

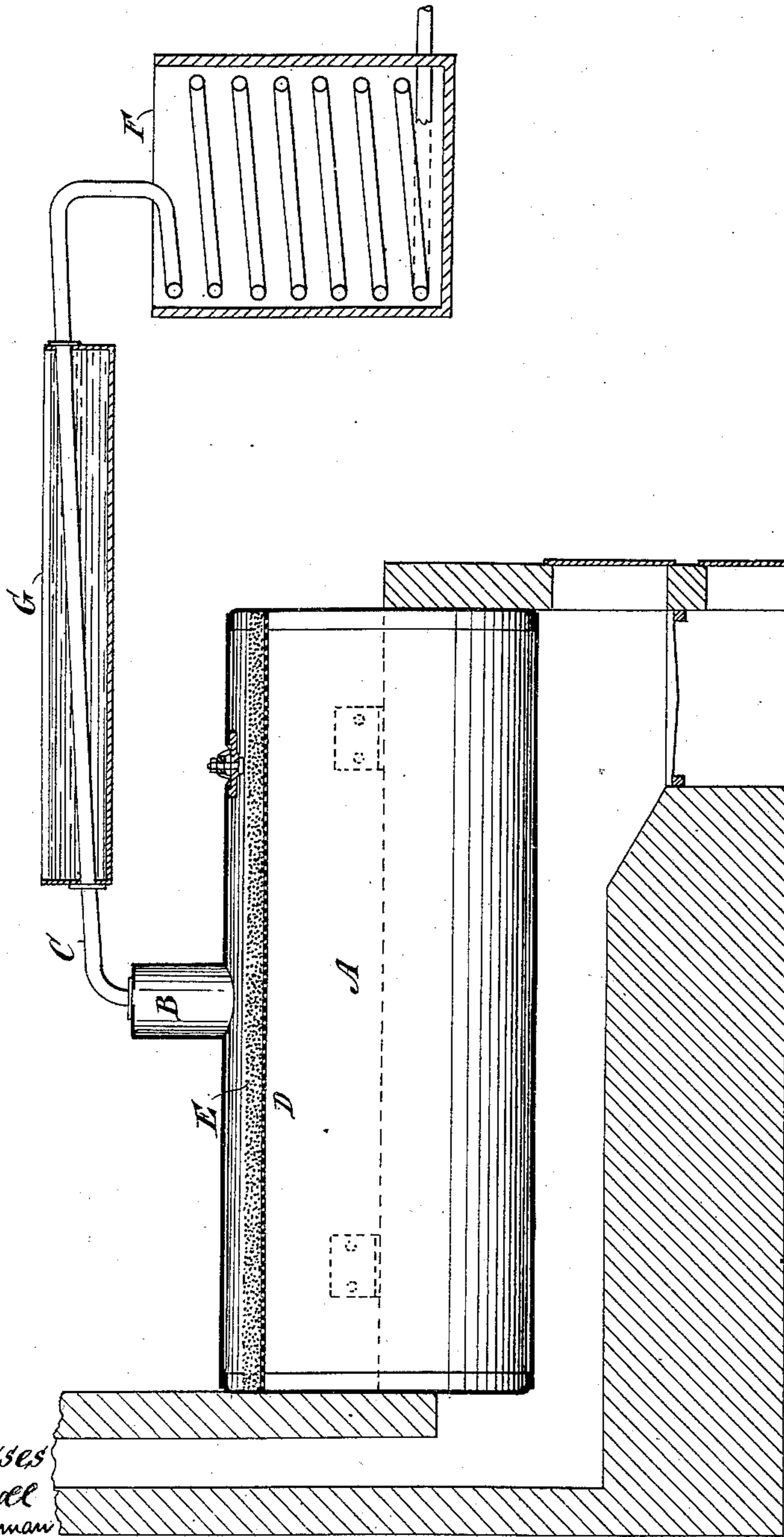
(No Model.)

G. H. KLINE.

PROCESS OF DISTILLING PETROLEUM.

No. 353,362.

Patented Nov. 30, 1886.



Witnesses  
Attest  
Geo Wadman

Inventor  
George H. Kline  
by Clifford & Brown  
Attys

# UNITED STATES PATENT OFFICE.

GEORGE H. KLINE, OF PAMRAPO, NEW JERSEY, ASSIGNOR OF ONE-HALF  
TO A. C. HENDERSON, OF BROOKLYN, NEW YORK.

