No. 878,932. PATENTED FEB. 11, 1908.

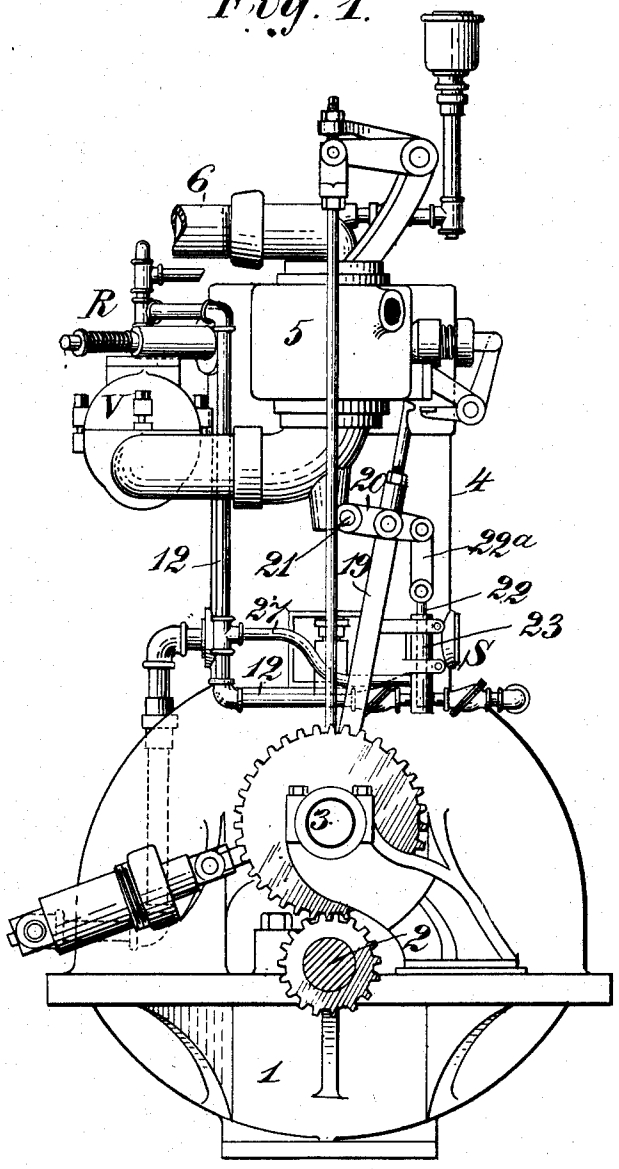
F. W. BRADY.

VAPORIZING DEVICE FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED AUG. 22, 1904.

3 SHEETS—SHEET 1.

Fig. 1.



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No. 878,932. PATENTED FEB. 11, 1908.

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VAPORIZING DEVICE FOR INTERNAL COMBUSTION ENGINES.

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3 SHEETS—SHEET 2.

Fig. 2.

