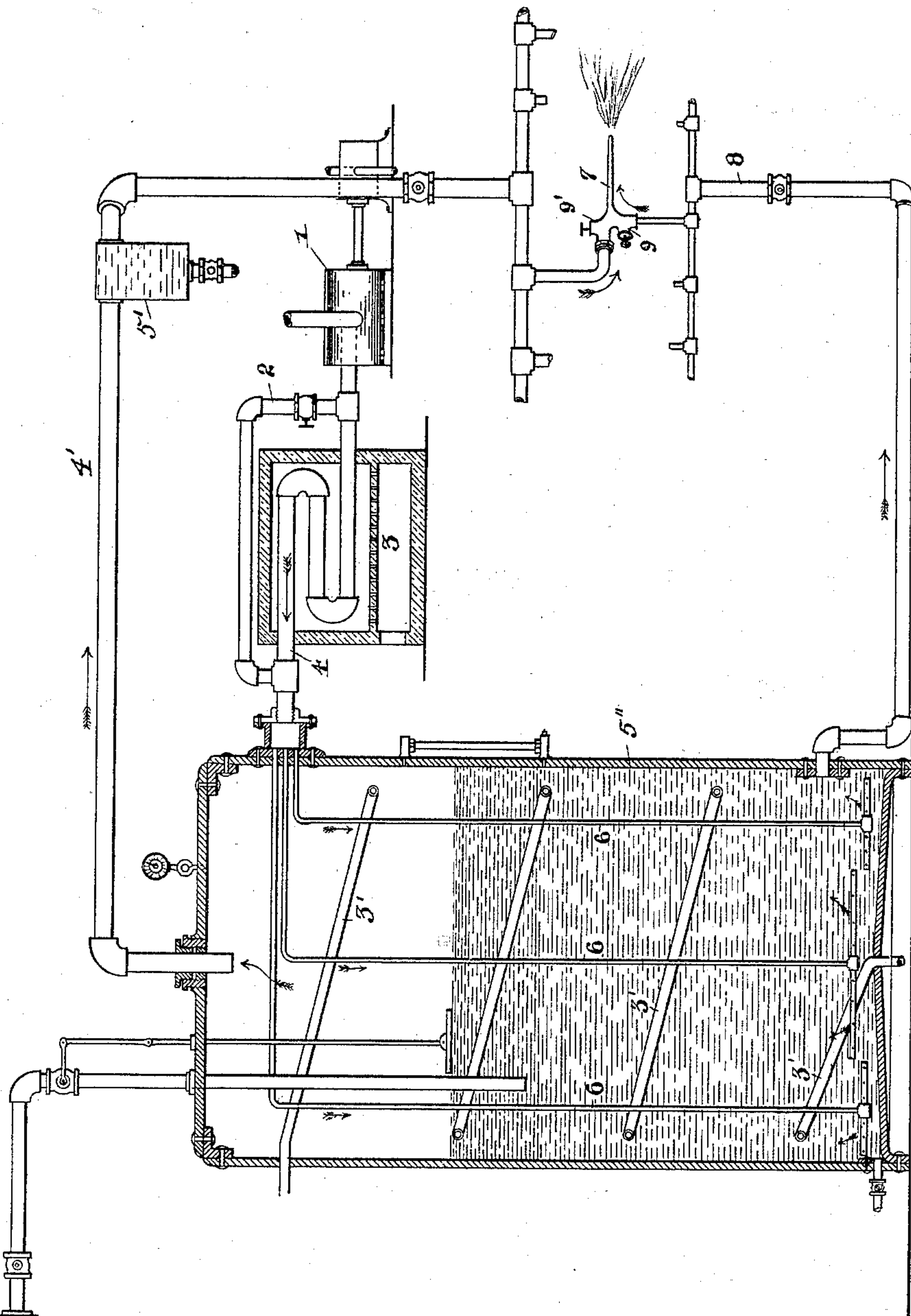


(No Model.)

G. H. HARVEY.
APPARATUS FOR BURNING OIL.

No. 482,508.

Patented Sept. 13, 1892.



Witnesses:
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UNITED STATES PATENT OFFICE.

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APPARATUS FOR BURNING OIL.

SPECIFICATION forming part of Letters Patent No. 482,508, dated September 13, 1892.