## PROCESS OF DISTILLING PETROLEUM.

SPECIFICATION forming part of Letters Patent No. 353,362, dated November 30, 1886.

Application filed August 3, 1885. Serial No. 173,313. (No specimens.)

*To all whom it may concern:*

Be it known that I, GEORGE H. KLINE, a citizen of the United States, residing at Pamrapo, Hudson county, New Jersey, have invented a new and useful Process of Distilling Petroleum, of which the following is a specification.

In the ordinary processes of distillation of petroleum the separation of the lighter ingredients from the heavy oils and from foreign matter is incomplete. The theory of the ordinary processes is that the lighter ingredients are distilled at a lower temperature than the heavier, and that therefore by beginning at a comparatively low temperature and gradually increasing it the lighter ingredients are driven off and collected first and the heavier ingredients last. In practice, however, the vapors of the lighter ingredients carry with them more or less of the heavier oils and foreign matters, which tends greatly to impair the completeness of the separation.

Many attempts have been made to overcome the above difficulty without satisfactory success in practice.

One part of my invention is based upon the discovery that when a proper material is interposed in the path of the vapors from petroleum the lighter vapors may pass through the same, but will be relieved of the heavy oil and foreign matter carried with them, and that the heavy oil will be substantially condensed and redistilled until the condition of the vapors is that which is proper for distilling when the vapors will no longer be condensed by the material, but will pass out through it.

One part of my invention consists in a process which I have devised for making use of the above discovery.

Another part of my invention consists in an arrangement of the exit-pipe from the still and provision for cooling it, whereby the heavier vapors will be condensed and flow back into the still, while the lighter vapors will pass over into the condenser.

In the drawing I have shown a longitudinal section of an apparatus suitable for carrying out my process.

A is an ordinary still, which may be of any ordinary form. If of the form shown in the

drawing it is preferably provided with a turret, B. The turret is not material. The furnace is arranged at the lower part of the still, as shown in the drawing.

C is the pipe through which the vapors are conducted away from the still. I prefer that this pipe should incline upward as it leaves the still, as shown, so that any oil condensing in it will flow back into the still rather than onward into the condenser. This pipe passes through a device for cooling it to a limited extent—such as the condensing-pan G. The temperature of the water or cooling material in this pan should always be such as not to condense the lighter vapors, which it is desired should pass over, but simply sufficient to condense the heavier vapors, which will then flow back into the still for redistillation. When these vapors which thus flow back into the still are redistilled they will come up in a lighter condition, in which more or less of them will pass over. The arrangement of pipe C and provision for cooling it may be used without the other part of my improvement, or vice versa; but the best results are obtained by using them in combination.

F is a condenser of the ordinary construction.

D is a diaphragm, which is placed horizontally across the interior of the still above where the heat is applied, so as to divide the interior into two compartments. This diaphragm is perforated sufficiently to admit freely of the passage of the vapors from the petroleum. The petroleum to be distilled is introduced below the diaphragm. On top of the diaphragm is placed the material E, which is to permit of the passage of the lighter vapors before it permits of the passage of the heavier products. The particular material which I prefer for this purpose is either broken pumice-stone or bituminous coke, because these substances, being in a state of sufficient division to produce considerable extent of condensing-surface, satisfactorily perform the functions which I require of them, while they do not act chemically on the vapors or tend to deteriorate the same; but I do not limit myself to these materials. Others will answer a good purpose. This material, not being directly subject to the heat, will be continually cooler than the vapors.

The dimensions and relative proportions of the parts may be varied and differ under different circumstances and for different sizes of still, and I do not limit myself to the same, but with a still of the form shown I should advise about the following, viz: diaphragm about twenty inches from top of still; layer of material about ten inches deep; size of perforations of diaphragm about one-thirty-second to one-half inch; distance between perforations about one-half to one-quarter inch; inclination of pipe C about one-half inch to the foot. If pumice-stone be used, size of pieces one-quarter to one inch in diameter. Heat to be applied at bottom and preferably less than one-third upward of the still.