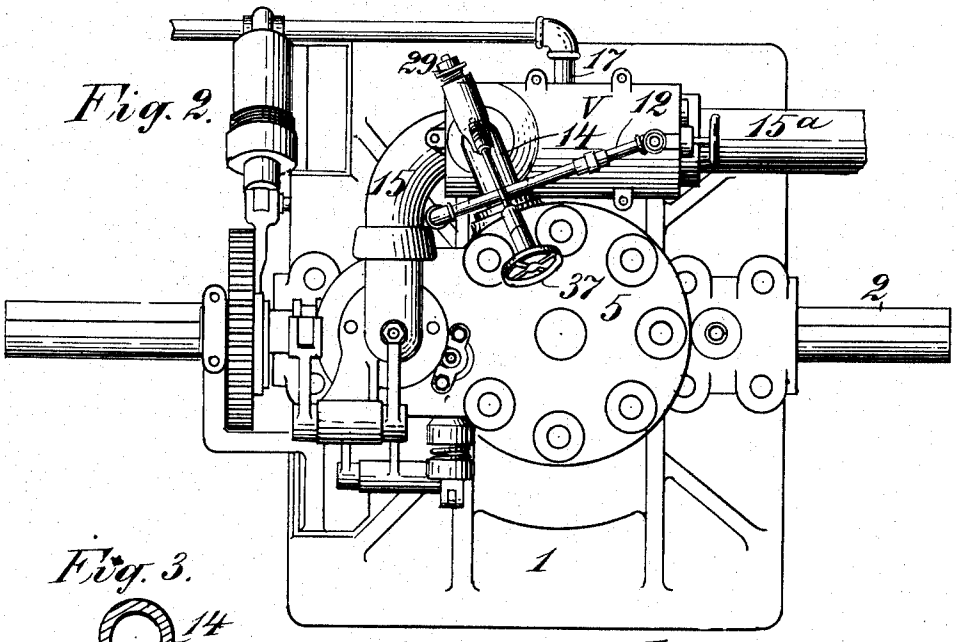


Fig. 3.

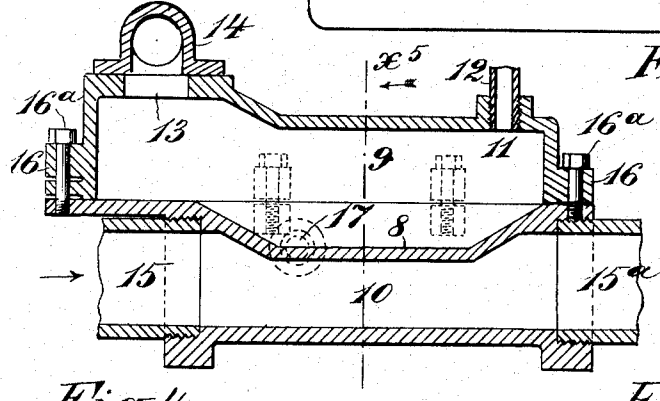


Fig. 5

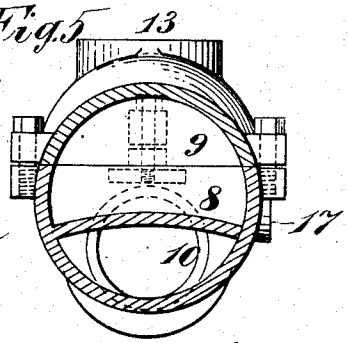


Fig. 4.

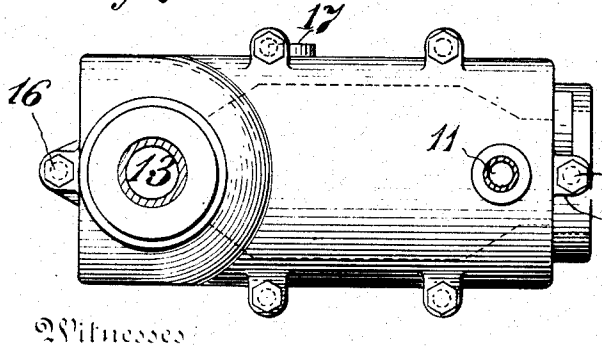
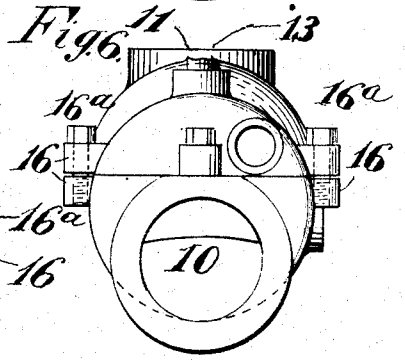


Fig. 6.



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No. 878,932. PATENTED FEB. 11, 1908.

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VAPORIZING DEVICE FOR INTERNAL COMBUSTION ENGINES.

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3 SHEETS—SHEET 3.

Fig. 7.

