No. 672,500. Patented Apr. 23, 1901.

F. VAN DUZEN.

VAPORIZING DEVICE FOR CRUDE OIL EXPLOSIVE ENGINES.

(Application filed Mar. 17, 1900.)

(No Model.) 2 Sheets—Sheet 1.

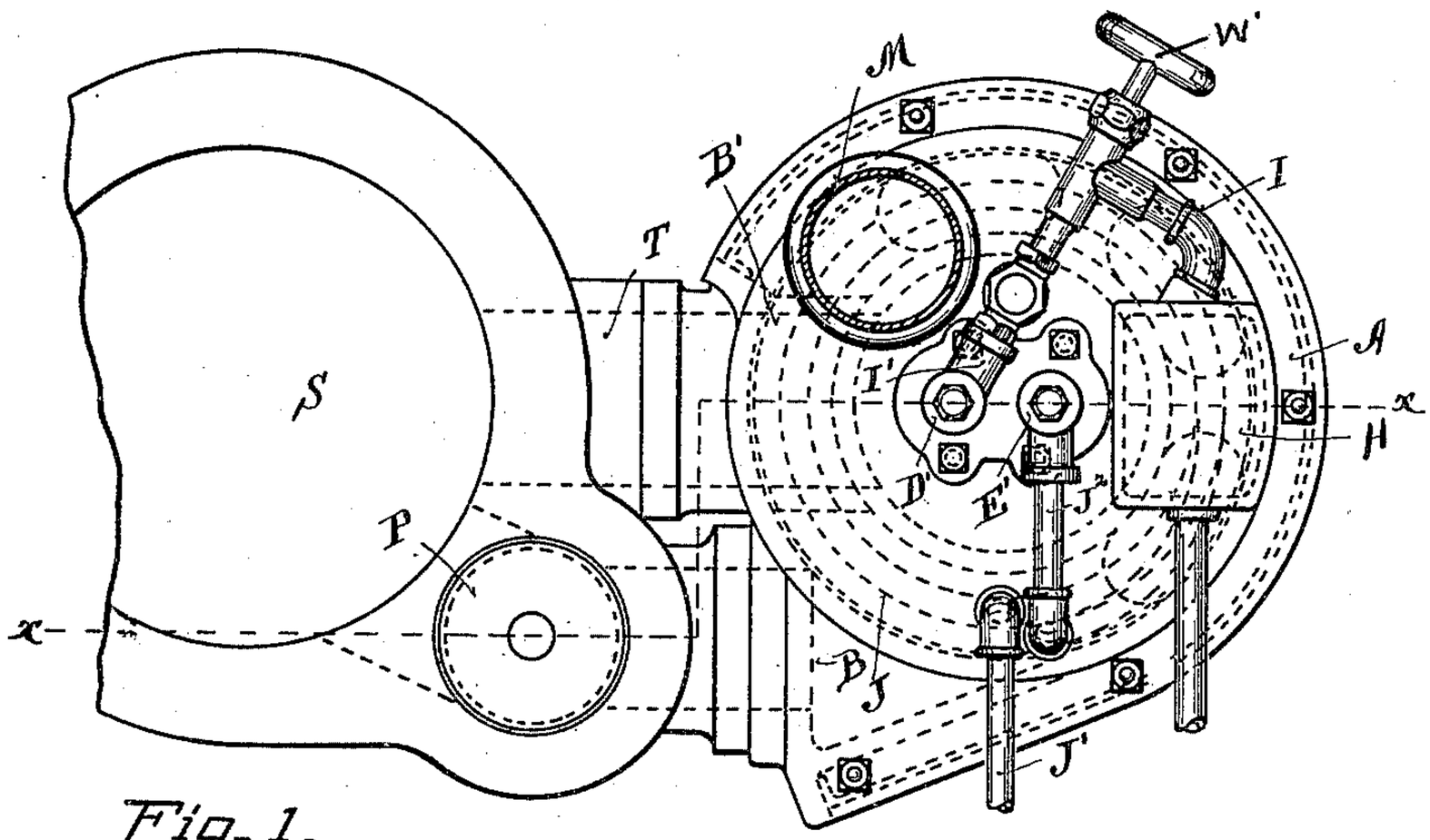

Fig. 1.

