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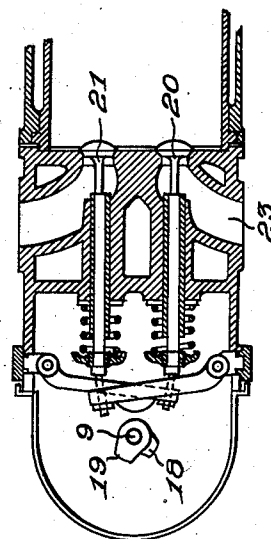
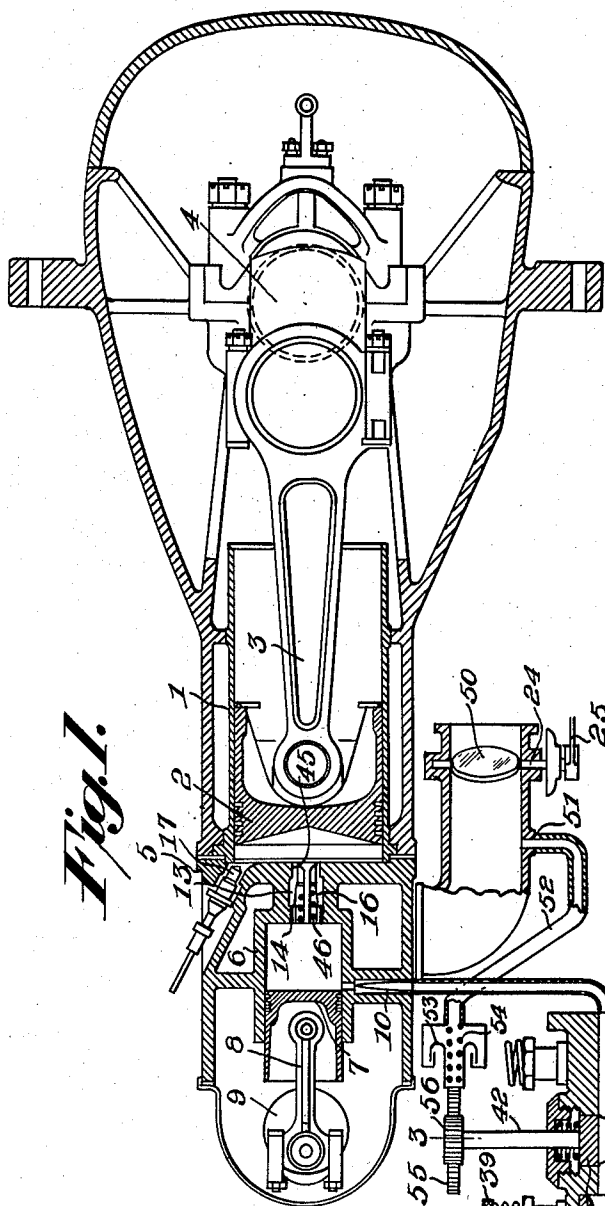
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2,646,026

THERMAL MOTOR WITH INJECTION CYLINDER

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2 Sheets-Sheet 1



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Fig. 4.

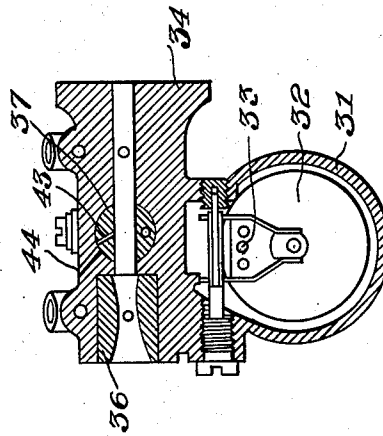
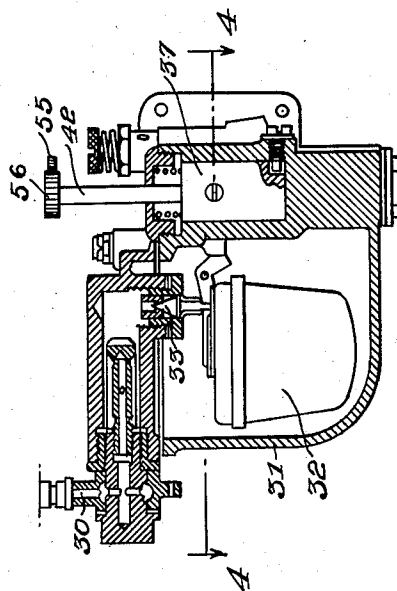


Fig. 5.



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THERMAL MOTOR WITH INJECTION
CYLINDER

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2 Claims. (Cl. 123—33)

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This invention relates to a heat engine.

According to known practice, the air in the combustion chamber maintains a constant quantity, irrespective of variation from the normal in the conditions under which the engine works. For this reason, the relative proportions of fuel and air are variable, the engine working therefore according to the diesel cycle, in which ignition is initiated by the heat of the compressed air at the precise moment that the fuel is injected, such injection taking place at a point of the cycle close to the dead center position of the piston.

