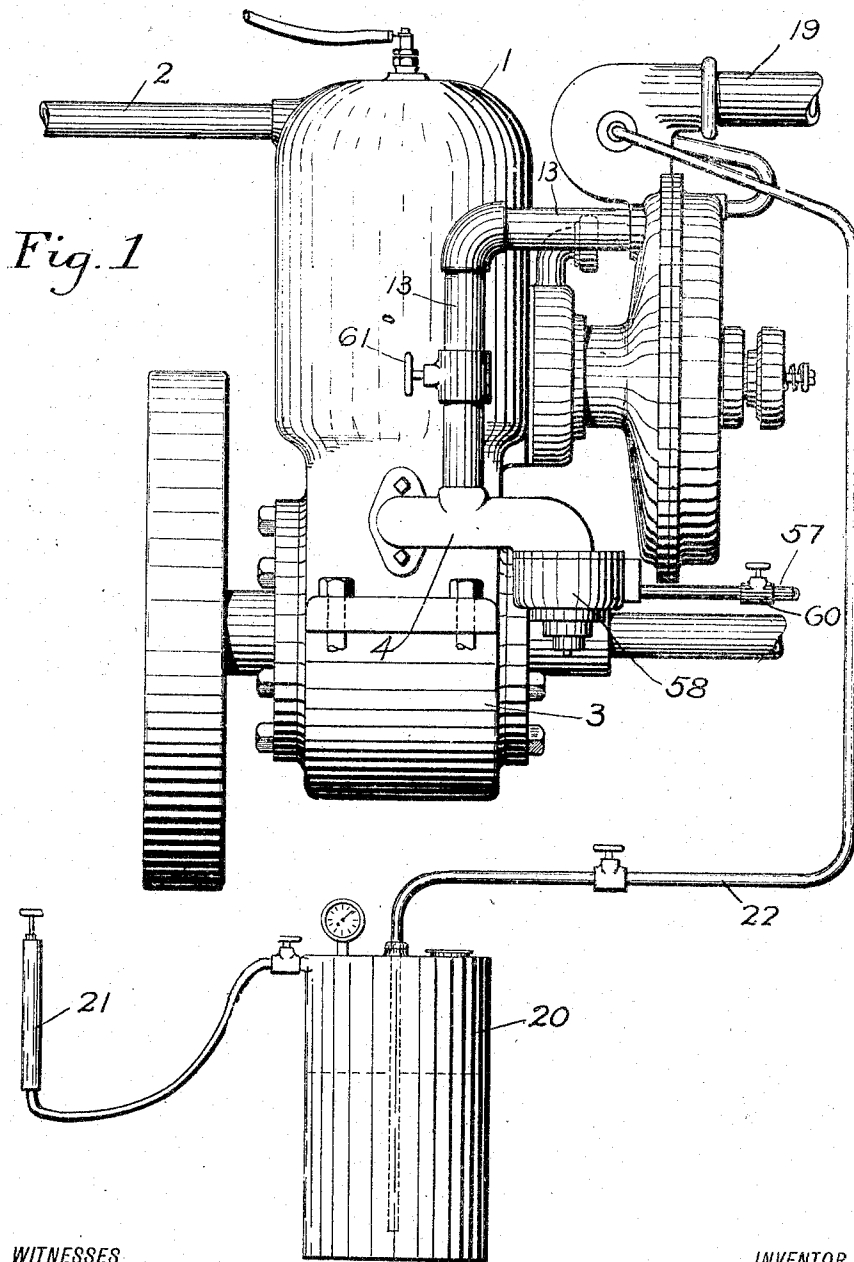


E. B. BENHAM.
VAPORIZER.
APPLICATION FILED JUNE 2, 1908.

1,015,285.

Patented Jan. 23, 1912.

