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A. HAYES.

FUEL VAPORIZER AND MIXER FOR EXPLOSIVE ENGINES OR OTHER USES.

(Application filed June 4, 1900.)

(No Model.)

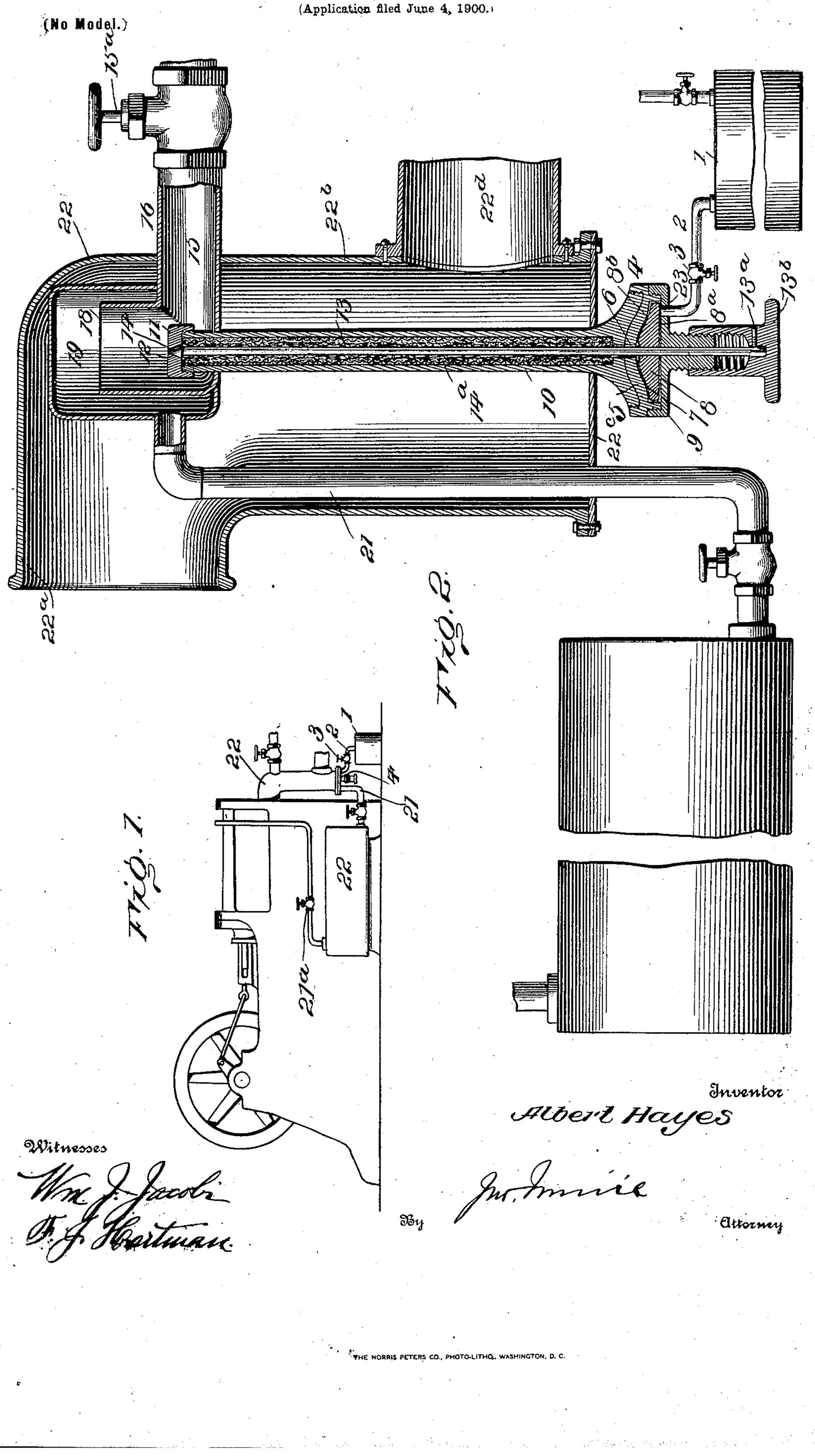

FIG. 2.

FIG. 1.

Witnesses

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FUEL VAPORIZER AND MIXER FOR EXPLOSIVE-ENGINES OR OTHER USES.

