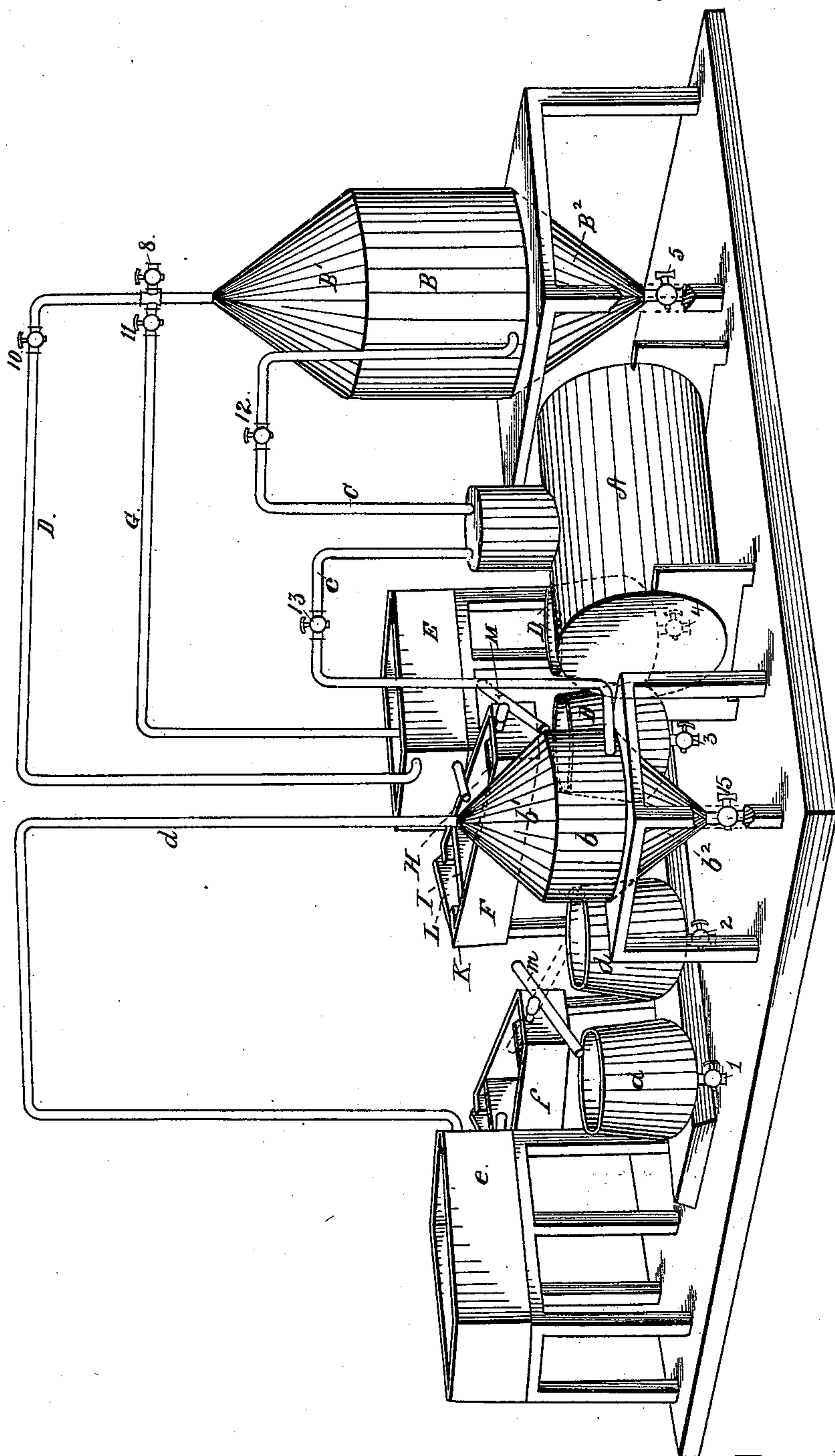


S. CHENEY.
Process and Apparatus for Distilling Petroleum.
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Fig. 1.



