No. 764,614. PATENTED JULY 12, 1904.

G. F. MURPHY.

EXPLOSIVE ENGINE.

APPLICATION FILED MAY 28, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 2.

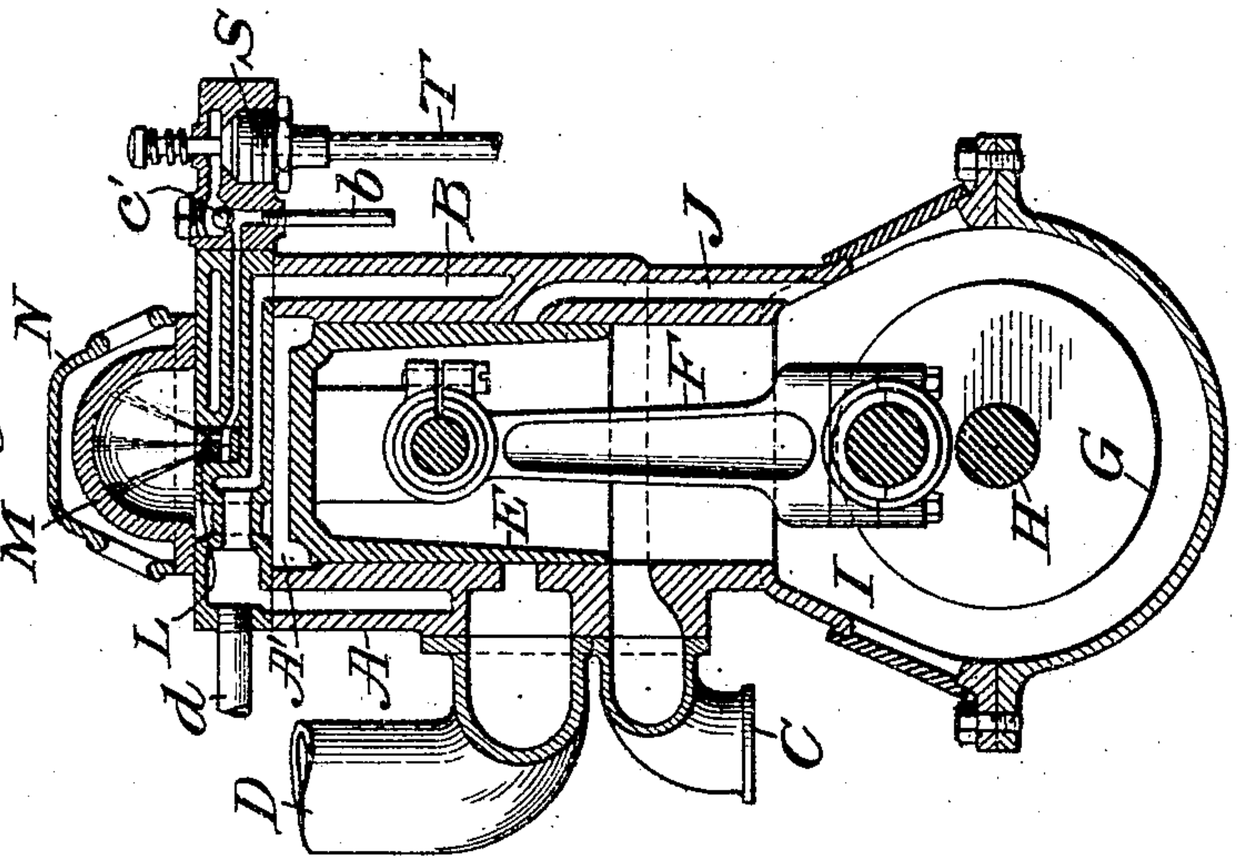
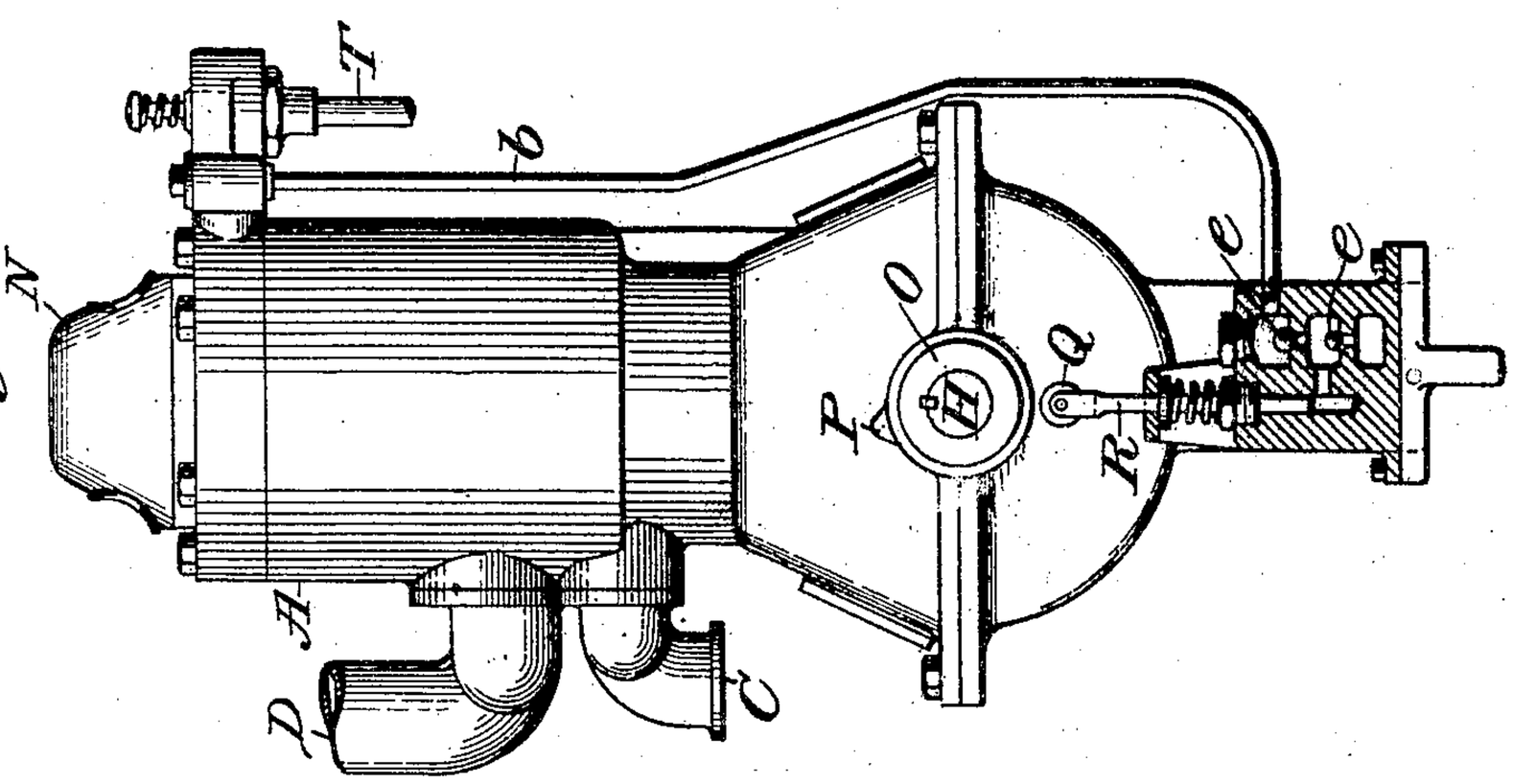


