J. A. DUBBS.

TREATMENT OF PETROLEUM.

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1,002,570. Patented Sept. 5, 1911.

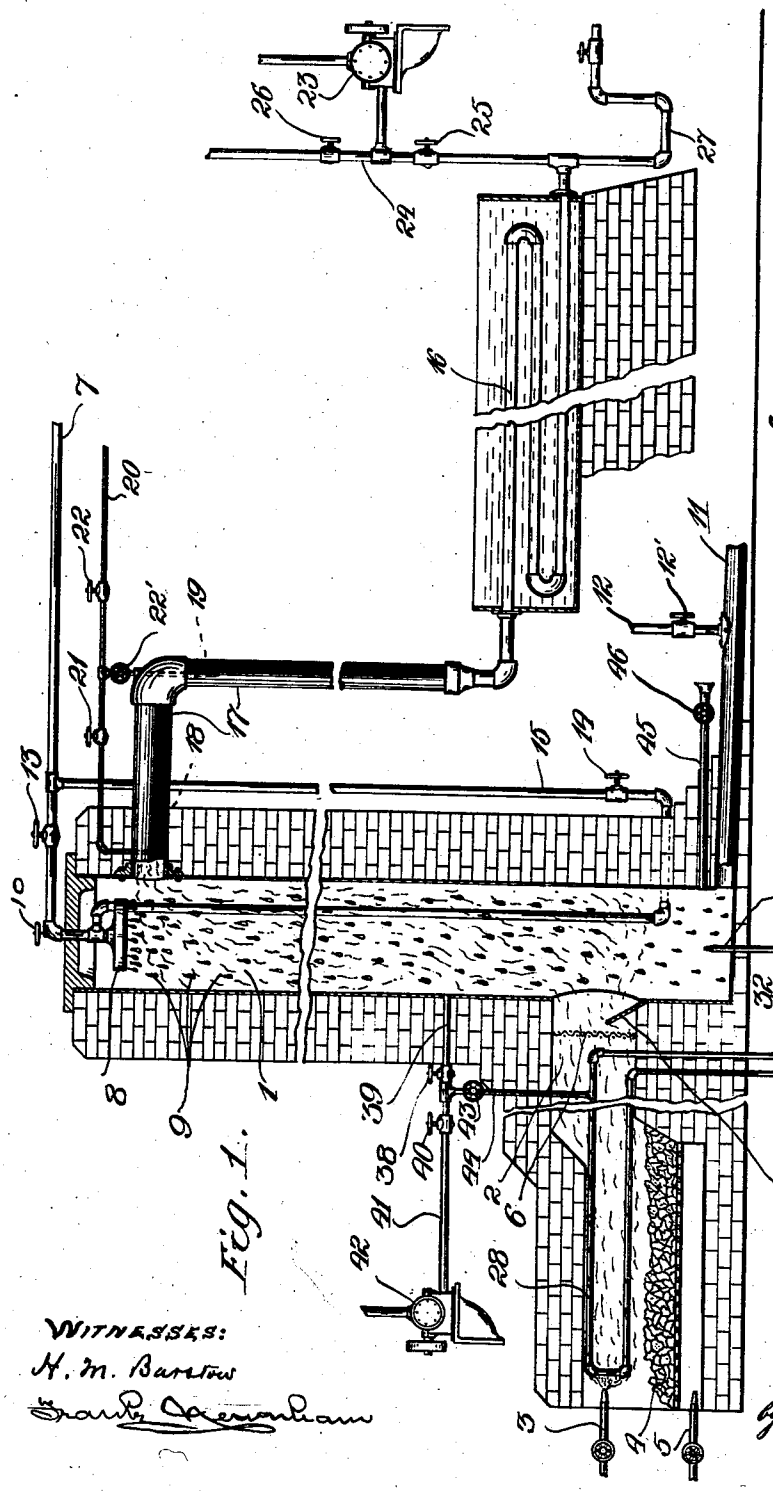

Fig. 1.

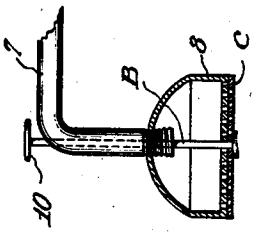

Fig. 2.

WITNESSES:
H. M. Barstow
Frank R. Cunningham

INVENTOR:
Jesse A. Dubbs.
by Anton Gloetzner Jr.
his Attorney.

UNITED STATES PATENT OFFICE.

JESSE A. DUBBS, OF SANTA MONICA, CALIFORNIA.

TREATMENT OF PETROLEUM.

1,002,570. Specification of Letters Patent. Patented Sept. 5, 1911.

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To all whom it may concern:

Be it known that I, JESSE A. DUBBS, a citizen of the United States, residing at Santa Monica, in the county of Los Angeles and State of California, have invented a certain new and useful Improvement in the Treatment of Petroleum, of which the following is a specification.

