No. 648,914. Patented May 8, 1900.

H. A. BERTHEAU.

VAPORIZER FOR PETROLEUM MOTORS.

(Application filed July 20, 1898.)

(No Model.)

Fig. 1.

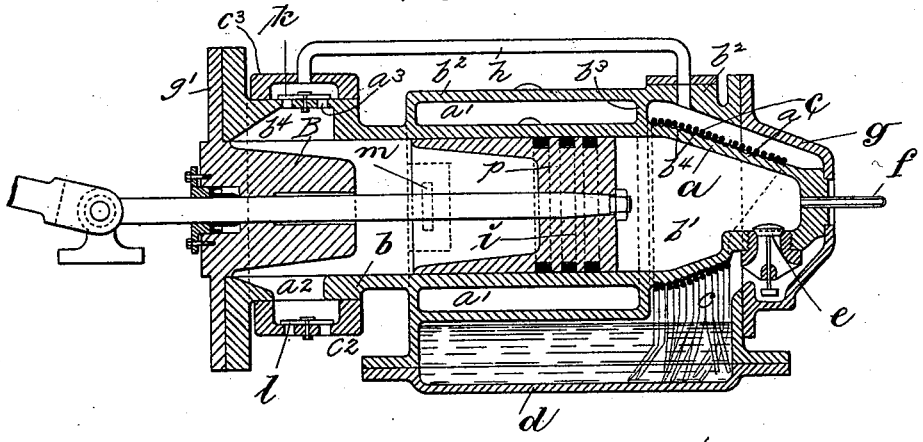


Fig. 2.

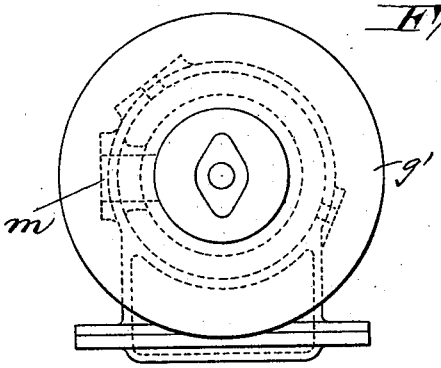
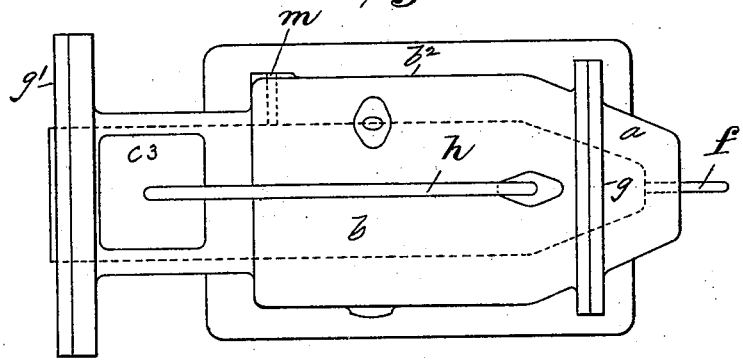


Fig. 3.



Witnesses.
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VAPORIZER FOR PETROLEUM-MOTORS.

SPECIFICATION forming part of Letters Patent No. 648,914, dated May 8, 1900.

Application filed July 20, 1898. Serial No. 686,442. (No model.)

To all whom it may concern:

Be it known that I, HENRIK AUGUST BERTHEAU, engineer, residing at Stockholm, Sweden, have invented Improvements in Vaporizers for Petroleum-Motors, of which the following is a specification.

This invention has relation to hydrocarbon-motors of the kind in which a liquid hydrocarbon is supplied to a vaporizing-chamber to which air is supplied to form with the hydrocarbon vapor an explosive mixture, which is then admitted to the power-cylinder at proper times and ignited. In this class of engines there is provided a suitable feed-conduit connected with the source of liquid-hydrocarbon supply and with the vaporizing-chamber, in which conduit is arranged a valve that controls the supply of hydrocarbon to said vaporizing-chamber, the valve itself being as a rule controlled by the movements of the piston. In motors of this class of great capacity or power, consuming comparatively-large quantities of liquid hydrocarbon, the valve-controlled admission-port for the hydrocarbon is necessarily of considerable cross-sectional area and not liable to be choked either by solid residues of the motive fluid or from other causes. In motors of small power, however, the valve-controlled admission-port is necessarily of comparatively-small cross-sectional area, and practice has demonstrated that this port becomes readily choked, causing considerable trouble and inconvenience.