Fig. 1.



Witnesses
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NO MODEL. 2 SHEETS—SHEET 2.

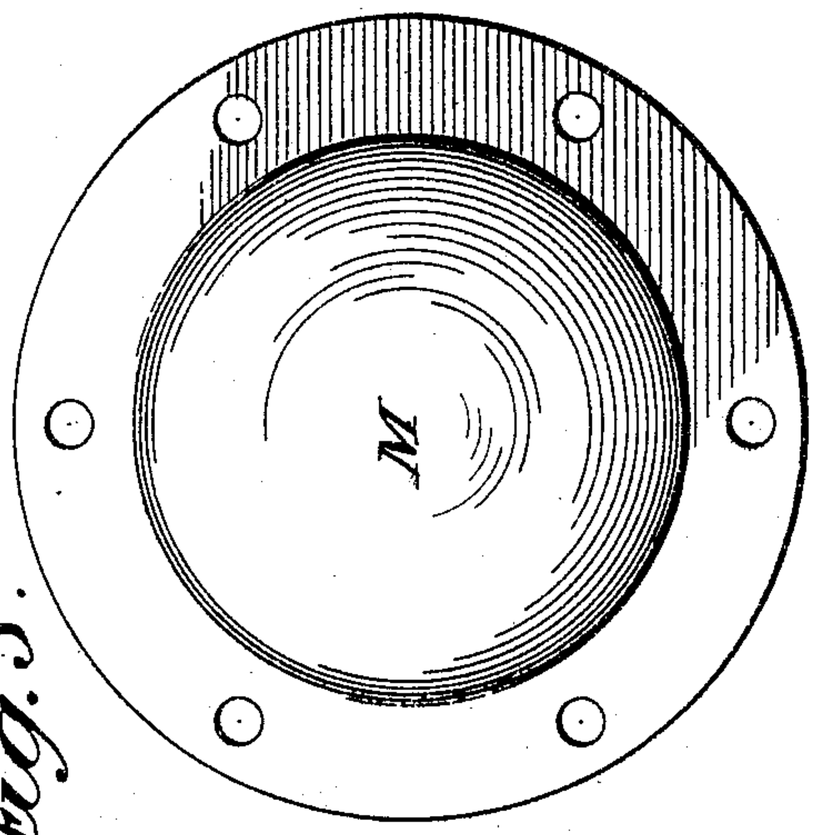

Fig. 5.

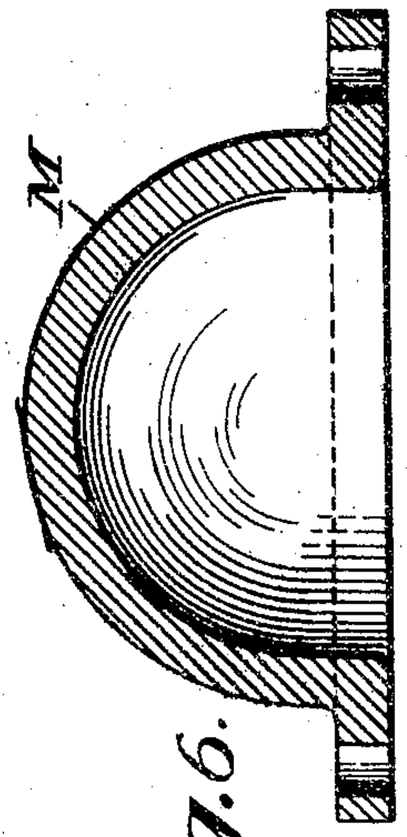

Fig. 6.

Fig. 3.

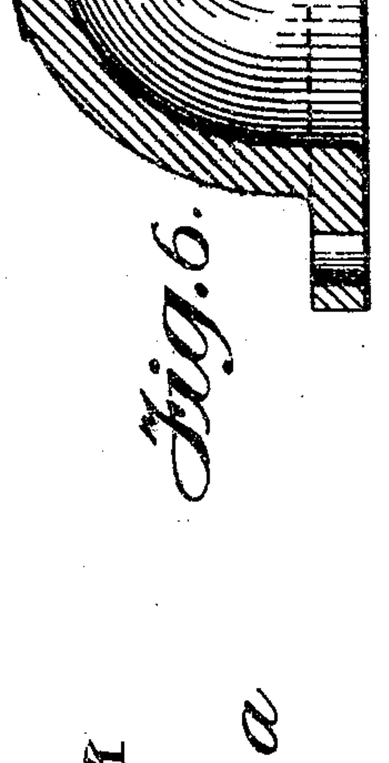

Fig. 4.

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No. 764,614. Patented July 12, 1904.

UNITED STATES PATENT OFFICE.

GEORGE FRANCIS MURPHY, OF NEW YORK, N. Y.

EXPLOSIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 764,614, dated July 12, 1904.

Application filed May 28, 1903. Serial No. 159,060. (No model.)

To all whom it may concern:

Be it known that I, GEORGE FRANCIS MURPHY, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Explosive-Engines, of which the following is a specification.

My invention relates to explosive-engines, especially to the class in which the material mixed with air to form the explosive compound is introduced into the vaporizing and combustion chamber in the form of a liquid.