SPECIFICATION forming part of Letters Patent No. 660,954, dated October 30, 1900.

Application filed June 4, 1900. Serial No. 19,006. (No model.)

To all whom it may concern:

Be it known that I, ALBERT HAYES, a citizen of the United States, residing at Salt Lake City, in the county of Salt Lake and State of Utah, have invented new and useful Improvements in Apparatus for Vaporizing Oil and Obtaining a Fixed Gas Therefrom, of which the following is a specification.

The object of my invention is to provide an apparatus in which hydrocarbon oils, such as gasolene and the like, may be vaporized, the vapor mixed with air, and the mixed vapor and air converted into a fixed gas capable of being stored without danger of stratification or condensation and separation of the vapor and air.

With this object in view my invention consists in the apparatus hereinafter described and claimed in which oil under pressure is fed through a valve arranged to be automatically regulated to a tube in which it is vaporized by heat and from which the vapor is discharged into a chamber or trap into which air is admitted and in which the vapor and air are mixed and the mixture subjected to heat sufficient to convert the mixture into a fixed gas.

My invention also consists in the details of construction hereinafter particularly pointed out and claimed.

Heretofore for power purposes, as well as for other purposes, it has been customary to vaporize oils and to mix the vapor with air, either in the cylinder of the engine or in a chamber adjacent thereto, and to ignite the mixture at once before condensation and separation takes place. This results in a more or less imperfect combustion and necessarily more or less unevenness of force in the stroke of the piston. As a further result, it being impossible to store the mixture of vapor and air, special means for starting the engine must be used in order to set in operation the devices by which the oil is vaporized, mixed with air, and introduced into the engine-cylinder. By my invention it is made possible to have on hand ready for use in starting the engine a supply of fixed gas capable of being stored indefinitely at any temperature without danger of combustion.

In the drawings forming a part of this specification, Figure 1 is a view illustrating the application of my invention to an engine. Fig. 2 is a central vertical section of the same.

Referring to the drawings, the numeral 1 represents a tank for containing oil, said oil being continuously under pressure. A pipe 2, having a valve 3, leads from the tank 1 to a head 4, said head consisting of a disk 5, having a central perforation 6 and a valve-seat 7. Fitted to the valve-seat is a valve 8, held in proper position by a cap 9, against which the flat side 8^a of the valve fits. The rear face 8^b of the valve does not fit the seat tight, allowing a sufficient quantity of oil to ooze around it and the seat to the vaporizer. To the rear of the head 4 is secured a vaporizer-tube 10, provided with a cap 11, having a valve-seat 12 therein.

Passing through the head 4 and the vaporizer-tube 10 is a valve-stem 13, carrying on its inner end a valve 14, passing through the valve 8, which is thus held from sidewise movement and guided in its movement to and from its seat by the valve-stem, on which it slides freely, and surrounding the stem within the vaporizing-tube is a packing, preferably of asbestos or some analogous material, which latter is incased within a tube 14^a, so as to withstand the pressure as the vapor is created. The purpose of this packing is to restrict the too full flowing of the oil. The lower end of the valve-stem 13 is made angular in cross-section and is secured by a set-screw 13^a in a cap 13^b, which is screw-threaded onto a nipple 13^a on the cap 9. By turning the cap 13^b the distance of the valve 14 from its seat, and consequently the flow of vapor, may be regulated.

The inner end portion of the vaporizing-tube 10, which is preferably vertical, is projected into and sustains an atmospheric-air-introducing tube 15, which is composed in the present instance of a horizontal member 16 and a vertical member 18. The vertical member is surrounded by what I shall term a "trap" or "chamber" 19, into which the vapor and air are introduced, as will be hereinafter and more particularly referred to. A

vertical pipe 21 leads from the chamber to a gasometer 22, wherein the generated fixed gas is stored as rapidly as it is created. This vertical pipe 21 is preferably connected to the chamber 19 at a point above its bottom.