3 SHEETS—SHEET 1.



WITNESSES
E. B. Barningham
E. D. Ogden

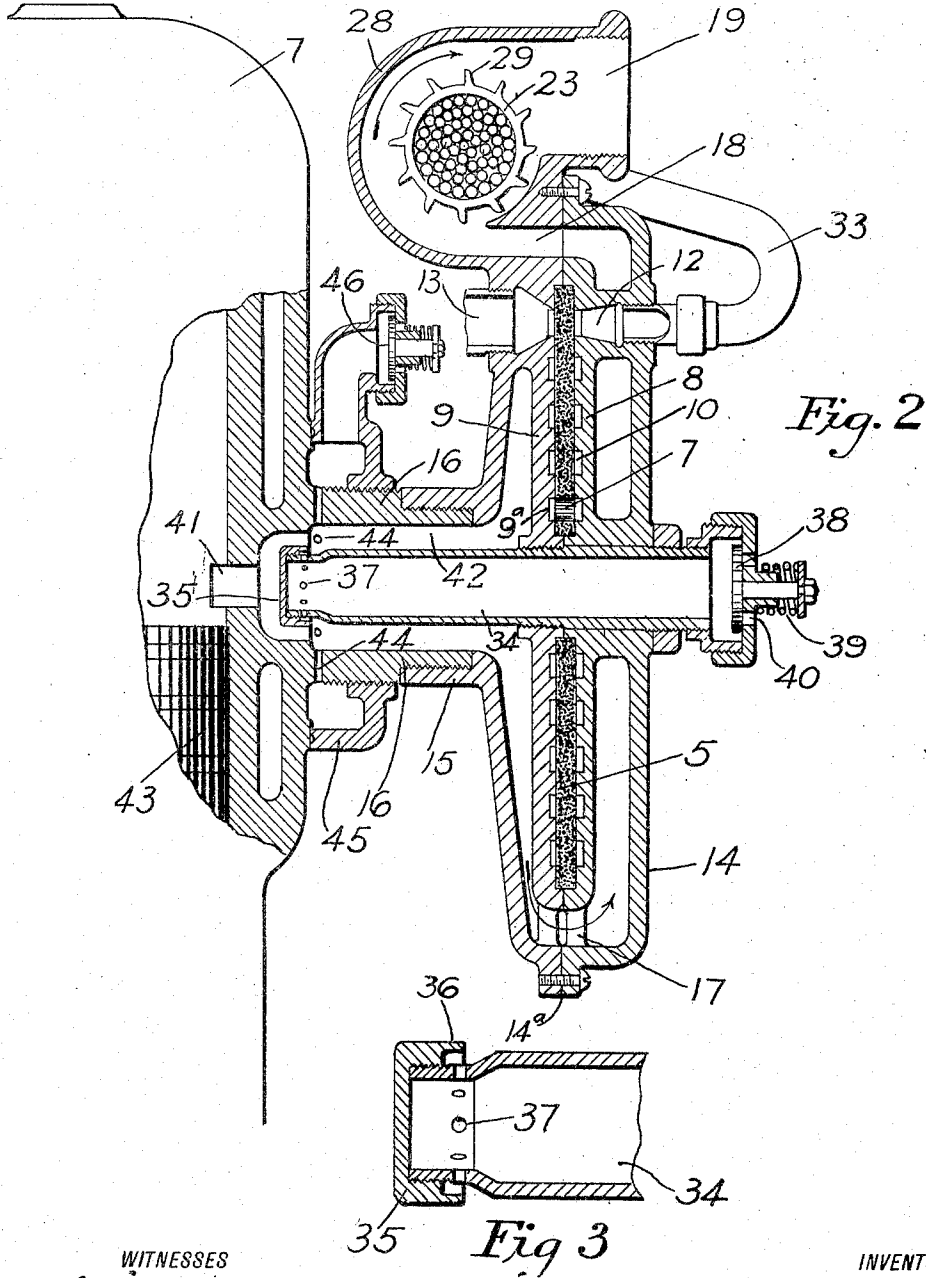
INVENTOR
Elijah B. Benham.
BY
Howard C. Barlow
ATTORNEY

E. B. BENHAM.
VAPORIZER.
APPLICATION FILED JUNE 2, 1908.

1,015,285.

Patented Jan. 23, 1912.

3 SHEETS—SHEET 2.



WITNESSES

C. S. Birmingham
E. J. Hyde

INVENTOR

Elijah B. Benham

BY

Howard E. Bulow
ATTORNEY

E. B. BENHAM.
VAPORIZER.

APPLICATION FILED JUNE 2, 1908.

1,015,285.

Patented Jan. 23, 1912.

3 SHEETS—SHEET 3.

Fig. 5.

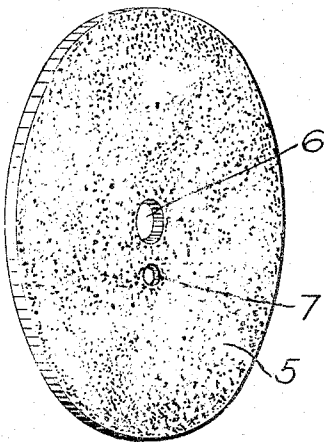


Fig. 4.