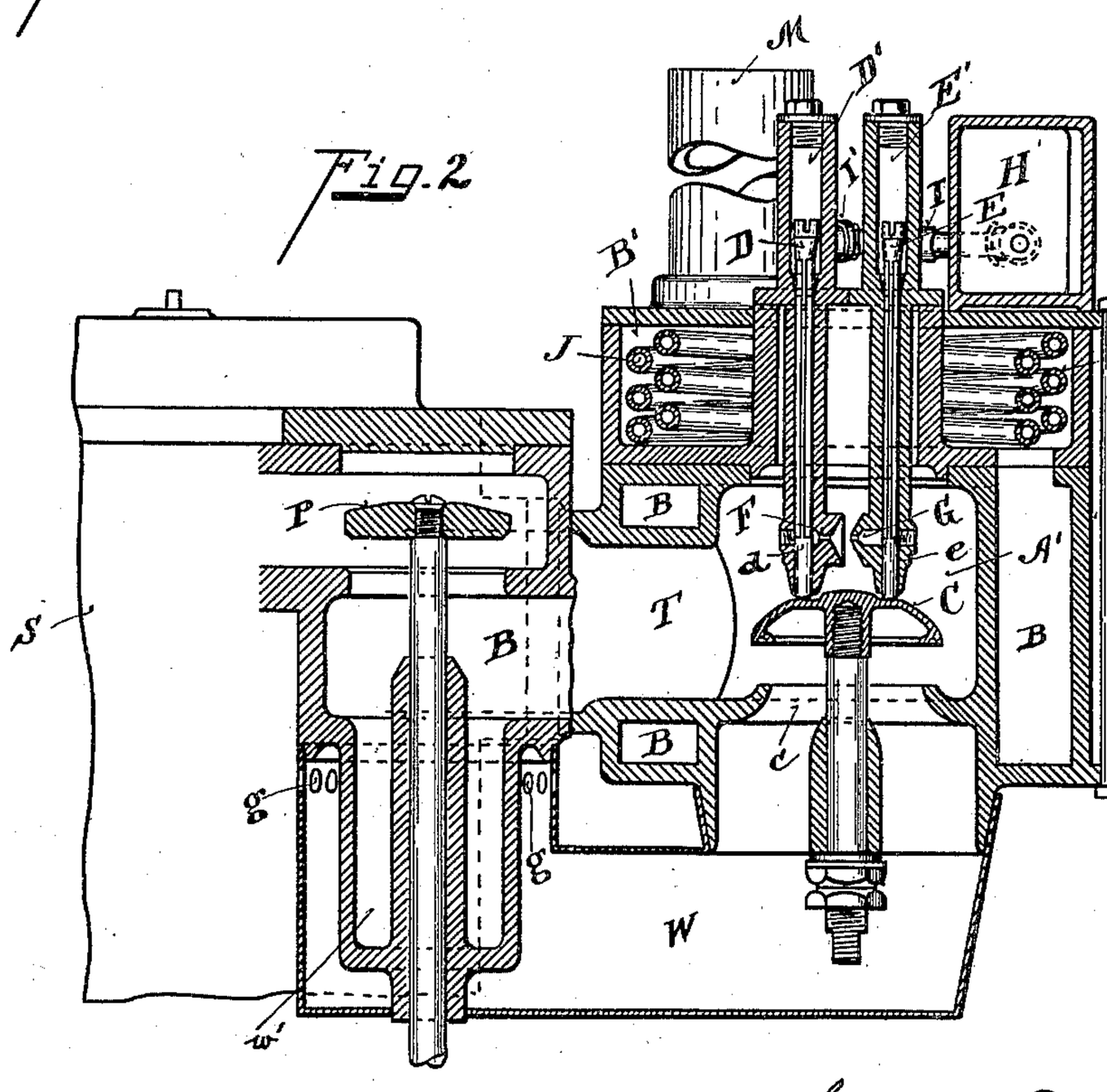

Fig. 2.