The vaporizing-tube 13, air-supply pipe, chamber 19, and gas-pipe 21 are preferably arranged, as shown, within the exhaust-pipe 22 of an engine, the exhaust-pipe consisting of a horizontal portion 22^a and a vertical portion 22^b, having a closed bottom 22^c, through which the vaporizer-tube 10 and gas-pipe 21 extend and having near its bottom an outlet 22^d for the escape of the products of combustion. The chamber 19 being placed, as shown, directly in line with the horizontal portion of the exhaust-pipe is in position to receive the exhaust from the engine at its highest temperature, with the result that the external wall of this chamber and the upper portion of the pipe 21 will be heated to the temperature necessary to insure the fixing of the gas, a temperature which should not be less than 700°. The vaporizer-tube 10 being arranged vertically, as shown, will be less highly heated, even in its upper portion, than the chamber 19, while the products of combustion in passing to the lower end of the tube will have time to cool materially, and its lower portion will consequently be at a temperature much less than that of the chamber 19. If the pressure in the vaporizer-tube 10 becomes excessive, it will by acting on the upper face of the valve 8 cause the lower face 8^a of the valve to close the end of the oil-supply pipe 2, and thus shut off the supply of oil. As soon as the pressure in the vaporizer-tube is reduced the valve 8 will be lifted by the pressure of the oil and the oil will ooze around it and enter the vaporizer-tube. In this way the supply of oil will be automatically regulated. The air-tube 15 is provided with a valve 15^a, by which the amount of air introduced is regulated. By manipulation of the valves 14 and 15^a the relative proportion of vapor and air may be regulated, so as to obtain a fixed gas of any desired quality.

The operation of my invention is as follows: The engine having been started and the exhaust from the cylinder directed into the exhaust-pipe 22, oil entering the valve-seat at 23 under pressure oozes around the valve to the vaporizer 10, when it is heated by the exhaust products, and by the time it has passed through the asbestos and reached the opposite end of the vaporizing-tube it is completely vaporized and ready to be introduced into the chamber 19. The valve 14 is opened, and the desired quantity of vapor is discharged into the air-inlet pipe 15. The discharge of the vapor draws in air through the valve 15^a, and the vapor and air are mixed in the tube. The mixed vapor and air passing above the edge of the vertical portion 18 of the air-inlet pipe comes in contact with the highly-heated walls of the chamber 19, by which it is converted from a mixture of vapor and air into a fixed gas and is discharged into the gas-pipe 22, which conveys it to the gasometer. The mouth of the gas-pipe 22 being above the bottom of the chamber 19, any of the mixed vapor and air not completely converted into a fixed gas will tend to drop below the level of the mouth of the gas-pipe and will come in contact with the bottom of the chamber, by which its conversion into a fixed gas will be insured. The chamber 19 being inclosed within the exhaust-pipe is exposed on all sides to the hot exhaust from the engine. If preferred, instead of starting the engine and utilizing its exhaust to begin the vaporization heat from any other source may be applied to the chamber 19 and vaporizing-tube 10 until a sufficient quantity of gas has been made with which to start the engine. The vaporizing-tube 10 being filled, as described, with a packing of asbestos or like material and being arranged vertically, as shown, the oil which enters through the automatic regulating-valve will immediately upon its entrance into the vaporizing-tube be broken up into finely-divided streams as it is absorbed by the packing material. There will thus be no considerable quantity of oil at any time in the tube. The heat even in the lower portion of the tube will be sufficient to vaporize the oil to such an extent as to expand its volume to many times its original volume. As the partly-vaporized oil rises in the tube it meets a more intense heat and is at the same time still further divided by the packing material. At a point considerably below the discharge-orifice the vaporization will be completed, with the result that nothing but finely-divided vapor can be discharged from the vaporizing-tube. The vapor so discharged will necessarily be at a pressure much higher than that on the oil in the supply-tank, the packing in the tube operating to choke the back pressure, so that the back pressure transmitted to the regulating-valve will be very much less than that in the upper end of the tubes. If at any time the volume of vapor generated in the vaporizer is greater than the capacity of the tube, the back pressure will close the valve 8 and shut off the supply of oil from the oil-tank 1.

By such a construction and operation I am enabled to vaporize the oil, introduce heated air, and mix the two together wholly by the waste or escaping heat. This utilization of heat produces a combustion of the elements of the oil in the mixing-chamber to such an extent as to render a gas totally incapable of stratifying, enabling me to at all times have a supply of gas in my gasometer of a given mixture. A given mixture of gas in the gasometer has many decided advantages. However, as I have shown my invention as applied to an engine I can better point out a few of the advantages in connection therewith. We will suppose the engine is to be stopped. The valve 21^a is closed and a sufficient amount of gas is in the gasometer. To start the engine again, it is only necessary to

turn on the supply of gas from the gasometer, whereupon the engine is immediately started without the usual preliminary use of some auxiliary expedient. Moreover, from the first strokes of the engine the gasometer is replenished and the mixture therein is continuously maintained.