Witnesses.
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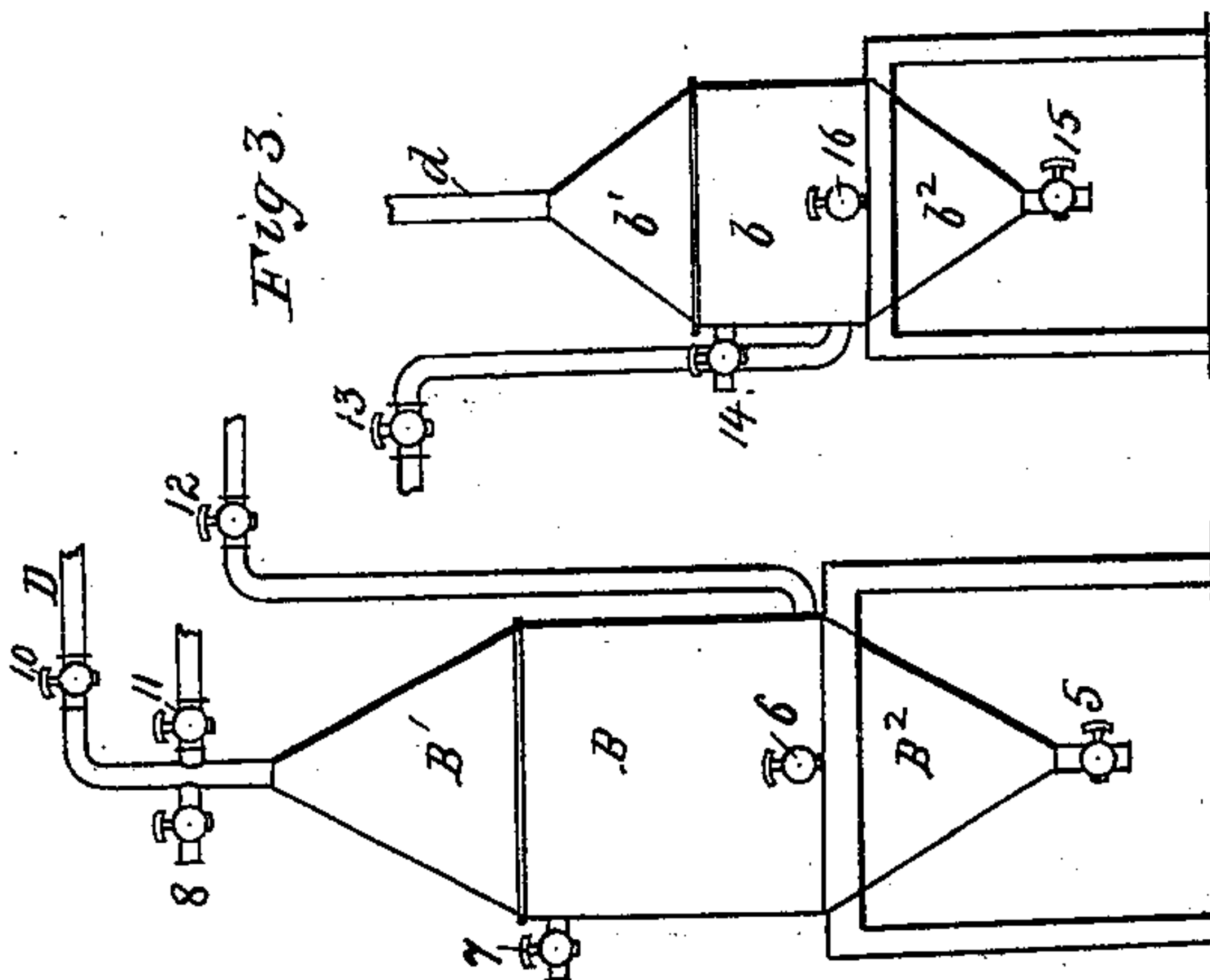
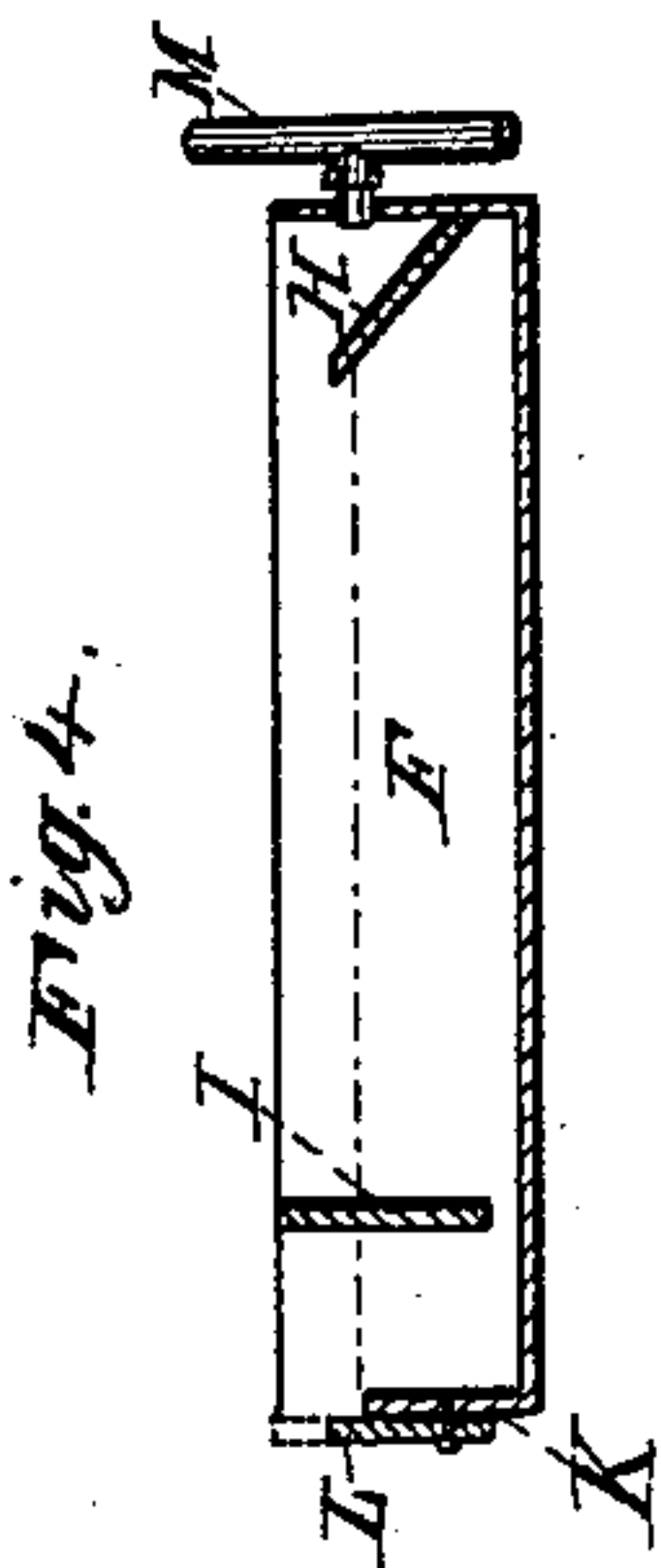
