

LOUIS JULES JEAN-BAPTISTE LE ROND.
THERMIC MOTOR.

APPLICATION FILED FEB. 25, 1908.

1,099,149.

Patented June 2, 1914.

2 SHEETS--SHEET 1.

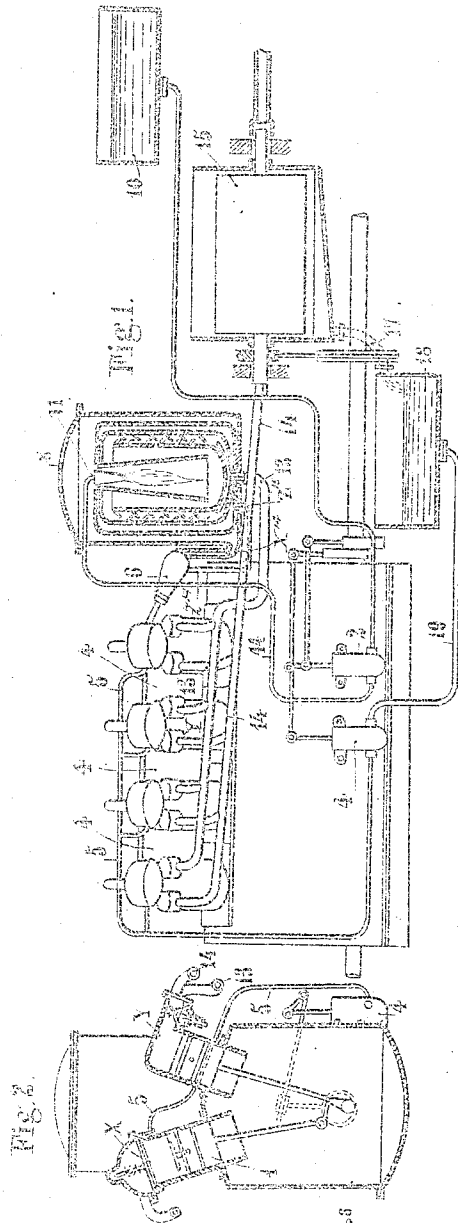


Fig. 1.

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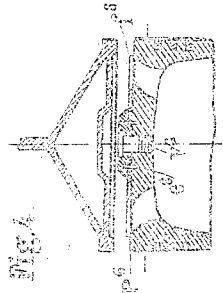


Fig. 2.

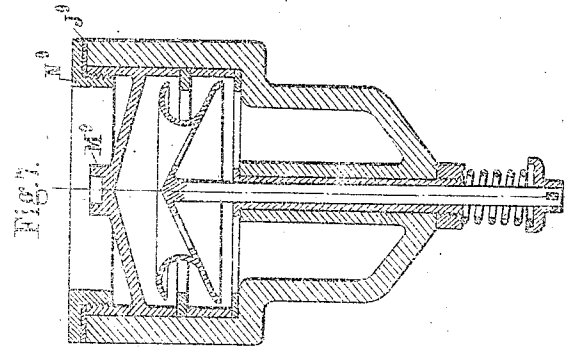


Fig. 3.

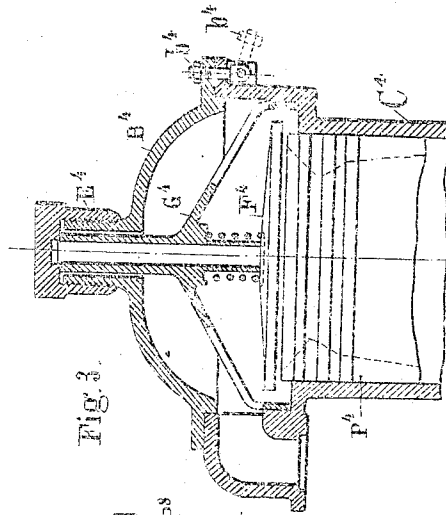


Fig. 4.