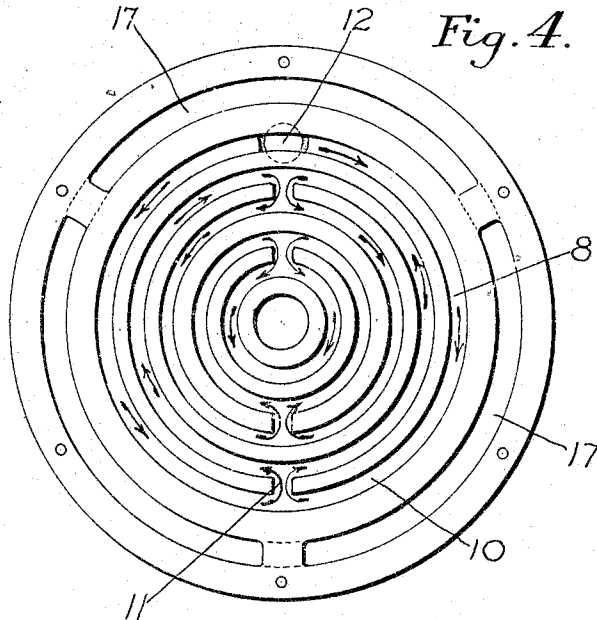


Fig. 6.

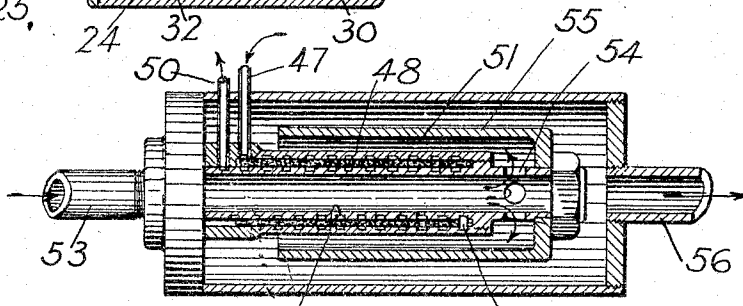
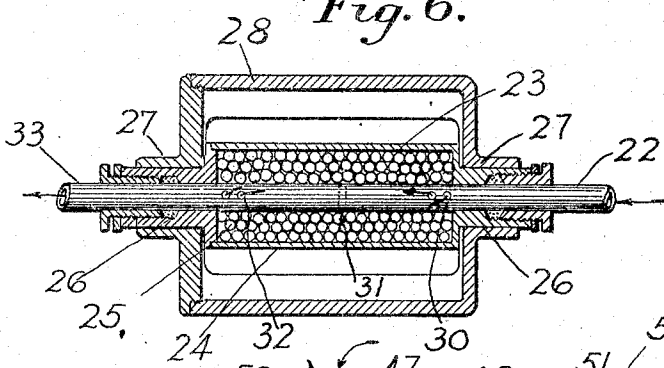


Fig. 7.

WITNESSES
C. B. Birmingham
E. J. Ogden

INVENTOR
Elijah B. Benham.
BY
Howard E. Barlow.
ATTORNEY

UNITED STATES PATENT OFFICE.

ELIJAH B. BENHAM, OF NEW LONDON, CONNECTICUT, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO HYDROCARBON CONVERTER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

VAPORIZER.

1,015,285.

Specification of Letters Patent.

Patented Jan. 23, 1912.

Application filed June 2, 1908. Serial No. 436,200.

To all whom it may concern:

Be it known that I, ELIJAH B. BENHAM, a citizen of the United States, residing at the city of New London, in the county of New London and State of Connecticut, have invented certain new and useful Improvements in Vaporizers, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to vaporizers or gasifiers for converting hydrocarbon oils, and particularly heavy hydrocarbon oils, into a vapor or gas suitable for use in internal combustion engines, in gas burners, etc.

A further object of my invention is to conduct the vaporization or gasification of the oil by means of waste heat—for example, the waste heat contained in the exhaust gases of an internal combustion engine.

My invention comprises means for spreading the oil over the surface of a heated porous material, preferably earthenware or the like, whereby the oil is converted into a vapor or gas; also various other features hereinafter described and particularly pointed out in the claims.

A practical embodiment in the invention is represented in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

In the drawings: Figure 1— is a side elevation representing an internal combustion engine with my fuel decomposing device attached thereto, showing a diagrammatic view of the arrangement of the fuel feed pipe and air pressure tank. Fig. 2— is an enlarged sectional elevation showing my apparatus attached to an engine cylinder. Fig. 3— is an enlarged view of the interior end of the central air inlet pipe showing the construction whereby the passing exhaust gases serve to draw in the outside air. Fig. 4— is a face view of one of the plates between which the porous disk is held. Fig. 5— is a detail of said porous disk. Fig. 6— is a central sectional view of the mixing device through which the raw material passes in flowing from the supply tank to the decomposing plates. Fig. 7— is a modification showing the porous material as made in a tubular form, likewise the heated surfaces over which the mixture is to pass, one fitting

inside and the other outside of the porous tube.