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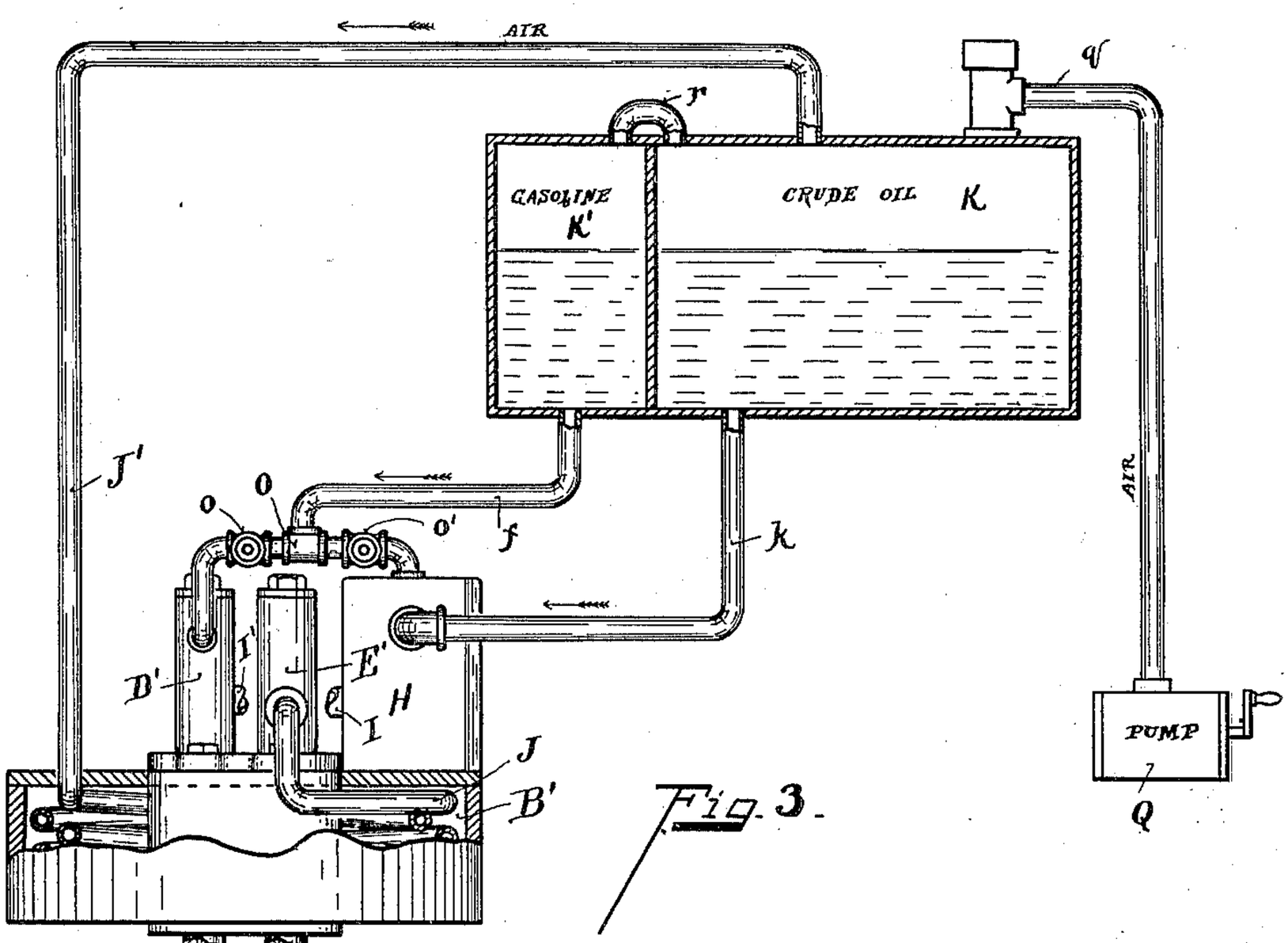
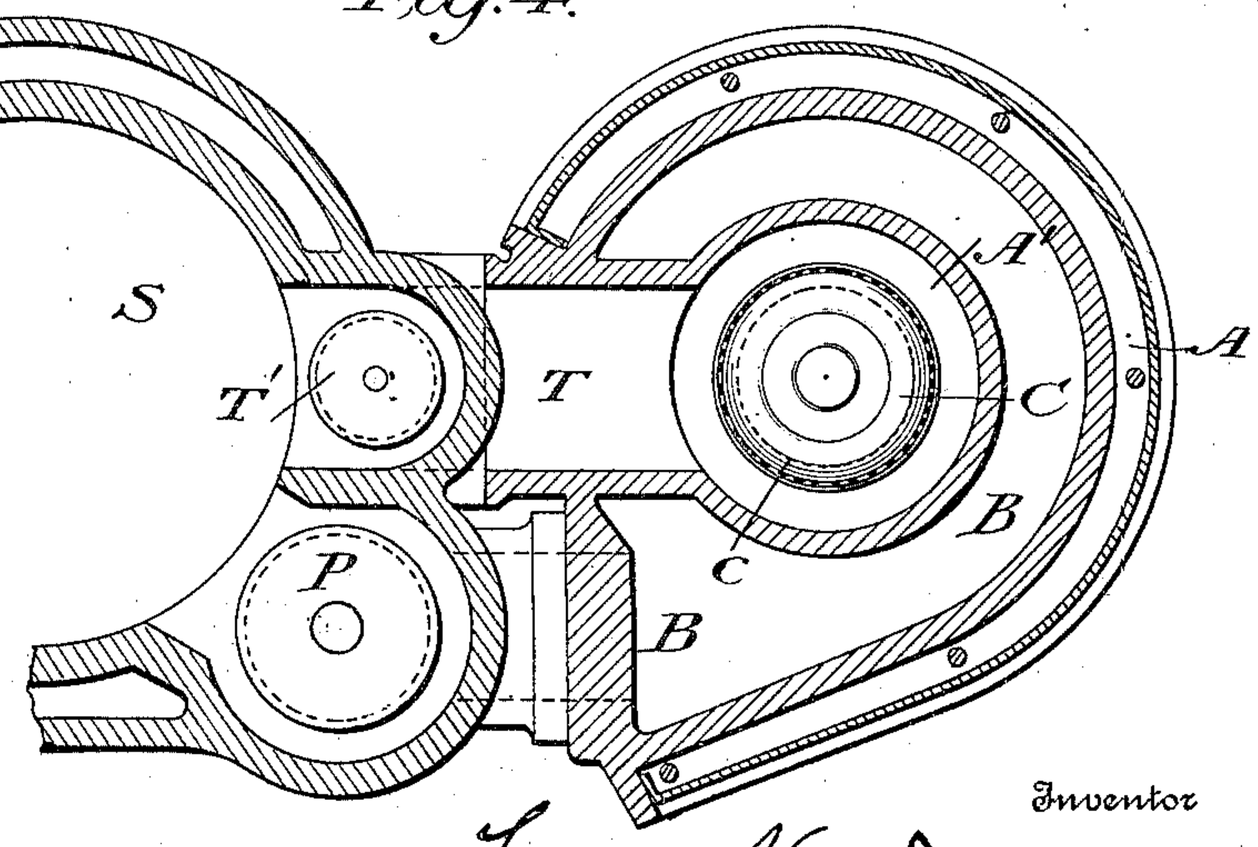


