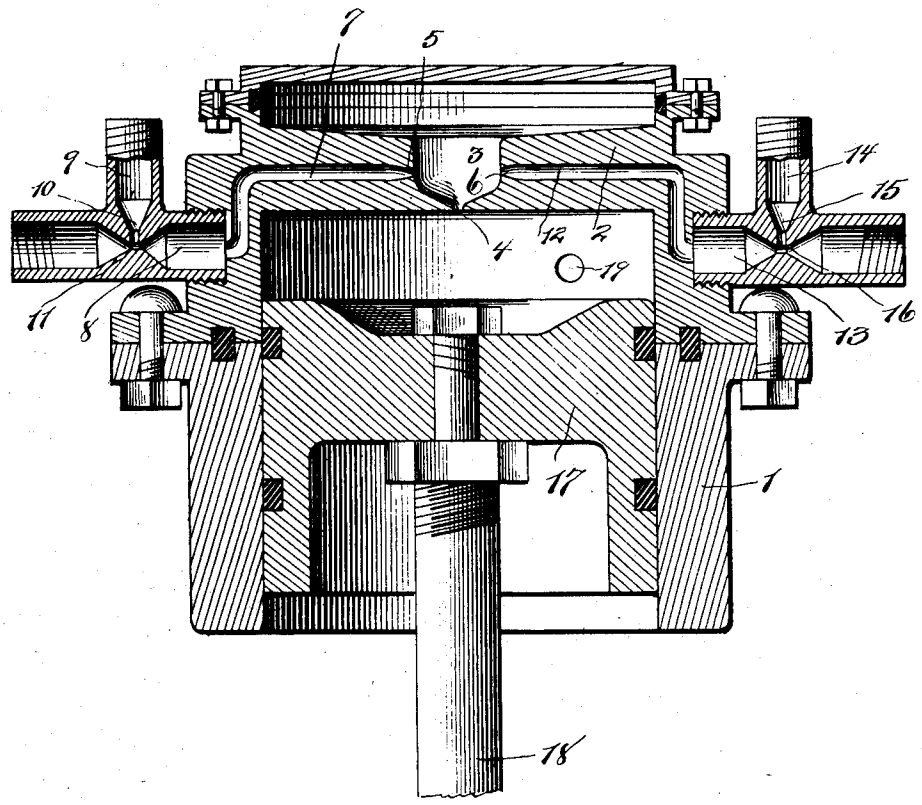
No. 832,728. PATENTED OCT. 9, 1906.

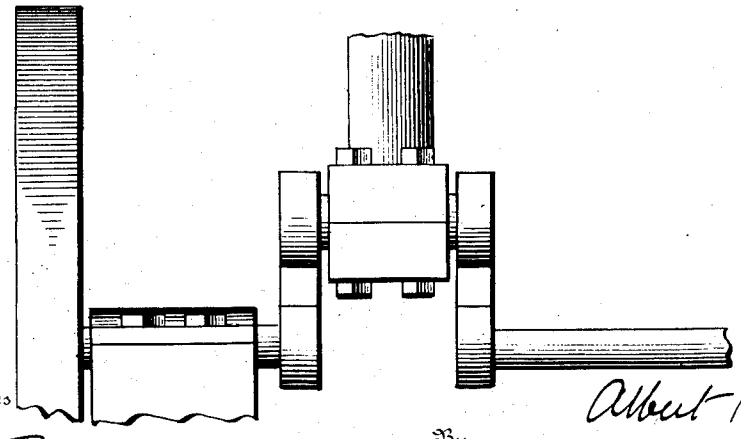
A. HAYES.

METHOD OF VAPORIZING HYDROCARBON OILS.

APPLICATION FILED SEPT. 24, 1904. RENEWED MAR. 6, 1906.

Fig. 1.





Witnesses

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METHOD OF VAPORIZING HYDROCARBON OILS.

No. 832,728. Specification of Letters Patent. Patented Oct. 9, 1906.

Application filed September 24, 1904. Renewed March 6, 1906. Serial No. 304,541.

To all whom it may concern:

Be it known that I, ALBERT HAYES, a citizen of the United States, residing at Noroton, in the county of Fairfield, State of Connecticut, have invented certain new and useful Improvements in Methods of Vaporizing Hydrocarbon Oils, of which the following is a description, reference being had to the accompanying drawing and to the figures of reference marked thereon.