Application filed February 6, 1891. Renewed July 28, 1892. Serial No. 441,540. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. HARVEY, a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Burning Oil; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

Heretofore heated air has been forced through oil to carburet the same, the mingled air and oil being conducted immediately to a burner. Such method can under suitable conditions be used successfully to burn the more vaporizable portions of the oil; but it fails to utilize a considerable portion of it that will not readily vaporize. Heavy hydrocarbons, including tar, have been atomized by steam or air jets and burned in such condition.

It is the object of the present invention to burn both the light and heavy portions of crude or other oil simultaneously at the same burner and under conditions that will secure perfect combustion and a clear flame without the necessity of refining the oil or of superheating, storing, or handling a residuum and without the necessity of a special atomizing blast by first mingling air and the more vaporizable portions of the oil and subsequently mingling such carbureted air with the heavier portions; and the invention consists in the apparatus for such purpose, hereinafter described and particularly pointed out.

In the accompanying drawings is represented, diagrammatically in part, my improved apparatus for vaporizing and burning oil.

Numeral 1 indicates an air-compressor; 4, an air-conduit; 2, a by-pass pipe; 3, a furnace for heating the air-conduit; 4', a conduit for carbureted air; 5, an oil-tank; 5'', an air-carbureting oil-holder, and 5' an oil-receptacle with which conduit 4' communicates and which may be employed, if desired. These may be of any approved construction, and suitable cocks and other customary adjuncts will be used.

6 6 indicate branches of the hot-air pipe, which extend to near the bottom of the air-carbureting oil-holder and are there provided,

preferably, with ring or other extensions having numerous fine perforations to thoroughly distribute hot air in the lower strata of the oil, whence it rises through the oil by reason of its small specific gravity and is conducted, together with oil-vapors, from the oil-tank to the burner 7. The heated condition of the air promotes the vaporization of the oil, and as the oil-vapors and air are intimately mingled and have practically the same temperature the vapor will readily burn. Instead of heating the air before it is introduced into the oil, the latter may be heated—for example, as by a steam-coil 3'—and it may thus be made the medium of heating the carbureted air. A considerable portion of the oil, however, will not vaporize, but will settle to the bottom of the air-carbureting oil-holder as the lighter portions are carried away, and as fresh oil is supplied to the holder these heavier portions tend to accumulate and would interfere with the proper carbureting of the air. It has heretofore been necessary to draw off this residuum for use as a lubricator or for burning by use of special air or steam atomizers, and such burning has been effected with difficulty and imperfectly, because of the highly-carbonaceous composition of such residual oil. Its combustion can, however, be thoroughly and satisfactorily accomplished by mingling it with the more hydrogenous part of the oil after the latter has been suitably blended with air, whereby the more carbonaceous and heavy oil is diluted in manner to more thoroughly oxidize its carbon and other combustible elements. For this purpose the bottom of the oil holder or carbureter is made to communicate with the burner 7 by means of a pipe 8. This pipe preferably communicates with the oil-holder a short distance above its bottom to avoid drawing off the heavy dirt that will settle thereon, and the air-pipes also, by preference, extend to or below the outlet for heavy oil. The pressure of the air in said oil-holder tends to force the heavy oil through pipe 8, and it is aided by the eductive effect of the carbureted air that is forced through the burner.

9 indicates a valve or regulator whereby the quantity of heavy oil can be suitably ad-

justed to produce the best results, the effect of which can be readily determined by observing the flame. Were it not for such regulation, too much heavy oil relative to the carbureted air might be passed through the burner and a smoky flame result, particularly if the burner-orifices were not of the best proper relative size. They can be most conveniently made to have such proper size and capacity by a regulating device.

9' indicates a valve for regulating the flow of carbureted air. These two valves give entire control of the relative quantities of heavy and light oil vapors delivered through the burner. For this purpose the ordinary needle-valve used in vapor-burners for refined oil is unsuitable, for the reason that it would be speedily clogged by the impurities of crude oil.

The use of hot air warms both portions of the oil, so as to produce a common temperature above the normal highly favorable for combustion. The use of the steam-coil to heat the oil has an equivalent effect, and this means can be used whether the oil be preheated or not.