In the accompanying drawings I represented my vapor or gas making device in connection with an internal combustion engine, the latter being used as a source of heating gases, the gas or vapor produced in the apparatus being delivered to said engine to operate it.

In the drawings I have represented the simplest form of two-cycle internal combustion engine, but my device may be used on an engine of any style or construction.

1 represents the ordinary water-jacketed engine cylinder supplied through the circulation pipe 2. The crank case 3 is made in any of the usual forms and in this construction the mixture is admitted thereto through the inlet pipe 4.

In order to provide a simple and effective means for applying heat to the fuel and then subjecting the same to a straining action I have provided a central porous plate 5 preferably made in the form of a disk, see Figs. 2 and 5, said disk being made of porcelain, clay, or any other substance of a porous nature. A central hole 6 is formed in said disk to receive the hubs of the inclosing plates. A small hole 7 is also made through said disk which forms a port through which the gas passes in going from one side to the other of said plate. This porous plate is inclosed between two disks 8 and 9, preferably of metal, the internal face of each disk being provided with circular grooves 10 which communicate with each other through the channels 11, see Fig. 4. The fuel enters through the inlet port 12 and passes through the circular channels 10 commencing at the outer near the circumference of said plate to the inner channel near the center thereof. From this channel it passes through the port 7 to the opposite plate 9 and works its way outward passing successively through the concentric channels 9* in this plate, which are preferably shallower than those in the opposite plate. The gas or vapor so produced passes through outlet pipe 13 and pipe 4 into the engine cylinder where it is used in the ordinary way. It is found, in order to obtain the desired effect on the mixture, that both of said plates should be heated and one to a very much higher tem-

perature than the other, and in order to obtain this result and apply the heat in a simple and practical way, a shell 14 is formed around said plates the same being preferably made in two parts and bolted together as at 14^a, the inner member of which is provided with a threaded hub 15 which is adapted to be screwed onto the exhaust pipe 16 of the cylinder 1, the heated gases in this way first come in direct contact with the inner plate 9, heating the same to a high degree, after which they pass around said plate through the circular outlet ports 17, see Figs. 2 and 4, over the back or outer surface of the second or outer plate 8, also heating this plate, but to a much lower degree than that of the plate 9. The exhaust then passes out through the passage 18 and pipe 19 to the open air.

It is found in the use of crude oil, and the like, in my device, that the same should be thoroughly stirred before it is allowed to pass between the heated plates. The fuel for this purpose is fed from the supply tank 20 in which is preferably generated a pressure of air by a hand pump 21 or a power pump, (not shown), run from the engine, or the fuel may be fed by gravity, if desired. In this way the fuel is forced or fed through the supply pipe 22 to the mixer 23, which is located in the exhaust pipe 19. This mixer is preferably constructed in the form of a cylinder 24 filled with small balls 25 and held to turn freely in the bearings 27 in the casing 28. A series of longitudinal fins or vanes are located at intervals around the periphery of said cylinder so that the exhausting gases in passing will cause said cylinder to rotate rapidly. The inlet pipe 22 is provided with a stop 31 so that as the fuel enters through said pipe it passes into said cylinder through the small holes 30 and after being thoroughly shaken up and mixed coming in contact with the loose balls in the rapidly rotating cylinder it passes out again through the small holes 32 and through the pipe 33 between the decomposing plates, above described.

In order to provide a simple and effective means for admitting air to the exhausting gases a central tube 34 has been provided on the inner end of which is fixed the cap 35, see Fig. 3, which cap extends back along the walls of the tube and has a lip 36 which overhangs the inlet holes 37. On the outer end of this tube is an inlet valve 38 held normally closed by spring 39, said valve being opened by the sucking action of the exhausting gases, when liberated from the cylinder, through the exhaust port 41 into the channel 42 as the piston 43 descends, to open the ports 40 and admit air into the tube and through ports 37 into the chamber 42 where said air is mixed with the exhausting gases supplying sufficient oxygen thereto

to cause a continued combustion whereby all of the remaining particles in the gases are consumed to free the exhaust from objectionable smoke. In order to provide a further supply of air a series of holes 44 have been made through the exhaust neck 16 onto which the cup-shaped member 35 is threaded, an inlet air valve 46 is formed on said member which valve is also adapted to open automatically by the passing exhaust and draw in more air, if desired.