The invention of this application relates to a means for overcoming the disadvantage just recited by keeping a constant ratio of air to fuel, irrespective of changes in the engine load. Such operation maintains the highest efficiency for the engine at various speeds and loads.

An improved heat engine for carrying out the above mentioned object is characterized by the features disclosed in the following description and more particularly in the claims appended at the end of this description.

A heat engine according to the invention is shown by way of example in the appended drawings in which:

Figure 1 shows the engine according to the invention in a cross-sectional view through the axis of the injector cylinder.

Figure 2 shows the heat engine of Figure 1 in a cross-sectional view through the axes of the inlet and exhaust valves.

Figure 3 is an elevational sectional view of the carburetor of the heat engine according to Figures 1 and 2.

Figure 4 is a horizontal sectional view of the carburetor of Figure 3 through the line IV—IV of said figure.

For supplying fuel to the heat engine, a rich mist is formed. This mist is caused to expand suddenly in a partial vacuum so that it will partially vaporize. Immediately after this expansion, the mist is compressed with the vaporized fuel and this compressed mixture of mist and vaporized fuel is delivered into the compressed air of the working cylinder, the pressure of which is lower than that of the mixture.

During this latter operation, according to the manner in which the invention is carried out, the quantity of air-fuel mist is varied according to the load of the engine by maintaining the proportion of air and fuel constant and the quan-

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tity of air contained in the working cylinder is varied in the same proportions in order that the final mixture contained in the cylinder is in a constant proportion to the weight of the fuel whatever the load of the engine may be. This produces efficient engine operation at all speeds.

The regulation of the quantity of mist and air can be effected in the following manners:

(a) The weight of the air-fuel mixture to be introduced into the working cylinder is regulated automatically by the vacuum existing in the suction pipe for the admission of pure air into the working cylinder.

(b) The weight of the pure air admitted into the working cylinder is regulated automatically through the vacuum existing in the suction pipe for the admission of the air-fuel mist.

The injection of the mixture into the working cylinder is effected advantageously just at the moment when the working piston reaches its lower dead center, so that the mixture is mixed intimately with the compressed air contained in the working cylinder before the explosion is produced.

This method is more particularly applicable to engines in which the ignition is produced by an electric method and in which volatile fuels are used. The ignition point is localized in a small part of the working cylinder and it is advisable to promote the propagation of the explosion by all means. This propagation is obtained by promoting the mixing of air and fuel the mixture of which must be very homogeneous and by taking care that the proportions of air and fuel are maintained between certain limits.

The heat engine used for carrying out the above described method is made in the following manner (Figure 1):

The working piston 2 moves in the working cylinder 1 and drives the driving shaft 4 through the connecting rod 3. The cylinder head 5 carries the injector cylinder 6 in which moves the injecting piston 7 actuated by the connecting rod 8. This rod 8 is pivotally secured to the shaft 9 which rotates with half the speed of the driving shaft 4 for a four stroke cycle engine.

When the injecting piston 7 reaches its upper dead center (Figure 1) it uncovers a port 10 communicating with the carburetor 11, the regulating body of which is controlled by means of the small hand lever 12. The working cylinder 1 and the injector cylinder 6 are connected with each other through the injecting device 13

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which is secured by the nut 14 screwed onto the cylinder head of the engine. The injecting device carries an automatic valve 15 with a seat 45 and a return spring 46. The opening of the valve 15 puts the injector cylinder 6 in communication with the working cylinder 1 through the passages 16. The cylinder head carries an ignition plug 17 projecting into the upper part of the working cylinder 1.

The shaft 9 controls the inlet and exhaust valves 20 and 21, respectively, of the working cylinder 1 through the cams 18 and 19 respectively (Figure 2).

The inlet valve 20 is in communication with an intake manifold 23 for the admission of pure air into the working cylinder. A throttle valve 50 for controlling the admission of pure air is located in the manifold and comprises a flap rotating about an axis. This flap closes the intake manifold 23 for controlling the admission of pure air more or less according to its angular position. The injection of the air-fuel mixture produced by the carburetor 11 and drawn in by the injector cylinder 6 takes place in the working cylinder 1 at the end of the admission stroke or at the beginning of the compression stroke of the working piston 7.

The engine works as follows:

At the end of the injection stroke the injecting piston 7 is in the position of its lower dead center, the shafts 4 and 9 being set accordingly. During its upward stroke, the injecting piston 7 produces in the injector cylinder 6 a relative vacuum which induces a suction of the air-fuel mist when the port 10 is uncovered in the position of the piston's upper dead center. The quantity of air-fuel mist is determined by the carburetor 11 adjusted as a function of the weight of pure air drawn in by the working cylinder 1 through the poppet valve 20 under control of the throttle valve 50. The quantity of pure air is regulated by means of the throttle valve 50 controlled by the small lever 25.

When the working cylinder 1 is filled with pure air which is then compressed, the injecting piston 7 delivers the air-fuel mixture into the working cylinder 1.

The carburetor 11 which forms the air-fuel mist is shown in Figures 1, 3 and 4.

