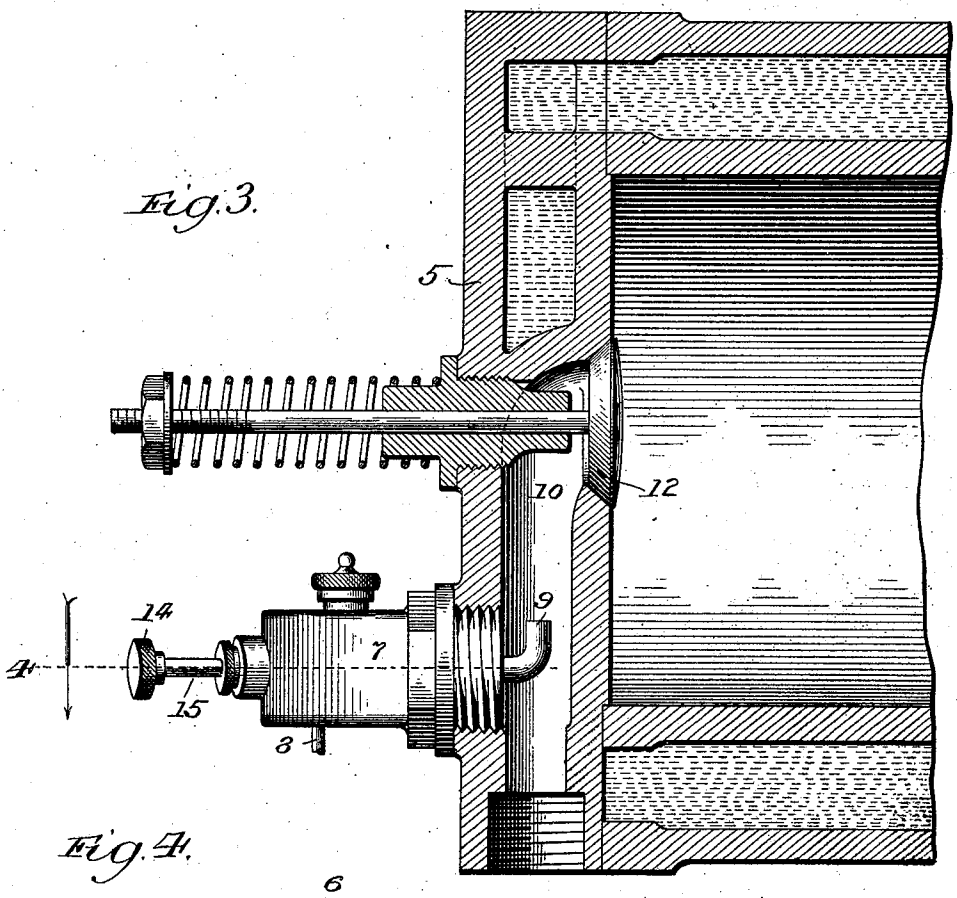
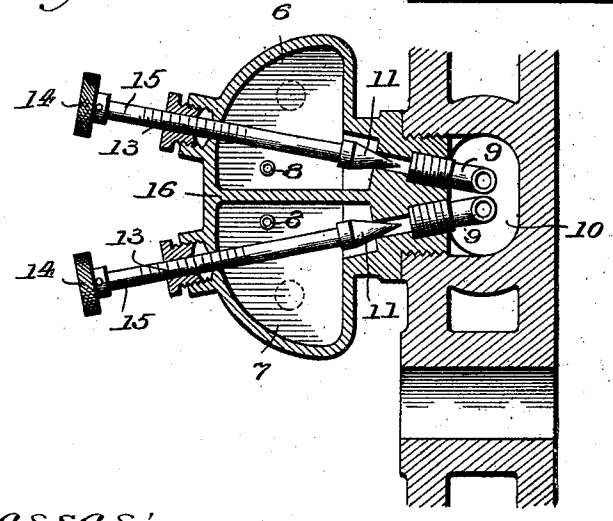


Fig. 4.



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UNITED STATES PATENT OFFICE.

AARON D. RICHARDSON, OF BELOIT, WISCONSIN.

HYDROCARBON-ENGINE.

SPECIFICATION forming part of Letters Patent No. 690,610, dated January 7, 1902.

Application filed February 2, 1901. Serial No. 45,701. (No model.)

To all whom it may concern:

Be it known that I, AARON D. RICHARDSON, a citizen of the United States, residing in Beloit, Wisconsin, have invented certain new and useful Improvements in Hydrocarbon-Engines, of which the following, taken in connection with the accompanying drawings, is a specification.

It has been heretofore demonstrated by experiment that a gas, gasolene, or oil engine will develop more power for a given amount of fuel if the same be used under high compression than if it be employed at low compression. Because of the increase in temperature due to the compression of the mixture, however, it has heretofore not been practicable with the ordinary construction of gas-engine to use a degree of compression beyond a certain fixed point, the mixture tending to ignite prematurely—that is, before the end of the compression-stroke—whenever too high a degree of compression is employed. Such premature ignitions occur in engines using kerosene or crude oil at a lower point than in engines employing gas or gasolene, in consequence of which it is necessary to operate a kerosene or crude oil engine at a relatively low compression or else to provide some means for keeping the temperature down during compression.

The first of the objects of my present invention is to overcome the above-mentioneds difficulties by the provision of novel means whereby higher compression can be employed without premature ignition, thus securing higher efficiency, the said means being constructed to permit a small quantity of water, in the form of spray, to be taken into the cylinder with the explosive mixture during the suction-stroke and to insure more effective operation of the said spray in the accomplishment of the objects sought than has been possible in the case of apparatus heretofore employed.