While I have shown and described a structure capable of performing the desired results, many minor changes may be made without departing from the spirit and scope of my invention, and I accordingly reserve the right to do so.

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

1. In an apparatus for the purpose specified, the combination with a tank containing oil under pressure, a vaporizing-tube connected with the tank and having a valve-controlled outlet, and a valve independent of the outlet-valve controlling the supply of oil to the vaporizing-tube constructed and arranged to be operated to shut off the supply of oil by the back pressure in the vaporizing-tube when it exceeds the pressure on the tank, of a fixing-chamber, an air-inlet tube communicating with the fixing-chamber, the vaporizing-tube being arranged to discharge vapor into the air-inlet tube, and means for heating the vaporizing-tube and fixing-chamber, the parts being so arranged that the fixing-chamber is subjected to a more intense heat than the vaporizing-tube; substantially as described.

2. In an apparatus for the purpose specified, the combination with a vaporizing-tube having a vapor-outlet at one end and a valve controlling the outlet, of means for automatically controlling the supply of oil to the vaporizing-tube, consisting of a valve carried by and freely movable on the stem of the outlet-valve arranged between the oil-supply tube and the entrance to the vaporizing-tube, the space between the upper face of the valve and the casing therefor being sufficient to permit oil to be forced into the vaporizing-tube and the lower face of the valve fitting tightly in its seat when forced to its seat by back pressure from the vaporizing-tube; substantially as described.

3. In an apparatus for the purpose specified, the combination with a vaporizing-tube having a vapor-outlet at its inner end and provided with a filling of fibrous material, means for supplying oil to the outer end of the tube, and means actuated by the vapor-pressure for automatically regulating the supply of oil, of a fixing-chamber and an air-inlet tube communicating therewith, the vaporizing-tube being arranged to discharge vapor into the air-inlet tube, a gas-outlet pipe communicating with the fixing-chamber and means for heating the vaporizing-tube and fixing-chamber; substantially as described.

4. In an apparatus for the purpose specified, the combination with a vertical vaporizing-tube having a vapor-outlet at its upper end and provided with a filling of fibrous material, means for supplying oil to the bottom of the tube and means for automatically regulating the supply of oil, of a fixing-chamber and an air-inlet tube communicating therewith, the vaporizing-tube being arranged to discharge vapor into the air-inlet tube, a gas-outlet pipe communicating with the fixing-chamber at a point above its bottom, and means for heating the vaporizing-tube and fixing-chamber, the parts being so arranged that the fixing-chamber is subjected to a more intense heat than the vaporizing-tube, substantially as described.

5. In an apparatus for the purpose specified, the combination with a tank containing oil under pressure, a vertical vaporizing-tube connected with the tank having a filling of fibrous material and having a valve at its lower end, constructed and arranged to be operated to shut off the supply of oil by the back pressure in the vaporizing-tube, when it exceeds the pressure on the tank, of a fixing-chamber, an air-inlet tube communicating with the fixing-chamber, the vaporizing-tube being arranged to discharge vapor into the air-inlet tube, and means for heating the vaporizing-tube and fixing-chamber, the parts being so arranged that the fixing-chamber is subjected to a more intense heat than the vaporizing-tube; substantially as described.

6. In an apparatus, for the purpose specified, the combination with a vertical vaporizing-tube, having a filling of fibrous material, and having a valve-controlled outlet, of means for automatically controlling the supply of oil to the vaporizing-tube, consisting of a valve arranged between the oil-supply and the entrance to the vaporizing-tube, the space between the upper face of the valve and the casing therefor being sufficient to permit oil to be forced into the vaporizing-tube and the lower face of the valve fitting tightly in its seat when forced to its seat by back pressure from the vaporizing-tube; substantially as described.

7. The combination with a vaporizing-tube having an oil-inlet at one end, and a vapor-outlet at the other end, of a valve controlling the vapor-outlet and a valve controlling the oil-inlet, carried by and freely movable on the stem of the outlet-valve; substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ALBERT HAYES.

Witnesses:
EDWARD F. COLBORN,
SAML. C. MILLS.