I do not restrict myself to distributing the oil over a porous plate as any convenient or practical porous substance or material may be used for this purpose, neither do I restrict myself to making the same in the form of a disk or plate as the same may be made in a tubular form, if desired, as illustrated in Fig. 7, or it may be made in any other convenient or practical form. In the construction shown in Fig. 7 the fuel is admitted through the pipe 47, is carried around the outside of the porous tube 51 by means of the helical groove 48 then passes from the outside to the inside of said tube through the port 49 and back through the helical grooves 52 on the inner surface of said tube and out to the engine through the pipe 50, the exhaust from the engine entering through pipe 53 where it comes in contact with the inner plate then passes outward through the ports 54 and back through the tube 55 over the outer plate thence out to the open air through the pipe 56.

The operation of my device is more particularly described as follows: In order to heat the plates to the desired temperature to properly convert the fuel into gas for use in the cylinder it is found most convenient to first start the engine on gasoline, which is supplied from a tank, not shown, through the pipe 57, carbureter 58 and pipe 4 to the engine. The heat from the exhaust in passing out first comes in contact with the plate 9 and then with the plate 8 quickly heating them up to the desired temperatures, after which the valve 60 is closed shutting off the supply of gasoline and the valve 61 is opened allowing the fuel, which has been decomposed and prepared, to enter through the supply pipe 13 when the engine will continue to run and will develop greater power on the less expensive fuel. I do not, however, restrict myself to this method of starting the engine as any means may be employed for heating the plates in which case the engine may be started directly from the low grade fuel mentioned. Neither do I restrict myself to the precise construction and arrangement of parts herein shown and described, nor to the various details thereof, as the same may be modified or rearranged in various particulars.

The invention is exceedingly practical in its construction and effective in its operation.

ation and by its use the lowest grade or cheapest of hydrocarbon fuels may be employed and cause the engine to develop greatly increased power over the higher grades of hydrocarbon fuel, such as gasoline, or the like.

In my Patent No. 920,903, dated May 11, 1909, I have claimed the general structure of the gas making apparatus herein illustrated and described, except as to the port through the porous material, and the means for supplying air to the exhaust gases of the engine.

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

1. A vaporizer or gasifier for hydrocarbon oils and the like, comprising in combination a solid body of porous material having a port or passage leading from one side of it to the other, means for distributing oil over one side of said body, means for collecting gas or vapor from the other side of said body, and means for heating said porous body.

2. In a vaporizer or gasifier for hydrocarbon oils, a porous member having a port leading from one side to the other, means for subjecting the opposite sides of said member to heat of different degrees, means for passing the fuel over both faces of said member, and means for collecting the vapor produced.

3. In a vaporizer or gasifier for hydrocarbon oils, a porous member having a port leading from one side to the other, means for subjecting the opposite sides of said member to heat of different degrees, means for passing a thin film of fuel over both faces of said porous member whereby said fuel is decomposed and the gases separated, and means for collecting the gas or vapor evolved.

4. In a vaporizer or gasifier for hydrocarbon oils, a porous member provided with

a port leading from one side thereof to the other, means for heating the opposite faces of said member to temperatures of different degrees by circulating gases therearound, an inclosing plate on each side of said member, said plates being each provided with channels adapted to guide the fuel first over one face of said member and then on the opposite face of said member.

5. A vaporizer or gasifier for hydrocarbon oils and the like, comprising in combination a solid body of porous material and inclosing members therefor, space being provided on one side of said porous body for distributing oil thereover, space being provided on the other side of the said porous body for collecting gas or vapor, a heating chamber inclosing said porous body and its inclosing members, and adapted for the flow through it of the exhaust gases of a gas engine, and means for introducing air to such chamber to complete the combustion of such exhaust gases.

6. A vaporizer or gasifier for hydrocarbon oils and the like, comprising in combination a solid body of porous material and inclosing members therefor, space being provided on one side of said porous body for distributing oil thereover, space being provided on the other side of the said porous body for collecting gas or vapor, a heating chamber inclosing said porous body and its inclosing members, and adapted for the flow through it of the exhaust gases of a gas engine, and an air conduit passing centrally through such chamber and connected to such chamber near the gas-admission point thereof, such air conduit having means at its outer end for the admission of air.

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

ELIJAH B. BENHAM.

Witnesses:

WM. T. CUTTER,

W. HAMPTON DE FONTAINE.