One of the objects of my invention is to obviate this difficulty by dispensing with a valve-controlled connection between the vaporizing-chamber and the source of motive-fluid supply.

The invention has for its further object to so arrange the vaporizing-chamber as to present to the motive fluid a very great vaporizing-surface, the heat being supplied to the chamber by radiation from the combustion-chamber of the power-cylinder.

The invention has for its further object certain features of construction whereby a portion of the power-cylinder is cooled from within by the air used in the formation of the explosive fluid, whereby said air is heated before its admixture with the hydrocarbon vapor.

In the accompanying drawings, Figure 1 is a longitudinal vertical sectional view of so much of a hydrocarbon-motor as is necessary to a full understanding of my improvements. Fig. 2 is a left end view, and Fig. 3 a top plan view thereof.

In the above drawings, b indicates the power-cylinder, the inner end of which—namely, the combustion-chamber b'—has the form of a frustum of a cone, through the smaller end of which extends the hot tube f for igniting the charges of explosive fluid. The combustion-chamber has a port controlled by a loaded check-valve e, opening inwardly, the load on the valve being so adjusted as to cause it to move off its seat under a partial vacuum formed in the combustion-chamber during the outstroke of the piston and exhaust of the products of combustion. As shown, the power-cylinder is jacketed, the space between the jacket b^2 and cylinder being divided by a partition b^3 into two chambers a and a', encompassing the greater portion of the power-cylinder, a suitable cooling agent, as cold water, circulating through the space a' around that portion of the power-cylinder extending outwardly from the combustion-chamber, while the jacket-space a, surrounding the conical combustion-chamber, serves as an evaporating-chamber. It is obvious that with the construction described a very large evaporating-surface is presented to the liquid hydrocarbon supplied to said chamber. In order that ready access may be had to the evaporating-chamber a, the inner cylinder-head g is constructed in the form of the hollow frustum of a cone, forming the inner end of said combustion-chamber, as clearly shown in Fig. 1.

The power-cylinder b is provided at a suitable point with an exhaust-port m and at its outer end is of increased cross-sectional area, its inner faces converging to the outer cylinder-head g', forming a chamber b^4, having the form of the frustum of a cone.

In the enlarged outer portion of the cylinder b are formed two ports a^2 a^3 at diametrically-opposite points leading into suitable valve boxes or casings c^2 c^3. The valve-casing c^2 has inlet port or ports controlled by a check-valve l, opening inwardly, while the outlet port or ports a^3 are controlled by a check-valve k, opening outwardly, both valves being gravity-valves. The valve-casing c^3 is

connected by pipe *h* with the vaporizing-chamber *a*.

From the inner face of the outer cylinder-head *g'* projects a boss B, having the form of a frustum of a cone and fitting a corresponding cavity *i* in the piston *p*.

On the under side of the power-cylinder from near its inner end along the jacket-space *a'* is arranged a reservoir *d* for the liquid hydrocarbon, said reservoir communicating directly with the vaporizing-chamber *a* through a passage of comparatively-large area, the liquid being distributed over the evaporating-surface by means of strips of absorbent material *c*—as, for instance, wicks or the like—suspended from the combustion-chamber *b'* and dipping into the reservoir *d*, or said absorbent material may be wound around the said combustion-chamber, so that the ends thereof will dip into said reservoir, as shown.

Inasmuch as the combustion-chamber *b'* is tapering, the absorbent material is liable under vibratory or jarring movements to crowd toward the inner end of said chamber, and this I avoid by forming circular grooves *b*⁴ in the outer face of the tapering portion of the power-cylinder, as shown in Fig. 1.