The fuel supplied through the pipe 30 enters the body 31 which is provided with a float 32 and a needle valve 33 (Figure 3).

The main spraying nozzle 35 which is in direct communication with the body 31 delivers the fuel into the diffuser 36 where it is mixed with air (Figure 1). The so formed mist is drawn in through the body 37 in a quantity which varies according to the opening of the said body.

The carburetor 11 can also comprise an auxiliary nozzle 40 working when the body 37 is closed and the engine throttled down. This auxiliary nozzle 40 receives the fuel through the pipe 41 opening on the down side of the main nozzle 35.

An opening 43 provided in the body permits, through its relative position to an opening 44 in the body of the carburetor 11, the leaning of the mixture when the engine runs at intermediary speeds if the said mixture, formed by an over-compensated carburetor, is too rich.

In order to maintain the proportion of the quantities of fuel to the air contained in the final mixtures constant, whatever the load of the engine may be, the adjustments of the body 37 of the carburetor 11 and of the lever 25 of the throttle valve in the manifold 23 for the ad-

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mission of pure air are rendered dependent upon one another.

For this purpose (Figure 1) the manifold 23 for the admission of pure air carries a throttle valve 50 regulating the weight of the drawn-in air. The position of this throttle valve 50 is adjusted by means of the lever 25. The manifold 23 for the admission of pure air carries a boss 51 on which a pipe 52 is fitted and by which the vacuum existing in the intake manifold 23 is transmitted to the vacuum responsive device 53. This vacuum is a function of the position of the air throttle valve 50. The vacuum responsive device 53 which is balanced by the spring 54 is deformed more or less according to the vacuum transmitted to the said device. The movements of the vacuum responsive device 53 are transmitted to the pinion 56 by the rack 55 which is connected to said device, and this motion causes the rotation of the body 37 of the carburetor 11, thus regulating the weight of the air-fuel mist.

The foregoing embodiment permits the regulation of the position of the body 37 of the carburetor as a function of the vacuum prevailing in the intake manifold 23. The charge of combustible mist introduced into the injector cylinder is at every moment proportional to the quantity of air of combustion introduced into the motor cylinder 1.

In this manner, the uniformity of the weight of air, on the one hand, and the uniformity of the weight of the air-fuel mist, on the other hand, are insured through a suitable adjustment of the vacuum responsive device and of the spring opposing the displacement of the said device.

I claim:

1. In a thermal motor, a motor cylinder, ignition means, a motor piston working in the cylinder, a motor shaft, a connecting rod joining the piston to the shaft, an injection cylinder, means for affording communication between the injection cylinder and the motor cylinder, an injection piston working in the injection cylinder and driven by the motor shaft, a pipe for admitting pure air to the motor cylinder, a quantitative control valve arranged in the air pipe, manual control means for said valve, a deformable member responsive to pressure and communicating with the air admission pipe; a carburetor, a pipe for the gas-air mixture connecting said carburetor to the injection cylinder, quantitative control means arranged in the gas-air pipe and controlled by said deformable member, the injection piston injecting into the pure air drawn into the motor cylinder, at the end of the intake stroke, and at the beginning of the compression stroke of the motor piston, the gas air mixture formed in the carburetor, in order to produce in the motor cylinder a homogeneous mixture capable of electrical ignition by said ignition means.

2. In a thermal motor, a motor cylinder, ignition means, a motor piston working in said cylinder, a motor shaft, a connecting rod joining the motor piston to the motor shaft, an injection cylinder, means for affording communication between the injection cylinder and the motor cylinder, an injection piston working in the injection cylinder and driven by the motor shaft, a pipe for admitting pure air to the motor cylinder, a quantitative control valve arranged in the air pipe, manual control means for said valve, a vacuum responsive device located along the pipe for admission of pure air to the motor cyl-

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inder, a balance spring applied to said vacuum responsive device, a rack integral with said vacuum responsive device, a pinion engaging with said rack, a carburetor, a pipe for the gas-air mixture connecting said carburetor to the injection cylinder, a regulatory hollow body mounted in the pipe for the gas-air mixture and firmly fastened on the pinion shaft, the injection piston injecting into the pure air drawn into the motor cylinder, at the end of the intake stroke, and at the beginning of the compression stroke of the motor piston, the gas-air mixture formed in the carburetor, in order to produce in the motor cylinder a homogeneous mixture capable of electrical ignition by said ignition means.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,022,178	Brazelle -----	Apr. 2, 1912
1,597,917	Maedler -----	Aug. 31, 1926
1,662,090	Vorhauer -----	Mar. 13, 1928
1,812,566	Spencer -----	June 30, 1931
1,986,674	Gernandt -----	Jan. 1, 1935
2,032,902	Bachle -----	Mar. 3, 1936
2,183,035	Weber et al. -----	Dec. 12, 1939
2,190,630	Weber et al. -----	Feb. 13, 1940
2,435,659	Summers -----	Feb. 10, 1948
2,453,377	Lozivit -----	Nov. 9, 1948

FOREIGN PATENTS

Number	Country	Date
225,846	Great Britain -----	Apr. 29, 1946