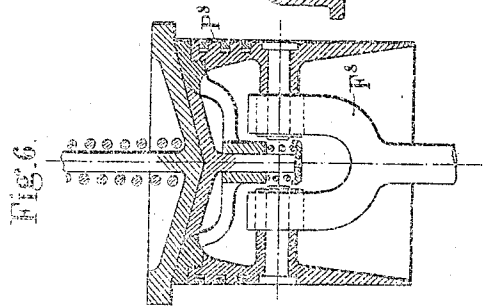


Fig. 5.

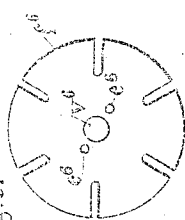


Fig. 6.

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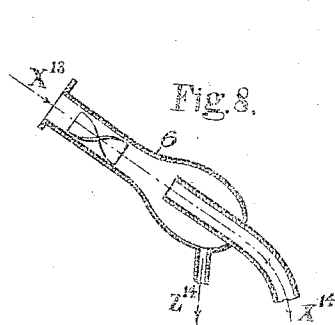


Fig. 8.

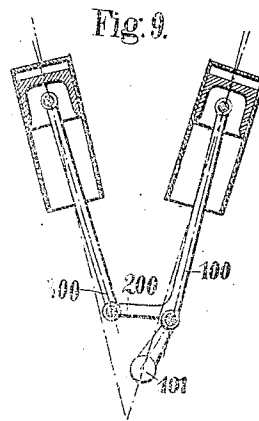


Fig. 9.

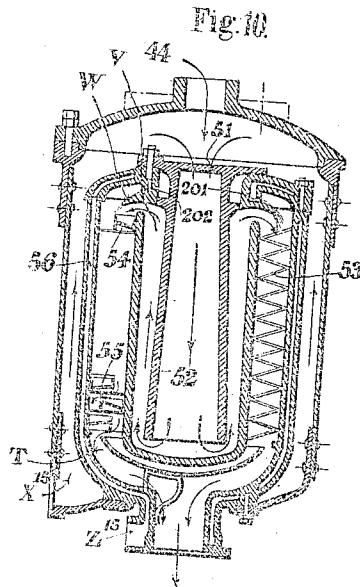


Fig. 10.

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UNITED STATES PATENT OFFICE.

LOUIS JULES JEAN-BAPTISTE LE ROND, OF PARIS, FRANCE.

THERMIC MOTOR.

1,099,149.

Specification of Letters Patent.

Patented June 2, 1914.

Application filed February 25, 1903. Serial No. 417,722.

To all whom it may concern:

Be it known that I, Louis J. J.-B. Le Rond, of Paris, France, have invented certain new and useful Improvements in Thermic Motors, of which the following is a specification.

This invention relates to thermic motors, and more especially to those of the internal combustion type adapted to the use of motor vehicles.

The object of the invention is to provide such a motor of comparatively light weight, small compass, simple construction, and great economy of operation.

For this purpose the invention consists of a thermic motor comprising a combustion-chamber, a compressor, a motor, means for conducting compressed air from the compressor to the combustion chamber, means for conducting water from the compressor to the combustion chamber, means for conducting the gases of combustion from the combustion chamber to the motor, and in the necessary pumps and separators for conveying and separating the gaseous and vapor mixtures, and the water and fuel.

In a prior application filed by me on or about January 21, 1903, for improvements in recuperating cycles for steam and other engines, under Serial No. 413,565, I have described and claimed the new recuperating cycle which is carried out in the apparatus herein illustrated. The said former application is limited to the process or cycle referred to, and no claims are therein made upon the apparatus by which it is carried out. In the present application no claims are made to the recuperating cycle, and the apparatus or thermic motor only is claimed herein.

In the accompanying drawings, Figure 1 is a side-view, partly in section, of a motor embodying my invention, Fig. 2 is a vertical transverse section through a pair of the motors and compressors, Fig. 3 is a vertical section on a larger scale of the upper end of one form of compressor, Fig. 4 shows another form of compressor valve, Fig. 5 is a top view of the valve plate shown in section in Fig. 4, Fig. 6 is a vertical section through the piston head of a compressor, Fig. 7 shows in vertical section another form of valve, Fig. 8 is a vertical section of a steam or water vapor separator. Fig. 9 is a vertical elevation showing in diagram the connection on the same shaft and with each other of the motor and compressor. Fig. 10

is a vertical section through a modified form of combustion chamber.