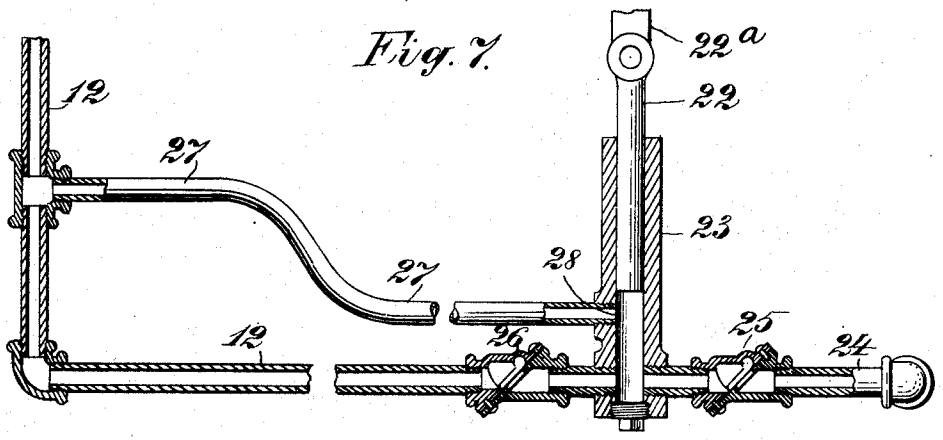


Fig. 8.

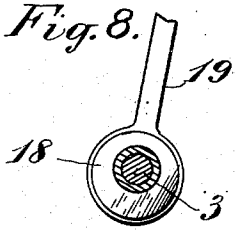


Fig. 11.

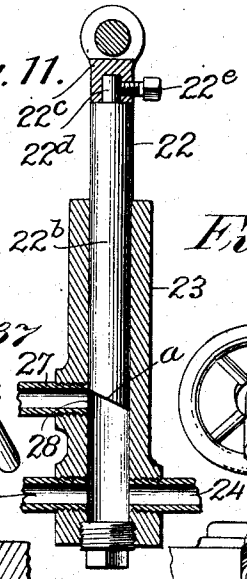


Fig. 10.

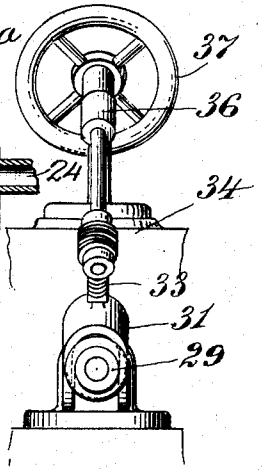
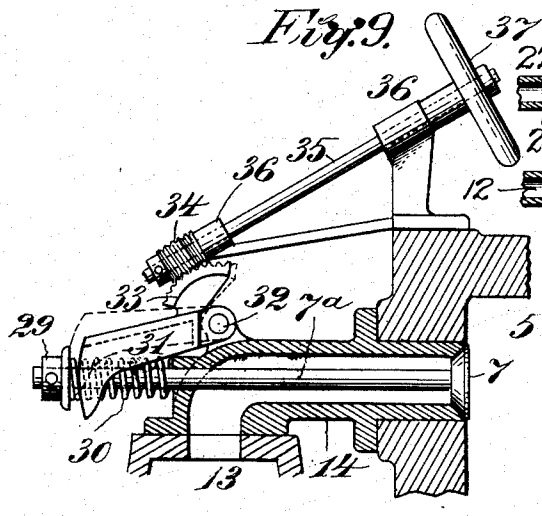


Fig. 9.



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UNITED STATES PATENT OFFICE.

FRANCIS W. BRADY, OF ENGLEWOOD, NEW JERSEY.

VAPORIZING DEVICE FOR INTERNAL-COMBUSTION ENGINES.

No. 878,932. Specification of Letters Patent. Patented Feb. 11, 1908.

Application filed August 22, 1904. Serial No. 221,661.