Another object of my invention is the provision of means whereby the quantity of water introduced for the purpose specified may be readily and accurately controlled, so that the amount of water used may be proportioned with nicety to suit the temperature developed by the compression. The lower the compression, of course, the less water will be needed, it being only necessary to use a quantity just sufficient to keep the temperature of the explosive mixture below the ignition-point until the end of the compression-stroke is reached. The water being converted into steam when the explosion takes place aids in driving the piston on the expansion-stroke, and the action of the water in keeping down the temperature, and thereby preventing premature ignitions, makes it possible to use the jacket-water at a higher temperature, this also resulting in greater efficiency.

The above, as well as such other objects which will hereinafter appear, I attain by means of a construction which I have illustrated in preferred form in the accompanying drawings, in which—

Figure 1 represents in sectional view one end of a gasolene-engine cylinder having my improvements applied thereto. Fig. 2 is a partial section through one of the storage-reservoirs. Fig. 3 is a section showing the employment of a twin-reservoir device in place of the two separate reservoirs shown in Fig. 1, and Fig. 4 is a horizontal section through the twin-reservoir construction shown on Fig. 3.

Referring to the construction shown in Figs. 1 and 2, it will be seen that into the cylinder-head 5 of the engine are secured two reservoirs 6 and 7, one of them being adapted to hold oil and the other water and both being preferably constructed in such a manner as, for example, by the provision of an overflow-pipe, (indicated at 8,) to maintain the height of the oil and water at a constant level. Each reservoir is shown as provided with a tube or nozzle 9, projecting into the suction-passage 10 of the engine, the said tubes or nozzles 9 being controlled by means of an adjustable valve 11.

The operation of my invention is as follows: The reservoir 6 being filled with oil and 7 with water and the regulating-valves 11 being adjusted at such points as will give just the right quantities proportionately of oil and water, when the suction-valve 12 opens at the beginning of the suction-stroke the air which rushes up through the passage 10 will draw with it into the cylinder the oil from the outlet-tube 9 of the oil-reservoir 6 and the water from the reservoir 7, the water being

formed into a spray and mixed with the spray of the more volatile hydrocarbon or oil. The water thus introduced absorbs sufficient of the heat to keep the temperature during the compression-stroke below the ignition-point of the mixture. When the explosion takes place, the water is converted into superheated steam, which after aiding in the expansion-stroke passes out at the exhaust with the burned gases. By the provision of the opening 13 and the thumb-piece 14 on the stem 15 of the valve 11 it is possible to adjust the amount of water-vapor admitted into the cylinder to just the point required to prevent premature ignition, so that the apparatus can be operated up to the highest degree of practical efficiency.

As shown in Figs. 3 and 4, I have employed a twin-reservoir device in which the oil-chamber 6 and the water-chamber 7 are combined in a single casing 16, provided with two separate tubes 9, opening into the suction-passage 10, and separate valves 11, all, operatively considered, substantially like the corresponding parts shown in Figs. 1 and 2. By the use of the twin-reservoir arrangement the cost of the device is considerably reduced. The two tube-openings 9 are arranged more closely together, so that there is a better mixture formed between the water-vapor and oil, and there is but a single threaded opening into the suction-passage instead of two, as shown in Figs. 1 and 2.

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

1. A hydrocarbon-engine comprising the combination of an engine-cylinder, a reservoir containing a supply of water located adjacent to said cylinder and attached thereto, an opening or passage establishing communication between said reservoir and the inlet to said engine-cylinder, means for maintaining a constant level of water in said reservoir, and means adjacent to said reservoir for controlling the passage of water from the said reservoir into said communicating passage, the said devices being arranged so that the suction of the piston of the cylinder draws the water into the cylinder past said last-mentioned means, substantially as described.

2. A hydrocarbon-engine having a cylinder, a reservoir attached to said cylinder, containing a supply of water, an opening or passage establishing communication between said reservoir and said cylinder, means for maintaining the water in said reservoir at a constant level, a valve controlling the opening into said communicating passage, and means for adjustably fixing said valve in open position whereby to govern the amount of water admitted to the cylinder in proportion to the degree of compression employed, said parts being so arranged as to permit the suction in the engine-cylinder to draw the water into the same, substantially as described.

3. The combination with a hydrocarbon-engine cylinder of a twin-reservoir device, comprising a casing, an oil-chamber, and a water-chamber in said casing, and means for permitting the oil and water to enter the cylinder, substantially as described.

4. The combination with a hydrocarbon-engine cylinder of a twin-reservoir device, comprising a casing, an oil-chamber, and a water-chamber in said casing and separate means for permitting the oil and water to enter the cylinder, substantially as described.

5. The combination with a hydrocarbon-engine cylinder of a twin-reservoir device comprising a casing, an oil-chamber, and a water-chamber in said casing, a tube through which oil from said oil-chamber may enter the cylinder, a tube through which water from said water-chamber may enter the cylinder, said tubes formed with their outlets adjacent, and means for controlling the openings of the said tubes, substantially as described.

6. The combination with a hydrocarbon-engine cylinder of a twin-reservoir device comprising a casing, an oil-chamber, and a water-chamber in said casing, a tube through which oil from said oil-chamber may enter the cylinder, a tube through which water from said water-chamber may enter the cylinder, and means for controlling the openings of the said tubes, substantially as described.

AARON D. RICHARDSON.

In presence of—
J. B. LAMBERT,
P. C. BROOKS.