I am aware that oil has been forced through a pipe leading from the bottom of an oil-holder by air-pressure and oil from the same source being used to atomize the oil, and such method is not of my invention. It is characteristic of my improvement that heated air is passed through oil and mingled with its vapors and forced to the burner, and also that it is therein mingled with a regulated portion of the residual oil, and, further, the blending of the air with the non-combustible portions of the oil favors speedy ignition and the prompt generation of heat at the burner in addition to any which may have been previously imparted, whereby the heavy oils are converted into combustible vapor and gases in the flame of the burner. For the best result the air is highly heated and the various parts of the apparatus protected from radiation.

I do not claim, broadly, forcing oil from the bottom of a tank by air-pressure in the upper part of said tank, the air being simultaneously supplied therefrom to burn the oil. Such air-pressure would retard the vaporization of the lighter portion of the oil and would not be carbureted in any material degree. Nor do I claim conducting oil by gravity from the bottom of a tank and drawing air through the upper part of said tank above the oil and supplying said air to an oil-burner. In such case the air would be carbureted to a limited extent; but in such an operation heavy residuum, such as heretofore has been separated by distillation before use, would not flow to the burner, except it was practically on the same level, and it would in any case clog the oil-pipe and burner.

It is characteristic of my method that the air is forced through the oil and is thereby carbureted thoroughly, while at the same time air-pressure is thereby maintained in

the oil-tank to force the heavy residual oil in liquid state to the burner. I also separately heat the air and the oil, including the residuum, whereby the air is more heavily carbureted and the residuum is rendered more fluid. The comparative amount of residual oil is thereby diminished and its fluidity maintained by the same operation. Prior to the present improvement it has been found impracticable to successfully burn coal-oil without a preliminary distillation, and it is the object of my improvement to furnish means suitable for this purpose. It may be noted that the heavy oil is delivered in liquid form and warm condition directly to the burner under pressure of the carbureted air and that it is blended with warm carbureted air in the burner. Such method will completely burn crude oil without deposit in the burner or in the oil-tank and without smoke.

I do not claim the combination of a vapor generator or distilling retort having both air and oil supply pipes and also conduits for vapor and oil leading therefrom to a burner, nor such apparatus provided with automatically-operated valves in either the air or oil supplying pipes, said valve or valves being affected by back-pressure from the generator. In such construction the proper relation between the air and fuel supply is not sufficiently stable and the air-supply is liable to be partially or even entirely cut off by such back-pressure, particularly when the opening and closing of the air-inlet valve is controlled by the movement of a diaphragm subject to such pressure.

By my improvement the oil and air supplies are positively and independently regulated and the burner is supplied with air carbureted independently of the burner and supplied thereto in any desired constant quantity, by which means a more constant and equable blending of air and vapor is secured. The mixture is both more uniform and intimate for any desired and fixed quantity of fuel consumed. Further, when vapors are distilled in or by the burner the amount of heat available for the main purpose of the same is thereby diminished. This effect I avoid by carbureting the air mechanically, and I even add to the heat of the main furnace by preheating the air and oil.

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

1. The combination of an oil-holder, an air-forcing device, an air-conduit for conveying air to the oil-holder, means for mechanically distributing the air in the oil, a burner, and conduits connecting the upper and lower parts, respectively, of the oil-holder with the burner, whereby carbureted air and residual oil may be conveyed to said burner, substantially as set forth.

2. The combination of an oil-holder, an air-forcing device, an air-conduit for conveying air to the oil-holder, a heater for heating the air, means for mechanically distributing the

air in the oil, a burner, and conduits connecting the upper and lower parts, respectively, of the air-holder with the burner, whereby carbureted air and residual oil may be conveyed to said burner, substantially as set forth.

3. The combination of an oil-holder, an air-forcing device, an air-conduit for conveying air to the oil-holder, means for mechanically distributing the air in the oil, a burner, and conduits connecting the upper and lower parts, respectively, of the oil-holder with the burner, whereby carbureted air and residual oil may be conveyed to said burner, and an independent regulating-valve in the oil-conduit, substantially as set forth.

4. The combination of an oil-holder, an air-forcing device, an air-conduit for conveying air to the oil-holder, means for mechanically

distributing the air in the oil, a burner, and conduits connecting the upper and lower parts, respectively, of the oil-holder with the burner, whereby carbureted air and residual oil may be conveyed to said burner, and independent regulating-valves in the oil and vapor conduits, respectively, located at the burner and adapted to positively close either wholly or partially the oil and vapor passages, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

GEORGE H. HARVEY.

Witnesses:

S. G. HOPKINS,
BENJ. R. CATLIN.