To all whom it may concern:

Be it known that I, FRANCIS W. BRADY, residing at Englewood, in the county of Bergen and State of New Jersey, a citizen of the United States, have invented certain new and useful Improvements in Vaporizing Devices for Internal-Combustion Engines, of which the following is a specification.

This invention relates to vaporizing devices for that class of internal combustion or explosive engines wherein the heavy hydrocarbon oil employed in producing the explosive charge, is vaporized by heat before its admission to the combustion chamber of the engine, and the object of the present invention is to improve such vaporizing devices so that a measured quantity of hydrocarbon oil is fed to, and vaporized by the vaporizer at intervals, such measured quantity of oil being sufficient when vaporized, to supply a charge for the engine; and so that clogging of the vaporizer, premature vaporization and after-drip of the oil is prevented.

To this end my vaporizing device is so constructed that a measured quantity of oil is forcibly projected onto a heated vaporizing surface at intervals and after each projection of the oil, a back-draft is created through the oil feed port and the oil in the feed pipe is withdrawn from proximity thereto.

In order that my invention may be clearly understood I have illustrated and described it in connection with a combustion engine of my own design, but it will be understood that my improved vaporizing devices are applicable to many different types of the internal combustion engines.

In the accompanying drawings, which illustrate an embodiment of the invention—Figure 1 is a side elevation of the engine on a relatively small scale, and Fig. 2 is a plan of the same. These are general views showing the application of the invention to an engine. Figs. 3 to 6 are views of the vaporizer; Fig. 3 being a longitudinal axial section; Fig. 4 a plan; Fig. 5 a cross-section at x^5 in Fig. 3, and Fig. 6 an end view. Fig. 7 is an enlarged sectional view of the device for supplying the liquid to the vaporizer. Fig. 8 is a view showing the eccentric which operates the liquid-supplying mechanism. Fig. 9 is an enlarged view of the device for regulating the extent of movement of the vapor-valve of the vaporizer; and Fig. 10 is an end view of the same as seen from the left in Fig. 9. Fig. 11 is a view showing a means for varying the cut-off in the liquid-supplying mechanism.

Referring primarily to Figs. 1 and 2—1 designates the bed-plate of the engine; 2 the main shaft; 3 the cam-shaft, driven by suitable gears from the main shaft at one half of the speed of the latter; 4 the engine cylinder; 5 the combustion chamber; 6 the air inlet; V the vaporizer as a whole; S the means for supplying the combustible liquid to the vaporizer, and R the means for regulating the valve which admits the vapor to the combustion chamber of the engine.

The vaporizer, as shown in Figs. 3 to 6, is elongated and nearly cylindrical, being divided by a partition 8, into an upper vaporizing chamber 9, and a lower flue 10, for the hot products of combustion from the engine. The partition 8 is depressed at its middle part, as clearly shown in Fig. 3, to form a sort of tray or receptacle for the liquid hydrocarbon which enters at an inlet 11, from a pipe 12. The vapor passes off at an outlet 13, and thence through a pipe 14 to the combustion chamber of the engine. The exhaust pipe 15 of the engine connects with the flue 10 at the left in Fig. 3, and the exhaust gases, after passing through the flue, escapes at the pipe 15^a. For convenience of casting, and to facilitate cleaning the chamber 9, the vaporizer is cast in two parts or sections provided with lugs 16 to receive securing screws 16^a. At the side of the vaporizer is a pipe 17 for draining the chamber 9.

The combustible liquid is supplied to the vaporizer by the means which will now be described with special reference to Figs. 1, 7 and 8.

On the cam-shaft 3 is an eccentric 18 (Fig. 8) which is embraced by a yoke on an eccentric-rod 19; and this rod is pivotally connected with a lever 20, fulcrumed at 21. This lever is coupled to the plunger 22, of a pump 23, by a link 22^a. It may be stated here that it is the object of this pump to deliver at each stroke a predetermined quantity of liquid to the vaporizer; to draw away the liquid at the liquid inlet 11, to the vaporizing chamber, at each suction stroke, and to deliver the liquid into said chamber with force, so as to in some degree spray it. With these objects in view the pump has a stroke and capacity in excess of that required for the de-

livery at each stroke, of the predetermined amount of liquid, as will be seen from the following description.