In the motor constructed as described a portion of the power-cylinder on one side of the combustion-chamber *b'* is cooled by a cooling agent circulating in jacket-space *a'*, said cooling agent also serving to cool the oil-reservoir, thus preventing undue evaporation of liquid hydrocarbon. The extreme outer end of the power-cylinder is cooled from within by the air used in the formation of the explosive fluid, while the heat radiated from the combustion-chamber is consumed in vaporizing the liquid hydrocarbon and in further heating the air admitted to the vaporizing-chamber, thereby preventing the inner portion of the power-cylinder from becoming unduly heated and utilizing the heat radiated from said portions, as will be readily understood.

The operation of the described motor is as follows, it being assumed that the piston is moving out under the explosive force of a charge of explosive fluid, the air confined in the outer enlarged portion of the working cylinder being compressed, thereby unseating valve *k* and securely holding valve *l* to its seat, the said air being forced into the vaporizing-chamber *a* through outlet-ports controlled by valve *k* and pipe *h*. As the piston uncovers exhaust-port *m* the products of combustion are exhausted, valve *e* is unseated by suction, and a charge of explosive fluid is drawn into the combustion-chamber *b'*. The piston then moves inwardly, covering exhaust-post *m*, unseating air-inlet valve *l*, drawing air into the outer end of the cylinder, and compressing the admitted charge of explosive fluid, which is then ignited, and the described operation is repeated, the motor working as a two-cycle motor.

The extent of the evaporating-surface, as well as the capacity of the means for supplying liquid hydrocarbon thereto, will of course be regulated in accordance with the capacity or dimensions of the motor in such a manner that a sufficient quantity of hydrocarbon will be evaporated, and a sufficient quantity of air will be mixed therewith to form the required quantity of explosive fluid to operate the motor. This of course means that no appliances are provided for the admission of variable quantities of explosive fluid to the power-cylinder, which of course is a fact, nor are such appliances necessary, because the volume of hydrocarbon vapor generated and the volume of air mixed therewith during each reciprocation of the piston are practically constant, resulting in charges of uniform volume drawn into the power-cylinder during each outstroke of the piston. Hence an engine constructed as described is not applicable to the moving of variable loads and is principally designed for pumping and similar work where the load is at all times practically constant.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In a hydrocarbon-motor, a hydrocarbon-reservoir, a vaporizing-chamber surrounding the combustion-chamber, a series of wicks on the latter adapted to convey vaporizable hydrocarbon thereto from said reservoir and means for forcing air across said wicks and feeding the same into the combustion-chamber, substantially as set forth.

2. In a hydrocarbon-motor, a vaporizing-chamber surrounding the combustion-chamber, a hydrocarbon-reservoir forming part thereof, a series of wicks suspended on the combustion-chamber and into the reservoir, means for forcing heated air from the opposite side of the piston across said wicks and feeding the same into the combustion-chamber, substantially as set forth.

3. In a hydrocarbon-motor, a vaporizing-chamber surrounding the combustion-chamber, a gravity-valve controlling communication between the two chambers, a hydrocarbon-reservoir forming part of the vaporizing-chamber, a series of wicks suspended on the combustion-chamber and extending into the reservoir, and means for forcing heated air from the opposite end of the cylinder across the wicks and into the combustion-chamber, substantially as set forth.

4. In a hydrocarbon-motor, a cylinder, a combustion-chamber at one end and air-compressing chamber at the other, an exhaust-port opened and closed by the piston, in combination with a mixing-chamber and a hydrocarbon-reservoir surrounding the combustion-chamber, wicks suspended from said combustion-chamber into the reservoir, and means for conducting compressed air from be-

hind the cylinder through the mixing-chamber into the combustion-chamber, substantially as and for the purpose set forth.

5. In a hydrocarbon-motor, a power-cylinder having an outwardly-tapering combustion-chamber provided with circular grooves in the outer face of its wall, a vaporizing-chamber surrounding said tapering combustion-chamber, a hydrocarbon-reservoir in communication with said vaporizing-chamber, a fibrous absorbent held in the aforesaid grooves and depending from the vaporizing-chamber into the hydrocarbon-reservoir, a valve-controlled passage connecting the aforementioned two chambers, and means for admitting air to the vaporizing-chamber, for the purpose set forth.

In witness whereof I have hereunto set my hand in presence of two witnesses.

HENRIK AUGUST BERTHEAU.

Witnesses:
KONR. DAHLQVIST,
M. GENBERG.