My invention relates to methods of vaporizing hydrocarbon oils, particularly the heavier or less volatile oils, to form a combustible gaseous mixture adapted for use for heating or other purposes.

In ordinary practice the vaporization of the lighter or more volatile hydrocarbon oils, such as gasolene or naphtha, presents comparatively little difficulty, though when even these hydrocarbons are vaporized within a heated tube or retort and discharged through a small orifice, such as is necessary to use, the orifice is liable to be clogged by deposits of a hard substance, probably carbon. In vaporizing the heavier hydrocarbons in a heated tube or retort a higher heat must be employed than in vaporizing the lighter hydrocarbons, and by reason of the higher heat more or less cracking of the oil takes place, and it is practically impossible to prevent the discharge-orifice from rapidly becoming choked with deposits. This clogging of the discharge-orifice seems to be practically unavoidable where a heated tube or retort is used to vaporize the oil, the liability of clogging being greater with the heavier hydrocarbons.

In order to vaporize the heavier hydrocarbon oils without the use of a vaporizing tube or retort, as where oil is sprayed directly into a flame, it is desirable to subdivide the oil as finely as possible and even when so subdivided by steam or air jets it is difficult, if not impossible, to secure complete vaporization or complete combustion, more or less unconsumed carbon being always deposited.

It is the object of my present invention to do away with the necessity of using a retort-vaporizer for vaporizing the heavier hydrocarbon oils and at the same time, by so finely dividing the oil that it will be readily vaporized by a comparatively low heat, secure complete vaporization and produce a combustible gaseous mixture which may be burned without depositing carbon, thus utilizing fully the heat units of the oil.

In order to secure this fine subdivision of the oil, I cause oil and water to be brought together in the form of spray, the water probably taking the form of minute drops or globules and the oil probably forming a thin film or coating on the exterior surface of each drop or globule, it being well known that when oil is brought into contact with water it tends to spread on the surface of the water as a thin film, the oil being thus, as I believe, divided more finely than it could be divided by mechanical means. The action of heat on the oil-coated drops or globules of water by converting the water into steam causes the bursting of the coat of oil, thereby effecting so complete a subdivision of the oil that a gaseous mixture of the oil, water, and air may be formed having the stability of a true gas and capable of burning without residue without subjecting the oil to such a temperature as would cause the least cracking.

My method may be carried out with various forms of apparatus, it being necessary only to introduce the oil and water, preferably together with atmospheric air, into a chamber where the several elements may together be subjected to heat and compression.

For the purpose of illustration I have shown in the accompanying drawing a form of apparatus which I have found suitable for use in practicing my method; but it is to be understood that so far as the method is concerned the drawing is to be considered as illustrative merely and not as in any respect restricting the invention to the form of apparatus shown or to any particular form of apparatus.

In the drawing the figure is a vertical sectional view of my preferred form of apparatus.

In the drawing, 1 is a chamber (here shown as the cylinder of an explosion-engine) in which a mixture of finely-divided oil, water, and air may be subjected to heat and compression.

2 is the cylinder-head, having formed therein near its center a small recess or chamber 3, having an outlet 4, leading to the interior of the cylinder.

5 and 6 are discharge-nozzles leading into the small chamber 3, these discharge-nozzles

being arranged at diametrically opposite points, so that the streams discharged through them will impinge and will thus be thoroughly mixed and finely divided.

To the discharge-nozzle 5 leads a passage 7 with the outer end of which is connected a pipe 8, communicating with a source of air-supply and through a branch 9, communicating with an oil-supply. The end of the branch 9 is preferably constricted, as shown at 10, so as to feed the oil slowly, and the pipe 8 is also constricted at the point at which the oil enters, as shown at 11, so that the air and the oil will tend to form a more or less complete mixture before they are together discharged from the nozzle 5.

To the discharge-nozzle 6 leads a passage 12, with the outer end of which is connected a pipe 13, communicating with a source of air-supply and through a branch 14 communicating with a water-supply. As above described with reference to the air and oil inlets the end of the branch 13 is preferably constricted, as shown at 15, so as to admit the water in a fine stream, and the pipe 13 is also constricted, as shown at 16, at the point at which the water enters, so that the air and water will tend to mix before they are together discharged from the nozzle 6.