This invention relates to the distillation of petroleum or other oils, also to freeing oils from contaminating waters, and has particular reference to a method of distilling petroleum to produce asphalt and asphaltic residual bodies.

Distillation of hydrocarbon oils, having an asphaltic base, has been extensively and is now generally carried on in cylindrical and other stills, into which the crude oil is let and in which it is distilled in bulk. A large number of methods have been devised for preventing deterioration of the basic asphalt after the distillates have been driven off, but I have found that coking or carbonization of some of the asphaltic products is unavoidable in bulk distillation, and have discovered that the distillation of petroleum in suspension will yield a purer and greater quantity of both distillates and asphalt, with a corresponding increase in economy in heat units.

By reference to the accompanying drawing, my invention will be more clearly understood.

Figure 1, is a sectional elevation of a still for carrying out my invention, and Fig. 2, is a sectional detail showing a means for regulating the size of the drops.

The still for carrying out the process to be more fully described hereinafter, consists of a vertical still chamber 1, of any suitable height, having in communication therewith an elongated flue 2, in the forward end of which is located the heat producing medium, such for example as an oil burner 3. The flue 2, is sufficiently long to prevent flames from the oil burners entering the still chamber, it being an important object to prevent physical contact of the flame with the petroleum body, radiated heat alone being utilized to effect the distillation of the petroleum, and the production of the asphalt and asphaltic bodies, and such radiated heat may be combustion gases, heated air, superheated steam or combinations of heated air, superheated steam and combustion gases. Where coke is employed, as seen at 4, for the obtainment of heat, the heat of the gases therefrom is increased by the use of air, introduced by an air jet 5.

In and covering the entire forward end of the flue 2, is a wire gauze 6 of about 50 mesh or finer, provided for the purpose of preventing an explosion of gases that may enter the flue, its action being similar to the gauze in a Davy lamp. An apron 6′, inclined inwardly away from the still chamber serves to prevent the petroleum from entering the flue. Petroleum oil is fed through pipe 7, leading from a suitable supply tank, not shown, to a rose or dropper 8, in the nature of a foraminous pan which is fastened onto the end of the feed pipe 7 and suspended in the top of the still chamber 1, into which the oil is distributed in drops, as seen at 9. Onto the end of the shank B, and immediately below and in contact with the bottom of said foraminous pan 8 is secured a perforated plate C. By manipulation of the hand wheel 10, the plate C is moved, thereby regulating the size of the openings in the pan, and consequently controlling the size of the drops. The size of the drop depends upon the asphaltic product desired and the intensity of the ascending heat currents, which of course determines the rapidity of distillation of each descending drop, the distance of the descent, size of the drops and the degree being always calculable by the asphalt which falls to the bottom of the still chamber 1, such bottom being below the heat zone, preventing thereby coking of the asphalt but admitting of the continuous production of asphalt. The asphalt escapes from the bottom of the still through outlet pipe 11, to a collector, not shown, surplus gases being taken off the asphalt during its travel to the collector, by pipe 12, connected with said outlet pipe, and provided with a valve 12′. When it is found desirable to preheat the crude oil before delivering it to the dropper 8, the valve 13, on the feed pipe 7, is closed, and the valve 14, on pipe 15, opened, causing thereby the oil to flow through said pipe 15, which enters the still chamber at the bottom, and extends along the walls thereof, connecting finally with the feed pipe slightly above the dropper.

The distillates are carried out of the still chamber to the condenser 16, through the pipe 17, some of the products of distillation being condensed in said pipe 17, by steam

sprays 18 and 19, supplied from the main steam pipe 20, and controlled by valves 21, 22 and 22′. These steam sprays 18 and 19, serve also to maintain a certain amount of suction to assist in carrying off the distillates from the still chamber, but in order to insure positively the drawing off of the condensable products, I have provided a vacuum pump 23, which is connected to pipe 24, leading from the condenser 16, and through which pipe 24, the uncondensed gases may be drawn to a condenser at another point, or by manipulation of valves 25 and 26, such gases may be allowed to escape to the atmosphere. The uncondensed gases are prevented from traveling with the condensed gases to the storage tank, by a trap 27, connected to the end of the condenser 16.

As stated in the preamble hereto, superheated steam and gases of combustion may also be used for the distillation. To this end a superheater 28, is disposed in the fire box or flue 2, and in the direct path of the flame from the oil burner 3, steam being supplied to the superheater through the pipe 29, connected with a generator not shown. The superheated fluid is admitted to the still chamber 1, through the nozzle 30, which is connected with the superheater by a pipe 31, having a valve 32. Where it is desired to utilize superheated steam, uncontaminated by the gases of combustion, the valve 32, is closed and the valve 33, on pipe 34, opened, admitting through such pipe 34, which is connected with any suitable superheater, not shown, and located at any suitable point, the pure superheated fluid.