It relates particularly to a new and improved construction of sprayer for the combustible mixture and to the vaporizing-chamber coöperating with said sprayer, the construction and arrangement of these two elements being such that a thorough vaporization of the said mixture will be effected.

In the drawings, Figure 1 shows an elevation of a single-cylinder engine, a portion of the oil-feed being in section; Fig. 2, a vertical section through the working parts of the engine; Fig. 3, a top view of the sprayer when the vaporizing and combustion chamber is removed; Fig. 4, a vertical section through the liquid-sprayer; Fig. 5, a top view of the semispherical vaporizing and combustion chamber; Fig. 6, a central vertical section of the vaporizing and combustion chamber.

The cylinder A is of the ordinary construction, except as hereinafter explained, surrounded by the water-jacket B, with an air intake C and exhaust D. Within the inner cylinder A′ moves the trunk-piston E, operated by the pitman F, eccentrically mounted on the crank-disk G, carried by the shaft H. The intake communicates with the chamber I, whence the air passes at the proper moment through the channel J to the cylinder A′. Bolted to the top of the cylinder A is a circular disk K, carrying the sprayer L, provided with numerous orifices *l*, the sprayer being centrally located in the cylinder A′ and spraying the liquid in the direction of travel of the piston and also distributing it radially against the walls of the semispherical combustion and vaporizing chamber M, attached to the disk K. The advantages of spraying the liquid radially against my semispherical vaporizer are that the liquid being brought in a finely-divided state into contact with the whole heated surface of the vaporizer a greater gasifying effect is produced from the sprayed liquid, a greater efficiency is attained, and less carbonization takes place. Moreover, the liquid being sprayed radially into the compressed air in the semispherical vaporizer the particles of the liquid and air are thoroughly commingled into a uniform explosive mixture. Above and around the chamber M may be placed a heat-retaining chamber N, provided with torch-holes for preliminarily heating the walls of chamber M. The sprayer L, centrally located as regards the cylinder A′ and the vaporizer M, is supplied with liquid through the duct *a*, communicating with the pump-line *b*, the exploding gases being prevented from being driven back into the oil-duct by the check-valve *c*. Another function of the check-valve *c* is to hold the liquid back in the duct *a*, which being surrounded by the water-jacket is maintained at a temperature below the vaporizing-point. The check-valve *c* opens against the spring when the liquid is forced by the pump through the oil-duct *a*, but closes when the pump-pressure is removed. The water in water-jacket B also circulates through the disk K, leaving the cylinder by the pipe *d*. I prefer to supply the liquid to the pipe *b* in the manner shown in Fig. 1. On the shaft H is a sleeve O, carrying a cam P. The sleeve O carries a cam P, Fig. 1, which when the engine is running contacts with a wheel Q, carried on a spring-controlled pump-rod R. This combination forces the liquid from the reservoir through the pipe *b*, the flow being controlled by the ball-valves *e*. Communicating with the spray-duct *a* and for the purpose of controlling the oil-supply in case the engine should tend to run too fast I have arranged the spring-seated valve S, which when depressed by a governor-arm (not shown) connects the pipe *b* with the overflow-pipe T, leading back into the oil-tank. In case the engine has two or more cylinders a check-

valve c' is introduced between the pump-pipe b and the governor-controlled valve S. The pump-pipe b maintains the pipe f, which connects the various cylinders constantly full of liquid, and the spring on the valve S being stronger than the spring controlling c the pressure in the duct f will hold down the valve c' until the valve S is depressed, when c' will lift and let the liquid into the pipe T. When the overflow-pipe is opened on account of the engine commencing to race, the liquid passes into the overflow-pipe, the fuel is shut off from the cylinders, and air is pumped thereinto, causing the engine to slow down and to resume its normal speed.

The engine works on the two-cycle principle. On the first half-stroke of the trunk-piston E a partial vacuum is created in the chamber I and the air is compressed above. As soon as the bottom of piston E has passed beyond the air-intake C the air rushes in and being compressed by the backward motion of the piston passes through the channel J into the cylinder A′, where on the next stroke of the piston it is compressed, mixed with the liquid from the sprayer, and the exploding mixture drives back the piston, and so on. In practice I have found the best time for injecting the liquid to be when the piston-rod has slightly passed the dead-point.