Similar letters of reference indicate corresponding parts.

The combustion chamber 8 is of the closed type, and from the same pass by tube 13 the gases of combustion from the downwardly-directed flame to the motor cylinders Y. These gases carry with them water vapor or steam, from the combustion chamber. This water vapor is by the expansion in the motor cylinder condensed, and passes by pipe 14 to a centrifugal separator 15. The spent gases of combustion pass out from the separator to the atmosphere. The condensed water from the separator passes by pipe 17 to reservoir 18, thence by tube 19 to an injection pump 4 actuated by any suitable mechanism (not shown) from the motor, whence it is forced by the pump through pipe 3 to the compressors X. In the compressors it is injected at such times and in such manner as to take up the heat of compression of the compressed air, and the mixture of air and hot water passes through a separator 6 between the compressors and the combustion chamber 8. The hot water passes by pipe 21 to the combustion chamber which it enters at 22, and in the same is conducted through suitable openings at the top of the same onto baffle plates shown in Fig. 1 at each side of the chamber, over which it trickles to the lower part of the chamber. On the baffle plates it is intimately mixed with and vaporized by the heat of the products of combustion of the flame, and passes then with said gases of combustion in the manner before described, out the bottom of the combustion chamber and thence to the motors. The mixture of gas and condensed water exhausted from the motors is received in the centrifugal separator 15, in which the water is separated by centrifugal force. The water collecting in the separator is conveyed to the water reservoir, thus completing the cycle of operation. The compressed air enters the combustion chamber 21 by pipe 21, and passes to the burner 11, where it serves to support the combustion of the flame. Liquid fuel is contained in the tank 10, and flows from the same to a pump 2, whence it is forced through pipe 41 to the burner.

It is essential that the compressor be particularly effective, and for this purpose valves of various types may be employed,

affording no lost space or clearance, and such valves are shown in the Figs. 3, 4, 5, 6 and 7.

In Fig. 3, the cap E¹ retains on the compressor head B¹ the spider G¹. The head is connected to the cylinder C¹ by swinging bolts D¹. The upper end of the piston head P¹ contacts with the spring-actuated valve head F¹.

In the structure shown in Figs. 4 and 5, the valve f² is made of thin metal, which offers advantages owing to its very small mass. The valve consists of a disk radially slotted at its periphery and held in place on the upper end of the piston by a screw v². Pins c² in the piston-head prevent rotation of the valve, so that the radial slots of the same are retained opposed to solid portions of the piston, the piston being provided with passages for the entering fluid, as shown.

In the construction shown in Fig. 6, the piston-head P³ has a conical upper end with a conical valve. The piston-rod is bifurcated at its upper end P³, as indicated, to provide space for the valve-stem.

In the construction of double valves shown in Fig. 7, the upper seat is held in place by a cap M³. A screw-ring N³ enables an airtight joint to be obtained by compressing a packing-ring J³.

The separator 6 is shown in Fig. 8, in detail in which the mixture of compressed air and water enters in the direction of the arrow at X¹¹, is separated by the spiral baffle, and the air passes off at X¹¹ and the water at Z¹¹.

The desired relative arrangement of operation of the motor and compressor working on a single shaft may be obtained as illustrated in Fig. 9, in which 100 indicates the motor piston rod, 300 is the piston rod of the compressor, and a lug or bracket connection 200 at the proper angle (preferably 92 degrees) connects the two rods so as to obtain their joint operation, around the shaft 101.