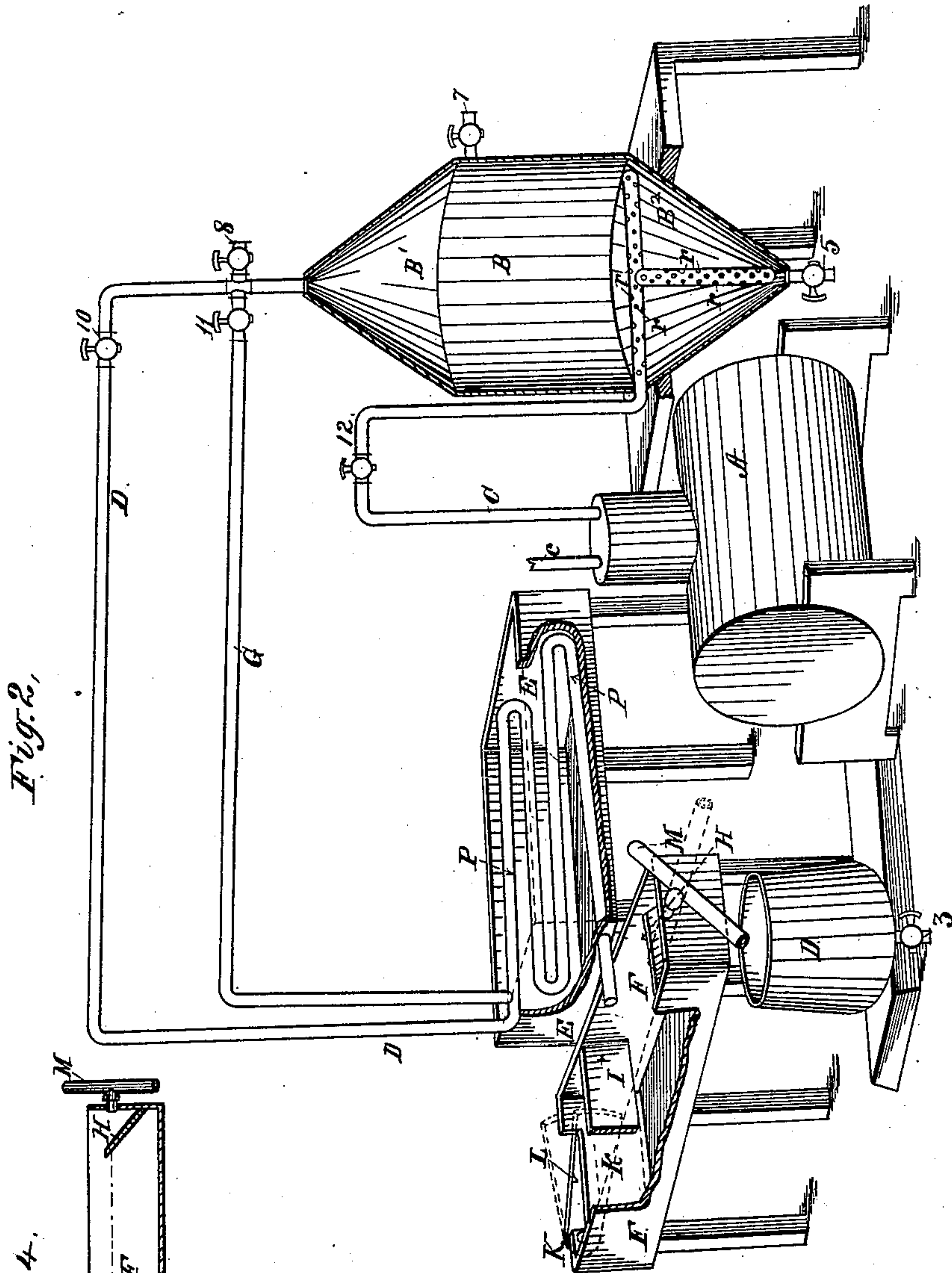
Inventor.
Samuel Cheney
By James C. Boyce
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UNITED STATES PATENT OFFICE.