Referring especially to Fig. 7,—24 is a pipe which supplies the combustible liquid to the pump 23, and in it is a check-valve 25. The outlet or delivery pipe 12, which supplies the liquid to the vaporizer, has in it a check-valve 26. So far as described the operation would be the same as, or very similar to that of an ordinary plunger pump; but in order that the plunger may, at a point in its outstroke, cease to draw in liquid from the pipe 24 and take in liquid from the pipe 12 for the remainder of its outstroke, a pipe 27 connects the pipe 12 with the body of the pump at a port 28, which may be at any predetermined point above the normal inlet and outlet. The operation then is as follows: The plunger, at the end of its down or instroke, will be just above the normal inlet and outlet and will close the port 28 leading to the pipe 27; and on its suction or outstroke it will first take in liquid through the pipe 24. When, however, the plunger uncovers the port 28 and continues to move back or up, the liquid will be drawn in at this port from the delivery pipe 12, the influx from pipe 24 ceasing. The suction thus created through the pipe 12 creates a back draft through the fuel inlet port of the vaporizer and withdraws the oil in that pipe from the point where vaporization takes place from the heat. When the plunger descends, or makes its instroke, the liquid in the pump chamber is forced out through the pipes 12 and 27, the amount thereof being the predetermined amount plus the amount drawn in from the delivery pipe 12. Obviously, with a given diameter of the pump-chamber, and a given stroke of the plunger, the theoretical amount of the liquid actually delivered at each stroke of the pump will be governed by the distance the plunger travels in making its outstroke before it uncovers the port 28, and this distance may be governed by disposing this port at any point desired in the pump-body.

Figs. 9 and 10 illustrate the means employed for regulating the degree or extent of opening of the valve 7 which admits the vapor to the combustion chamber of the engine from the vaporizing chambers. The stem 7^a of this valve extends back through the pipe 14 and out through the wall of same, where it is provided with a head 29, that bears on the outer end of a spring 30, which holds the vapor-valve closed yieldingly. In order to limit the extent of opening of this valve when the piston draws in a charge of vapor, a stop-detent 31 is employed, this detent being pivoted or hinged at 32 and having its free end so disposed as to engage the head 29 on the valved stem. The hinge 32 is disposed at one side of the axis of movement of the stem, and the broad end of the detent is made convex by a curve drawn from the point 32 as a center, so that by swinging or moving the detent about its hinge-axis in one direction or another, the extent of movement of the vapor-valve may be varied. This is indicated by dotted lines in Fig. 9. To adjust this stop-detent with delicacy, it is provided with a rack 33, which is engaged by a worm 34, on a stem 35, mounted rotatively in bearings 36 on the cylinder and provided with a hand-wheel 37.

As before stated, in the liquid-supplying device or mechanism the port 28 may be disposed at any point desired for the cut-off by the plunger; but this cut-off point may be made variable if desired. In Fig. 11 one means of doing this is illustrated. The plunger 22^b is made axially rotative in a socket-piece 22^c, coupled to the operating link, the plunger having a tenon 22^d, which may be secured by a set-screw 22^e. The lower end of the plunger is cut obliquely, at *a*, and by turning the plunger axially. this obliquely cut end may be made to open or close the port 28 earlier or later, as desired.

Having thus described my invention, I claim—

1. In a vaporizer for internal combustion engines, a fuel port, means for feeding fuel through the port into the vaporizer at intervals, and means for creating a back-draft through the port after the fuel feed.