In Fig. 10 is indicated a modified form of combustion chamber which may be used with good economy, this chamber being of the general type shown in Fig. 1, and having baffle-plates of any desired design, of which a complete set is shown at one side, and an incomplete set of a different form is indicated at the opposite side of the chamber. In this combustion-chamber the compressed air separated at X¹⁴ (Fig. 8) enters at X¹⁵ (Fig. 10). The water separated at Z¹⁴ (Fig. 8) enters at Z¹⁵ (Fig. 10). The combustible enters by tube 44 (Fig. 1) into burner 51 situated at the center of a diverging cone 52. The combustible gases which are mixed with air, after being burned, pass out around the diverging cone, in larger and larger section, into the upper part of the surrounding annular space V, whence they descend, traversing the baffles

53, 54, 55, having either of the forms shown in Fig. 10. The water entering at Z¹⁶ follows the conduit 56, and issues through openings 201, 202, on an annular rim W at the upper part of the burner. The water descends with the gas and traverses the baffles, which form alternately directed gutters, the gas escaping from these and traversing the falling water. The contact is accordingly very intimate and the vaporization of the water proceeds rapidly. The lower part of the combustion chamber receives a small amount of water not vaporized, which enters a basin T or other receptacle, in which it is exposed to the heat of the burner and is immediately vaporized. By this construction of apparatus an intimate mixture of gas and vapor is formed which constitutes the motor fluid. The fluid is conducted to the motor by the tube 13. The scale of Fig. 1 is too small to show the course of the water in the conduit 56, and this conduit is omitted from the figure, but the construction will be understood to be in all respects the same as that shown in full detail in Fig. 10.

It is obvious that changes may be made in the details of construction without departing from the spirit of the invention.

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

1. A thermic motor, comprising a compressor, a combustion-chamber, a motor, means for conducting the air compressed in the compressor to the combustion-chamber, means for injecting a combustible into the combustion-chamber, a reservoir, means for collecting therein the water which is injected in the compressor, separated from the compressed air, and injected in the combustion-chamber, means for conducting the mixture of burned gases and water vapor to the motor, and means for separating the water of the exhaust and reconducting the same to the reservoir.

2. In a thermic motor comprising a compressor, a combustion-chamber, a motor, means for conducting the air compressed in the compressor to the combustion-chamber, means for injecting a combustible into the combustion-chamber, a reservoir, means for collecting therein the water which is injected in the compressor, separated from the compressed-air, and injected in the combustion-chamber, means for conducting the mixture of burned gases and water vapor to the motor, means for separating the water of the exhaust and reconducting the same to the reservoir, a common crank-shaft, and means operatively connecting the compressor with the motor, and both with said crank shaft.

3. In a thermic motor comprising a compressor, a combustion-chamber adapted to 130

vaporize the entire quantity of water employed; a motor, means for conducting the air compressed in the compressor to the combustion-chamber, means for injecting a combustible into the combustion-chamber, a reservoir, means for collecting therein the water which is injected in the compressor, separated from the compressed air, and injected in the combustion-chamber, means for conducting the mixture of burned gases and water vapor to the motor, and means for separating the water of the exhaust and re-conducting the same to the reservoir.

4. In a thermic motor comprising a compressor, a combustion-chamber, a motor, means for conducting the air compressed in the compressor to the combustion-chamber, means for injecting a combustible into the combustion-chamber, a reservoir, means for collecting therein the water which is injected in the compressor, separated from the compressed air, and injected in the combustion-chamber, means for conducting the mixture of burned gases and water vapor to the motor, means for separating the water of the exhaust, from the gases of the exhaust, means for reconducting the separated water

to the reservoir, and means permitting the escape of the separated gases from the separating means to the atmosphere.

5. In a thermic motor comprising a compressor adapted to expel at each cycle the entire quantity of water and air therein, a combustion-chamber, a motor, means for conducting the air compressed in the compressor to the combustion-chamber, means for injecting a combustible into the combustion-chamber, a reservoir, means for collecting therein the water which is injected in the compressor, separated from the compressed air, and injected in the combustion-chamber, means for conducting the mixture of burned gases and water vapor to the motor, and means for separating the water of the exhaust and reconducting the same to the reservoir.

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

LOUIS JULES JEAN-BAPTISTE LE ROND.

Witnesses:

EMILE LEDRET,
H. A. COXE.