The operation is as follows: When the distillation commences, the lighter ingredients go off in the form of vapors, carrying with them more or less of the heavier ingredients and earthy matters. The lighter vapors pass through the material E. The heavier vapors are largely condensed by this material and drip back into the lower part of the still. The earthy matter largely deposits on the material E. If any of the heavier vapors escape through the material E, they condense in the pipe C and flow back into the still. As the heat increases the weight of the vapors which will pass through the material E increases until finally substantially all of the contents of the still required are distilled. The condensation of the heavier vapors by the material E and in the pipe C, both of which are cooler than the heavier vapors, is continually going on, and they are continually returning to the still, and each succeeding time that these vapors come up they are in a more or less lighter condition than before. The separation and purification of the ingredients will be found to be exceedingly perfect.

Thus by a simple and inexpensive process I am enabled to get a purity of product which I believe to have been heretofore unattainable in practical manufacture.

I am aware of Letters Patent No. 215,756, granted to J. L. Kirk, May 27, 1879, and lay no claim to anything therein described. The method described in said patent is one of those attempted continuous distillations which have always been unsuccessful in practice. In said patent the filters are placed within the furnace, "in order that they may be kept at the same temperature as the vapors, thus preventing condensation at this stage of the distillation." In practicing my process, the furnace being at the lower part of the still, the material E is at a lower degree of temperature than the vapors, which is essential for the condensation of the vapors, by which I accomplish the separation. I thus obtain a mode of operation and results which were impossible with the contrivance described in said patent.

I am aware of English Patents No. 1,117 of 1858, and No. 1,295 of 1863, and I do not claim anything described in these patents. The substances interposed in the path of the products

of distillation as described in these patents are such as to produce a chemical action upon the vapors. The substances which I use are of such a character as to produce substantially no chemical action on the vapors, but merely to act as an obstructant or condenser to the free egress of the vapors, thereby causing a partial condensation of the heavier vapors, which drop back into the liquid and are thence redistilled.

I am aware of United States Patent to Ellis and Kattell, No. 68,860, September 17, 1867, and English Patent No. 1,824 of 1882. In these patents the vapors are produced by the direct action of steam. I do not claim processes of this character. I apply the heat to the oil, not by mingling steam with it, but by heat applied to the outside of the oil-receptacle, or from what would be the equivalent hot flues or pipes immersed in the oil.

I am also aware of United States patent to Prentiss, No. 87,792, March 16, 1869, where there is a condenser arranged at a distance from the still with a vessel interposed between them, within which the vapors, after passing downward, are caused to bubble up through a body of the liquid on its way to the still. I do not claim processes of this character. In my process the vapors pass from the oil directly through the divided material which is to produce the condensation, as heretofore fully described.

I am aware of Patent No. 307,961, to F. Konig, in which vapors are passed from the still through various chambers containing long columns of cooling substances and various rectifiers. I do not claim that which is described in this patent. By the arrangement of the divided material, as I have shown and described it, on a perforated diaphragm within the still the vapors are caused to encounter the divided material while in substantially the condition in which they rise from the liquid mass, and the surface of the material being extended in comparison with its depth the obstruction afforded materially impedes only that portion of the vapors which it is desirable to redistill.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In the process of distilling crude petroleum, passing the light vapors of the petroleum through a thin layer of divided material located upon a perforated diaphragm above the surface of the liquid and within the body of the still, and which material is at a lower degree of temperature than the vapors and does not substantially act chemically upon the vapors, whereby the heavier vapors are obstructed and caused to return for redistillation, substantially as described.

2. In the process of distilling crude petroleum, passing the light vapors of the petroleum through a thin layer of divided material within the body of the still having an extended surface in comparison with its depth, which material is at a lower degree of temperature than the vapors and does not substantially act chemically upon the vapors,

whereby the heavier vapors are obstructed and caused to return for redistillation, substantially as described.

5 3. In the process of distilling crude petroleum, passing the light vapors of the petroleum through a thin layer of divided material located upon a diaphragm immediately above the surface of the liquid and within the body of the still, and which material is at a lower  
10 degree of temperature than the vapors and does not act chemically upon the vapors, thence passing the light vapors as they leave the still through a pipe inclined upwardly

and cooled sufficiently to condense the heavier vapors, but not sufficiently to condense the lighter vapors, whereby by the action of said divided materials and said cooled pipe the heavier vapors are condensed and fall back into the still for redistillation, while the vapors pass over into the condenser, substantially as described. 15 20

GEO. H. KLINE.

Witnesses:

DANIEL H. DRISCOLL,  
WM. G. LIPSEY.