SAMUEL CHENEY, OF ROUSEVILLE, PENNSYLVANIA.

PROCESS AND APPARATUS FOR DISTILLING PETROLEUM.

SPECIFICATION forming part of Letters Patent No. 230,239, dated July 20, 1880.

Application filed October 2, 1879.

To all whom it may concern:

Be it known that I, SAMUEL CHENEY, of Rouseville, in the county of Venango and State of Pennsylvania, have invented a new and useful Process for Extracting from Crude Petroleum its Illuminating and its Lubricating Oils, and an apparatus for working such process, of which the following is a specification.

The process itself is independent of any particular form of apparatus; but in the drawings I have shown, and will hereinafter describe, the apparatus which I find well adapted for the purpose.

Figure 1 is a perspective view of the entire apparatus. Fig. 2 is a perspective view of the main portion of the apparatus, with the digester shown in section, and parts of the condensing-tank and separator broken away to show their internal construction. Fig. 3 is a side view of the smaller and larger digesters. Fig. 4 is a sectional view of the separator, with a dotted line showing the water-level.

In the drawings, A is a steam-boiler of any ordinary construction, with steam-pipes C and c extending to the digesters B and b, respectively.

In the drawings, the parts designated by the smaller letters *b c d*, &c., correspond to those designated by the capital letters B, C, D, &c.

The apparatus consists of two parts, which differ in size, but in all other respects are exactly similar.

The crude petroleum to be treated is placed in the digester B, which should not be filled ordinarily to over three-fourths of its capacity.

The steam-pipe C enters the digester B and terminates in a branched pipe, perforated, as shown at *r*, Fig. 2. The total area of these perforations should not exceed three-fourths of the area of the steam-pipe C, as the steam should issue from the perforations *r* with considerable force.

The digester B is provided with suitable pipes D and G, which have stop-cocks 10 and 11, and also the gas-escape and stop-cock 8. The pipes D and G terminate in a condensing-worm, P, of the usual construction.

When the crude oil is placed through the cock 7 in the digester B all the stop-cocks

should be closed except the gas-escape cock 8, which should be opened.

When the steam in the boiler A has attained a pressure of about forty pounds to the square inch the stop-cock 12 is to be gradually opened and the steam let into the digester B. Issuing from the perforations *r* with considerable force, such steam will thoroughly agitate the petroleum. A portion of the steam will be condensed into water, and this, being distilled and nearly pure water and very hot, will dissolve and wash out many of the impurities in the crude oil, and the heat of the steam will cause, in connection with the thorough agitation of the oil, the gas to separate from the petroleum and escape from the gas-cock 8.