Having thus fully described and illustrated my invention, what I claim is—

1. In an explosive-engine, a cylinder having a dome-shaped head, a piston in said cylinder, and a radially-spraying fluid-injector located centrally of said cylinder between the dome-shaped head thereof and the piston, said injector being arranged to direct the fluid away from said piston and spread the same over and against the interior surface of the dome-shaped cylinder-head, whereby a thorough vaporization is effected.

2. In an explosive-engine, a cylinder having a dome-shaped head, a piston in said cylinder, and a radially-spraying, water-cooled fluid-injector located centrally of said cylinder between the dome-shaped head thereof and the piston, said injector being arranged to direct the fluid away from said piston and spray the same over and against the interior surface of the dome-shaped cylinder-head, whereby a thorough vaporization is effected.

3. In an explosive-engine, a cylinder having a dome-shaped head, a piston in said cylinder, a radially-spraying fluid-injector located centrally of said cylinder between the dome-shaped head thereof and the piston, said injector being arranged to direct the fluid away from said piston and spray the same over and against the interior surface of the dome-shaped cylinder-head, whereby a thorough vaporization is effected, and an automatic valve adjacent to said injector for controlling the passage of fluid therethrough.

4. In an explosive-engine, a cylinder having a dome-shaped head, a piston in said cylinder, a radially-spraying fluid-injector located centrally of said cylinder between the dome-shaped head thereof and the piston, said injector being arranged to direct the fluid away from the piston and spray the same over and against the interior surface of the dome-shaped cylinder-head, whereby a thorough vaporization is effected, an automatic valve adjacent to said injector for controlling the passage of fluid therethrough, and a cooling-jacket surrounding said injector and valve.

5. In an explosive-engine, a cylinder having a dome-shaped head, a piston in said cylinder, a cooling-jacket extending transversely across said cylinder between the dome-shaped head thereof and said piston, and a fluid-injector supported by said cooling-jacket centrally of said cylinder, said injector being arranged to direct the fluid away from said piston and spray the same over and against the interior surface of said dome-shaped cylinder-head whereby a thorough vaporization is effected.

6. In an explosive-engine, a cylinder having a dome-shaped head, a piston in said cylinder, a cooling-jacket extending transversely across said cylinder between the dome-shaped head thereof and said piston, and a radially-spraying fluid-injector supported by said cooling-jacket centrally of said cylinder, said injector being arranged to direct the fluid away from said piston and spray the same over and against the interior surface of said dome-shaped cylinder-head, whereby a thorough vaporization is effected.

7. In an explosive-engine, a cylinder having a dome-shaped head, a piston in said cylinder, a cooling-jacket extending transversely across said cylinder between the dome-shaped head thereof and said piston, a radially-spraying fluid-injector supported by said cooling-jacket centrally of said cylinder, said injector being arranged to direct the fluid away from said piston and spray the same over and against the interior surface of said dome-shaped cylinder-head, whereby a thorough vaporization is effected and an automatic valve for said injector also supported and surrounded by said cooling-jacket.

8. In an explosive-engine, a cylinder, a piston in said cylinder, a head attached to said cylinder, said head having a central opening therein, a cooling-jacket formed in said head and extending transversely across the opening through said head, a supply-pipe extending through said cooling-jacket and terminating at the central portion thereof; an automatic valve at the end of said supply-pipe, and a fluid-injector adjacent to said valve and located centrally of said cylinder, said injector having a plurality of inclined discharge-passages directed away from said piston, and a dome-shaped chamber attached to said head above

said injector, whereby the liquid discharged through the inclined passages of said injector impinges against the hot interior surface of said dome-shaped chamber and is thoroughly broken up, vaporized and mixed with air.

9. In an explosive-engine, a cylinder, a piston in said cylinder, a head attached to said cylinder, said head having an opening therein and having a hollow web integral therewith, extending transversely across said opening and constituting a cooling-jacket, a centrally-arranged radially-spraying, fluid-injector supported and surrounded by said cooling-jacket, and a dome-shaped chamber attached to said head above said injector, whereby the fluid discharged by said injector is sprayed over and against the interior surface of said dome-shaped chamber and a thorough vaporization thereof is effected.

Signed at New York, in the county of New York and State of New York, this 27th day of May, A. D. 1903.

GEORGE FRANCIS MURPHY.

Witnesses:

CHAS. S. MURPHY,

A. STETSON.