17 is the piston, adapted to reciprocate in the cylinder 1 and connected by pitman 18 with the engine-crank.

The oil and water supply are so regulated that the quantity of water admitted is greater than the quantity of oil, the air admitted being preferably sufficient in quantity to supply the oxygen necessary for the complete combustion of the mixture when burned.

In making use of the apparatus as above described for the purpose of carrying out my method the head 2 of the cylinder is first heated by any convenient means, as by the use of a torch, and oil, water and air are admitted into the chamber 3 through their several inlets, each preferably under pressure of from one hundred to two hundred pounds, the mixed oil and air being discharged through nozzle 5 and the mixed water and air through the nozzle 6. The streams from the two nozzles impinge upon each other, and the oil and the water are thus brought into contact and thoroughly mixed, the water probably being divided into minute drops or globules and the oil probably spreading in thin films on the surface of these drops or globules, the air probably aiding in the production of the drops or globules of water and in the distribution of oil over the surface of these drops or globules. The mixture thus formed passes from the small chamber 3 through the opening 4 into the interior of the cylinder, where it is subjected to compression by the upstroke of the piston 17, the compression necessarily increasing the heat, the heat of compressing, together with the heat of the chamber 3 and of the walls of the cylinder, being sufficient to cause the drops or globules of water, coated, as above described, with a thin film of oil to be converted into steam with a result of still further dividing the oil and resulting in forming, with the air, a combustible gaseous mixture which does not stratify and is practically a permanent gas and may be used in the cylinder as the explosive mixture for driving the engine or may be drawn off through the outlet 19.

The compression is preferably carried to a degree sufficient to generate heat sufficient to maintain the walls of the chamber and the walls of the cylinder at a temperature sufficient for the continued operation of the method. Of course if the mixture is burned within the cylinder to drive the piston by its explosion the heat of the explosion will serve to heat the walls of the cylinder and chamber sufficiently.

It is of course essential that the oil and water enter the cylinder before the piston reaches the limit of its compression-stroke, and the apparatus is preferably arranged if the gaseous mixture is to be burned in the cylinder to introduce the oil and water during the upward stroke of the piston before it reaches the upward limit of its stroke, though if the gaseous mixture is to be drawn off for use elsewhere the oil and water may be introduced during the downward movement of the piston also. In either case the introduction of the oil and water and the formation of the film of oil on the surface of the drops or globules of water takes place while the pressure is less than the maximum, the increase of the pressure to the maximum serving to break up the film into vapor. The mixture formed in the chamber 3 is thus subjected to varying pressure and varying temperature, the lower pressure and temperature, which occurs while the piston is near the lower limit of its stroke, permitting the mixing of the oil and water by which the oil is distributed in the form of a film on the drops or globules of water and the higher pressure and consequent higher temperature, which occurs as the piston reaches the limit of its upward stroke, causes the complete vaporization and union of the oil, water, and air.

While the apparatus above described is particularly adapted to effectively carry out my method, it is not essential, it being essential only that the oil and water be introduced into a heated receptacle with a sufficient quantity of air and subjected to compression.

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

1. The herein-described method of vaporizing hydrocarbon oils, which consists in introducing into a chamber a stream or spray of water and a stream or spray of oil, causing

the two streams to mix, forcing air into the chamber, and subjecting the oil, water and air to heat and to compression greater than that due to expansion within the chamber.

2. The herein-described method of vaporizing hydrocarbon oil, which consists in introducing into a chamber a stream or spray of mingled water and air, and a stream or spray of mingled oil and air, causing the two streams to mix and subjecting the mixture so formed to heat and to compression greater than that due to expansion within the chamber.

3. The herein-described method of vaporizing hydrocarbon oil, which consists in introducing into a chamber a stream or spray of mingled water and air, and a stream or spray of mingled oil and air, causing the two streams to impinge upon each other, whereby the water and oil are finely subdivided and mixed and subjecting the mixture so formed to heat and to compression greater than that due to expansion within the chamber.

In testimony whereof I affix my signature in presence of two witnesses.

ALBERT HAYES.

Witnesses:

ALBERT POPKINS,

A. P. GREELEY.