The gas-escape 8 must be carefully watched, and when, by placing a piece of white paper in the jet, it is found that a spray of oil is being thrown off, or when steam commences to escape freely, then the cock 8 is to be closed and cock 10 or 11 to be opened. I then increase the fire under the steam-boiler C, so as to gradually force up the pressure to seventy-five pounds to the square inch.

As shown in the drawings, the pipe from the digester B is in two branches, D and G, one of which, D, I run up about ten feet above the top of the digester B before bending it horizontally, and the other branch, G, I bend horizontally at a vertical altitude of about two feet. If I wish to obtain a very light and fine quality of illuminating-oil, I use the upper pipe, D, while the use of the lower branch, G, gives a coarser and heavier product. Whichever branch is used, its stop-cock is opened and the stop-cock in the other branch is closed.

Steam is admitted to the digester B as long as any vapor is extracted and condensed in the worm.

The liquid obtained by this first extraction is received into the separator F, and its treatment will be described hereinafter.

After all the vapor has been driven off from the oil in the digester B that it is worth while extracting the steam is shut off and the digester B and its contents allowed to cool.

The condensed water will settle in the bottom B² of the digester, and is drawn off through the cock 5 into a proper tank, though if

the charge is comparatively small the water may remain in the digester. This water will contain most of the dirt and other impurities of the oil, and will have a milky appearance, owing to its holding in suspension some of the oil. The water, when drawn off, is allowed to settle, the impurities sink, and the oil separates and floats on the surface. After the water is drawn off from the digester B steam is again admitted and the oil heated and agitated the second time, the gas allowed to escape, and the vapor condensed and collected, as before, the digester allowed to cool, and the condensed water drawn off and conveyed to a settling-tank, as before. The digester is then heated with the steam and agitated the third time precisely as in the first and second times, and allowed to cool sufficiently to condense the water, and then the whole contents of the digester are drawn off into another settling-tank, which should be a covered tank, and in this allowed to settle and cool slowly. The main object of covering the tank is to retain the heat longer than would be possible in an open tank. The impurities and water will sink to the bottom and the oil will float on the surface.

I have discovered that a slow cooling of the mixed liquids more thoroughly purifies the oil, and I make use of it for that purpose. The resulting oil will be a lubricating-oil.

As any one skilled in the art of refining is aware, the gravity of the lubricating-oil can be regulated in the process.

I recommend that the steam used should not be over seventy-five pounds pressure to the square inch; but a greater pressure and correspondingly hotter steam can be used, if desired. This must be left to the skill and judgment of the refiner, and will depend upon the varying value of the different products and the character of the crude material.

The illuminating-oil which is obtained by the first steaming of the petroleum in the digester B and the lesser quantities which are obtained by the second and third steamings are suffered to flow from the end of the condensing-worm in the usual manner; but I receive them in a vessel which I call a "separator," and which is designated in the drawings by the letter F.

For use with a fifty-barrel digester I would make the separator F from six to eight feet long, about sixteen inches deep, about twelve inches wide at one end and six at the other. At the larger end a water-way is cut to the depth of about an inch and a half, as shown at K, and this can be closed by the movable cover or gate L. A few inches from the larger end I fix the partition I, which extends from side to side of the separator and is flush with the top, but extends only to within a fourth of an inch of the bottom. Near the smaller end of the separator F, I place the inclined shelf H, which is fastened water-tight to the end and sides of the separator F. The upper

edge of H should be about a quarter of an inch higher than the upper edge of the water-way K. To the smaller end of F, and above the inclined shelf H, I fix the pipe M. This can be made with two branches, as shown, and movable, so that fluid running through M can be delivered, at the option of the refiner, into either of two tanks.

The separator F is to be filled with water up to the lower edge of the water-way K, the gate L opened, and as the separator F is placed upon a level the water will have a free course under the partition I, and will stand a little—say a quarter of an inch—below the upper edge of the inclined shelf H.

The liquid from the worm P is received in a gentle stream upon the surface of the water in the separator F, between the partition I and the inclined shelf H, and as near as practicable to I. The impurities of the liquid will sink, the condensed water will separate, and the purer oil will skim over the edge of the inclined shelf H and pass out through the pipe M and be conveyed to its appropriate tank, according to its gravity or as determined by the operator.