Where the superheated steam is not used, the valve 34′, on the pipe 35, connected with pipe 31, is opened, permitting the steam to escape to the atmosphere. Hot air may also be used to distil if desired. In such case, the valves 36 and 33, on the steam supply pipe 29, and the pipe 34, respectively, are closed, and the valve 37, opened. The valve 38, on the air pipe 39, leading to the still chamber 1, is also closed. After the valve 40, on the air pipe 41, which connects with a force pump, 42, and the valve 43, on the pipe 44, which connects the said pipe 41, with the superheater 28, are opened, the pump 42, is started, forcing the air through the superheater, and eventually into the still chamber 1, through the nozzle 30. By closing the valve 43, air may be delivered directly to the still chamber 1, to oxidize the oil, where this is found necessary. An air induction pipe 45, is also provided in the bottom of the still chamber 1, to supply air to the still, the quantity being regulated by valve 46.

By this process, asphalt may be continuously produced, the quality and grade being always under the control of the operator of the still, several provisions having been incorporated to prevent coking of the drops *in transitu*, as seen at 45 and 39, where cold air may be admitted to the still chamber to modify or cool the temperature.

I have referred throughout the specification to various means for producing the heat necessary for the distillation of the petroleum body, and in the claims, have used the word "heat." It will be understood that all forms of heat capable of use in carrying out the process herein defined, are included in the generic term heat, the special kind of heat and the mode of utilization depending to a large extent upon the results obtained and desired.

Though I have illustrated a dropper for distributing the oil in drops to the still chamber, and have described a process of distilling by heating the drops thus distributed to a distilling temperature, it does not follow that such is the only method of continuous distillation and production of asphaltic products. As stated, the degree of distillation depends upon the height of the fall and the degree of heat, in other words, upon the length of exposure of the petroleum body in suspense to the distilling temperature. Thus by increasing the height and the heat proportionably, the petroleum may be continuously introduced into the still, and distillation to various points, even to the production of coke, carried on.

In the practice of my invention, it is well to keep the supply of air just sufficient, or a very little more, to maintain combustion, thereby preventing any oxygen from passing through with the products of combustion, the object being to prevent the formation of explosive mixtures by the mingling of the oxygen with the vapors.

The process hereinbefore defined is adapted to the treatment of any of the oils having volatile constituents, such for instance as petroleum with an asphaltic or a paraffin base. Its chief use, however will be in treating the California oils containing a large percentage of asphalt, the recovery and preservation of which in its pure natural condition is the prime object of this invention.

Cylinder distilling as now practiced, requires the aid of many agents to properly obtain the base of the natural oil. Agitation is one of the most indispensable steps in order to avoid the creation of what are known as "carbines," and coking. And generally speaking, where there is a non-uniform dispersion of heat through the body, coking is impossible to guard against, unless the body under treatment be drawn off or the heat cut off before the petroleum is run down to the grade desired.

I have devised the arrangement shown for the purpose of carrying out a continuous process most suited for the treatment of pe-

troleum oils, whereby distillation may be little or great and various grades of asphalt obtained at any time desired. The heated gases of combustion are preferably created in the flue which forms a part of the still or vaporizing chamber 1, and when developed they ascend in the still chamber 1, and each and every particle of oil that descends thereinto from the dropper 8, is environed by a cloak of high heat. Where there is an exposure of small globules of oil, the evolution of the vapors contained therein must be proportionately large, depending upon the heat of the gases and the size of the globule, both of which are regulable according to the amount of distillate desired, the quantity of oil to be treated, and the nature of the resultant product desired.

When a large quantity of petroleum is to be treated with a corresponding large yield of vapors, and asphalt or asphaltic residuum, the oil may be pre-heated by passing the same through the pipe 15 that is located within the still chamber, or in any other suitable manner, and the heat in the flue increased, so that the small drops of oil are each exposed to a higher temperature. Hence all distillation in this apparatus is proportional. The distillates are exhausted through the pipe 17, both light and heavy products of vaporization, also the products of combustion leaving the still at one and the same time, for further treatment.

This apparatus is particularly useful for the treatment of drying of those oils containing an objectionable amount of water in the form of an emulsion, which in ordinary still distillation, causes an excessive foaming of the oil, frequently requiring the discontinuation of the heating and sometimes choking up the goose-neck which carries away the distillates.

In this process, whatever water may be in the oil drops as they descend in the zone of the high heat, is vaporized and converted into a gas, which is carried off in the same manner as the vapors from the oil. Foaming of the drops may be unlimited, for such action would have no effect on the continued operation of the still or process of drying.

What I claim, is:—

The method of treating petroleum to dry, and free the same from water, distil or produce asphalt therefrom, consisting in continuously causing the petroleum to drop, *in vacuo*, in the presence of ascending currents of combustion gases to drive off the lighter products from each of said drops while in suspension and collecting the asphaltic residuum below the heat zone, the size of the drops being varied according to the ascending heat and to the product desired.

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

JESSE A. DUBBS.

Witnesses:

WALTER C. MARSTON,

F. J. MCCLARY.