Fig. 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

FRANK VAN DUZEN, OF MARION, OHIO.

VAPORIZING DEVICE FOR CRUDE-OIL EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 672,500, dated April 23, 1901.

Application filed March 17, 1900. Serial No. 9,032. (No model.)

To all whom it may concern:

Be it known that I, FRANK VAN DUZEN, a citizen of the United States, residing at Marion, in the county of Marion and State of Ohio, have invented certain new and useful Improvements in Vaporizing Devices for Crude-Oil Explosive-Engines, of which the following is a specification.

One object of my invention is to provide an air and oil heating apparatus and a spraying and mixing device primarily adapted to be used with an explosive-engine using crude-oil as a fuel.

Another object of my invention is to obtain a proper heating of the air and oil before mixing and impinging the heated air under pressure upon a stream of oil which is broken up by the air and mixed therewith.

Another object of my invention is to combine with the oil-feeding tube a combined crude-oil and a gasolene tank, with proper feeding devices whereby either may be separately employed at pleasure.

The features of my invention are more fully set forth in the accompanying drawings, forming a part of this invention, in which—

Figure 1 is a top plan view. Fig. 2 is a section on line *x x*, Fig. 1. Fig. 3 is a sectional elevation of the heater and the hydrocarbon-supply device. Fig. 4 represents a horizontal section of my improvement.

S represents the cylinder of an explosive-engine; P, the exhaust-valve, which is operated by power in the usual manner, and T the feed-pipe, leading from the mixing-chamber to the cylinder, which is provided with the ordinary feeding-valve T′. (See Fig. 4.) These parts are of ordinary construction.

A represents the heating and mixing device, which consists of a casing provided with the internal mixing-chamber A′, in which are located three valves for supplying oil and air, which are constructed and operated as hereinafter explained.

B represents a pipe connection of the exhaust-port with the mixing-case for passing the exhaust-gases through the space B and thence through the supplemental heating-chamber B′, in which is placed a coil of pipe J, through which air is conveyed and which supports combustion and is heated in said coil.

M represents the final exhaust from chamber B′, where the gases from the engine are finally voided.

H represents an oil-supply tank mounted upon the top of the heater, as shown. I represents an oil-supply pipe leading from said tank to the valve-pipe D′. D represents a valve having a seat near the upper end of the pipe. *d* represents the terminal end of the valve-stem, which fills the lower end of said valve-pipe D′.

E′ represents an air-valve pipe or nozzle which is provided with a valve E near the top thereof. *e* represents the terminal end of the valve-stem, which fills the lower opening of said pipe or nozzle. Pipe E′ is supplied with heated air from the coil J. J′ represents the end of the said coil J, which is connected to the pressure-tank, as shown in Fig. 3. Said coil J is filled with air under pressure at all times, and is highly heated by the exhaust-gases from the engine in the heating-chamber B′. Coil J taps the air-pipe at J^2, as shown in Fig. 1.

F represents an orifice in the pipe D′ for supplying oil to the mixing-chamber. G represents a similar orifice or orifices in the air-supply pipe E′. The oil and air are supplied by these orifices whenever the respective valves are raised. The currents going in opposite directions meet each other with considerable force, which breaks the stream of oil up into very fine spray and mixes it at the same time with the heated currents of air thus opposing it. While this impingement of the entering currents of air and oil in the mixing-chamber is preferred, the injection of said currents into the mixing-chamber in any manner would produce commingling currents no less efficiently, and I do not desire to limit myself to this particular means shown except where such construction is specifically claimed.

In the preferred form of construction the valve-stems *d e*, which open and close valves D E for simultaneously admitting air and oil to the mixing-chamber, are operated by the valve C, which also supplies an additional amount of air. This valve is in the form shown operated by the suction-stroke of the piston through the operation of the charging-valve. This latter valve is under the control of any ordinary governor when the engine is

running above working speed. It is desirable to have the two valves D E open and close at the same time by the same positive means. I preferably employ the valve C for this purpose, because it is of the cheapest form and of very convenient construction. These valves may be operated simultaneously and by any other well-known valve-operating mechanism, taking motion from the valve C.

The method shown of supplying highly-heated currents of air which are admitted into the mixer in a different direction to that of the oil supplied by its valve, whereby oil is impinged upon by the heated currents of air and thoroughly intermingled therewith, both being heated approximately to the same degree, results in a high efficiency of explosion.

In the form shown in Fig. 2 the air is admitted into the mixing-chamber through the valve-opening *c*, which is supplied by chamber W. The said chamber W is heated by a pocket *w'*, depending from the exhaust-chamber B, as shown in Fig. 2. *g* represents air-orifices for supplying air to said chamber.

When crude oil is used in an explosive-engine, it is necessary in order to get good results to properly heat both the oil and air in order to bring the charge into proper condition for exploding. The amount of heat required is so great that it is slow work starting by extraneous heat supplied by a lamp or other similar devices. When the engine is to be used out of doors and in cold weather, this difficulty is largely augmented, so much so that it has been impossible hitherto to use crude-oil engines for outdoor purposes. I have overcome this difficulty by the construction and arrangement of the devices shown in Fig. 3 of the accompanying drawings.