2. In a vaporizing apparatus for internal combustion engines, a fuel port, a fuel supply pipe communicating with said port, means for feeding fuel through said pipe and port at intervals, and means for withdrawing the fuel in the pipe from proximity to the port after the fuel feed.

3. In a vaporizer for internal combustion engines, a heated vaporizing surface, a fuel port, means for feeding through the port and onto said surface at intervals, a quantity of liquid hydrocarbon and means for creating a back draft through said port after each fuel feed.

4. In a vaporizing apparatus for internal combustion engines, a vaporizing chamber, a fuel inlet port therein and a fuel pump having an eduction port communicating with the fuel inlet port in the vaporizing chamber, a fuel induction port in the pump and means for relieving the suction through said fuel induction port during part of the suction period of the pump.

5. In a vaporizing apparatus for internal combustion engines, a vaporizing chamber, a fuel inlet port therein, and a fuel pump having a pump chamber, a plunger moving therein, an eduction port in said pump chamber communicating with the inlet port in the vaporizing chamber, an induction port in said pump chamber for the admission of fuel, a second induction port in said chamber and means for opening the second induction port

during the outward movement of the pump plunger to relieve the suction through the fuel induction port.

6. In a vaporizing apparatus for internal combustion engines, a vaporizing chamber, a fuel inlet port therein, and a fuel pump having an eduction port, a fuel feed pipe connecting the eduction port of the pump with the fuel inlet port of the vaporizing chamber, a fuel induction port in the pump, a second induction port in the pump, a pipe connecting the second induction port with the said fuel feed pipe, and means for opening the second induction port at a predetermined time during the suction period of the pump to relieve the suction through the fuel induction port of the pump and withdraw the fuel from proximity to the fuel inlet port of the vaporizing chamber.

7. In a vaporizing apparatus for internal combustion engines, a vaporizing chamber, a fuel inlet port therein and a fuel pump having an eduction port communicating with the fuel inlet port in the vaporizing chamber a fuel induction port in the pump and adjustable means for relieving the suction through said fuel induction port during part of the suction period of the pump.

8. In a vaporizing apparatus for internal combustion engines, a vaporizing chamber, a fuel inlet port therein, and a fuel pump having a pump chamber, a plunger moving therein, an eduction port in said pump chamber communicating with the inlet port in the vaporizing chamber, an induction port in said pump chamber for the admission of fuel, and a second induction port in said chamber and adjustable means for opening the second induction port during the outward movement, of the pump plunger to relieve the suction through the fuel induction port.

9. In a vaporizing device for internal combustion engines, a vaporizing chamber, a fuel inlet port therein, a fuel pump having a plunger, a chamber in which said plunger reciprocates, an eduction port in the pump chamber, a fuel feed pipe connecting the eduction port of the pump with the fuel inlet port of the vaporizing chamber, a fuel induction port in the pump chamber, a second induction port opening into the side of the pump chamber in a position to be opened by the outward movement of the pump plunger, and a pipe connecting the second induction port with the said fuel feed pipe, whereby the second induction pipe is opened at a predetermined point in the suction stroke of the pump, to relieve the suction through the fuel induction port and withdraw the fuel from proximity with the fuel inlet port of the vaporizing chamber.

10. In a vaporizing device for internal combustion engines, a vaporizing chamber, a fuel inlet port therein, a fuel pump, a plunger for said pump having a beveled end, a chamber in which the plunger reciprocates, an eduction port in the pump chamber, a fuel feed pipe connecting the eduction port of the pump with the fuel inlet port of the vaporizing chamber, a fuel induction port in the pump chamber, a second induction port opening into the side of the pump chamber in a position to be uncovered by the outward movement of the pump plunger, the pump plunger being so supported that it can be rotated to vary the point at which it uncovers the second induction port.

In witness whereof I have hereunto signed my name this 10th day of August 1904, in the presence of two subscribing witnesses.

FRANCIS W. BRADY.

Witnesses:

HENRY CONNETT,

BENJAMIN H. HOLT.