By means of the gate L and a water-supply the level of the water in the separator F can be controlled so that all the oil can be run over the edge of the shelf H. The same effect can be produced by water-cocks placed in the separator F, or the inclined shelf H may be made movable. Any means for controlling the level of the water in the separator may be used.

After the illuminating-oil is all run over and collected it can be treated with acid neutralized by alkali and washed with water in the usual way, and I then place it in the digester *b* and steam it once and condense it, as at first.

The digester *b* need be but half the size of the digester B when used in connection therewith, or the digester B can be used for the second run; but it is better to have a second digester.

The pipe from the apex of the coned end *b'* of the digester *b*, I carry up to a vertical height of about eight feet and then lead it to the condensing-worm.

I prefer to run off all the oil from the second digester, *b*, except about five per cent., and that five per cent. I mix with the lubricating-oil, or if, on testing, I find it different from that oil, I put it in the first digester, B, with a fresh charge of petroleum. It is not necessary to have any gas-escape in the pipe *d*, or more than one pipe from the digester *b*. This second digestion of the illuminating-oil restores the grain of the oil, which is generally changed by the treatment with acids and alkalies.

The process which I have described is applicable to petroleum of above 38° Baumé. Petroleum of lower gravity I place in the digester B and extract about fifteen per cent.

on the first heating, allow it to cool, then heat it again by steam and extract about five per cent., (of the original quantity, making twenty per cent. in both extractions,) allow it to cool, then thoroughly boil it by the steam, and draw off the whole into the covered tank and allow it to cool slowly, as before described.

The condensed liquid which flows from the worm when the twenty per cent. is taken off from heavy oil (meaning oil of the gravity of 38° Baumé or below) can be treated with acid and alkali and digested a second time; but the product will not be illuminating-oil. It is a product heretofore unknown to the arts. It is clear and limpid, of a density of from 34° to 37° Baumé, and will not congeal at a temperature of zero. It has no illuminating power, is inflammable at ordinary temperatures, and is a powerful solvent of most gums, of paraffine, and of oils. It is adapted for lubricating sewing-machines and light journals, and for mixture with heavier oils to make lubricators for heavy journals.

The digesters B and b are an improvement upon ordinary forms of vessels used for similar purposes. They are made with coned tops and bottoms, as shown at B' b' and B² b², and with the main portion cylindrical, the vertical altitudes of the cones being about equal to that of the cylinder. The pipes D and d from the apex of the upper cone are to convey away the vapors, and at the bottom are stop-cocks 5 and 15 for drawing off the charge or the condensed water.

I am aware that steam has been introduced and used in a digester in the process of refining petroleum, paraffine-oil, and distilling turpentine, and that in the process of treating sludge-oil successive heating and cooling operations have been resorted to with the use of acids, followed by alkali, and that single-shell digesters having conical ends have also been used in refining petroleum, as well as tanks having a series of gates for separating ammonia-liquor from gas-tar, and do not claim the above broadly, but as confined to my process and apparatus.

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

1. The process of producing lubricating-oil from crude petroleum placed in a digester by driving off the gas with steam at a pressure of about forty pounds and that portion of the petroleum adapted for illuminating-oil by the action of live steam at a pressure of not over seventy-five pounds, allowing the heavy oil to cool, heating it and agitating it a second time by live steam at the pressure last mentioned, allowing it to cool, and heating it and agitating it by steam a third time, and then cooling the heavy or lubricating oil, with its condensed water, as slowly as practicable in receivers, substantially as described.

2. The process of obtaining light lubricating-oil from heavy oil, so called—to wit, crude petroleum of 38° Baumé and below—by agitating such heavy oil in a digester with live steam at a pressure not exceeding seventy-five pounds to the square inch, vaporizing and thus removing the illuminating-oil, then allowing the contents of digester to cool, and steaming again until about fifteen per cent. of the whole quantity is vaporized and condensed, then allowing the digester and contents to cool, and again treating the heavy oil with steam until about five per cent. of the original quantity is vaporized and condensed, which products of fifteen and five per cent., having a gravity of from 34° to 37° Baumé, are the light lubricating-oil above mentioned.

3. A separator made to receive condensed liquid from distillate of petroleum and water, constructed with inclined sides, partition I, inclined shelf H, and water-way with its gate, substantially as shown and described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

SAMUEL CHENEY.

Witnesses:

J. M. HARDING,
JAMES C. BOYCE.