K represents a crude-oil tank, and K' a gasolene-tank.

k represents a pipe leading from the crude-oil tank and tapping the reservoir H.

f represents a pipe leading from the gasolene-tank and tapping a branch pipe O. One limb of the pipe O taps the reservoir H, and the other limb taps the oil-supply pipe D'. *o* represents valves for closing either one or both of the limbs of said branch pipe.

Q represents an air-pump.

q represents a pipe tapping the top of the crude-oil reservoir.

r represents an elbow air-pipe connecting the air-space of the crude-oil tank with the air-space of the gasolene-tank. In the drawings these tanks for the convenience of illustration merely are shown as elevated above the mixer; but in ordinary practice these tanks will not be so elevated. The air-pump is employed for two purposes—first, for maintaining a constant pressure upon the hydrocarbon in the tanks, and, second, to supply air therefrom under pressure to the heating-coil J. The air-supply J', connected to said coil, takes its supply of air from the crude-oil tank, as shown. The pump may be continuously driven by employing an ordinary safety-valve in the air-pipe J, or it may be worked periodically by hand.

For starting the engine the crude-oil supply is shut off and the gasolene is supplied direct to the pipe D'. As gasolene vaporizes in cold weather, the engine can be started and run by the gasolene-supply until the cylinder of the engine is heated enough to supply the requisite amount of hot gas to the heater and mixing device A. When the gasolene-supply is shut off, the crude oil is supplied from the tank H. Valve *o'* between the tank H and the gasolene-pipe *f* is normally closed, so that valve *o* in the gasolene branch pipe O alone is used ordinarily to supply and shut off the gasolene. Valve W' is employed for controlling and regulating the supply of crude oil from the tank H to the oil-pipe D'. In order that the engine may be run entirely by gasolene, the branch pipe O is provided, which connects said tank H to the said gasolene-pipe *f*, so that the tank H may be kept filled with gasolene, if desired.

A very important advantage is obtained in supplying the air and oil under pressure, as the oil is more easily sprayed and intermixed with the air.

Having described my invention, what I claim is—

1. In a heating and spraying device for explosive-engines, a cylinder, a mixing-chamber connected to the supply-port of a cylinder, an air and an oil pipe tapping into said mixing-chamber, a valve in each pipe having valve-stems depending into said mixing-chamber, a heating-chamber surrounding said oil and air pipes connected to the discharge-port of said cylinder, a second air-valve in said mixing-chamber adapted to trip said valve-stems when actuated, means for actuating said second air-valve, and air and oil supply means connected to said air and oil discharge pipes, substantially as described.

2. In a heating and spraying device for explosive-engines, a cylinder, a mixing-chamber connected to the supply-port of said cylinder, an air and an oil pipe tapping into said mixing-chamber, a heating-chamber connected to the exhaust-port of said cylinder surrounding the ends of said air and oil pipes, an air-pipe coil located in said heating-chamber connected to the air-discharge pipe, valves in said air and oil discharge pipes having stems projected into said mixing-chamber, an air-valve located in the mixing-chamber adapted to intercept the said valve-stems in its movement, to trip the first-named air and oil valves, an oil-reservoir connected to the oil-pipe and means for operating the said air-valve in the mixing-chamber, substantially as described.

3. In a heating and spraying device for explosive-engines, a cylinder, a central mixing-chamber connected to the supply-port of said cylinder, an exterior heating-chamber con-

nected to the exhaust-port of said cylinder, an air-pipe coil in said heating-chamber, an oil-reservoir and a pipe leading therefrom, valve-stems in said pipes, the said air and oil pipes tapping concentrically through the heating-chamber and into the mixing-chamber, an air-valve in the said mixing-chamber adapted to actuate the said valve-stems when the said air-valve is operated, and a positive means for operating said air-valve, substantially as described.

In testimony whereof I have hereunto set my hand.

FRANK VAN DUZEN.

Witnesses:
ED. C. L. BARLOW,
JOHN J. CRAWLEY.