

S. VAN SYCKEL.

Distillation of Hydrocarbon Oils.

No. 152,440.

Patented June 23, 1874.

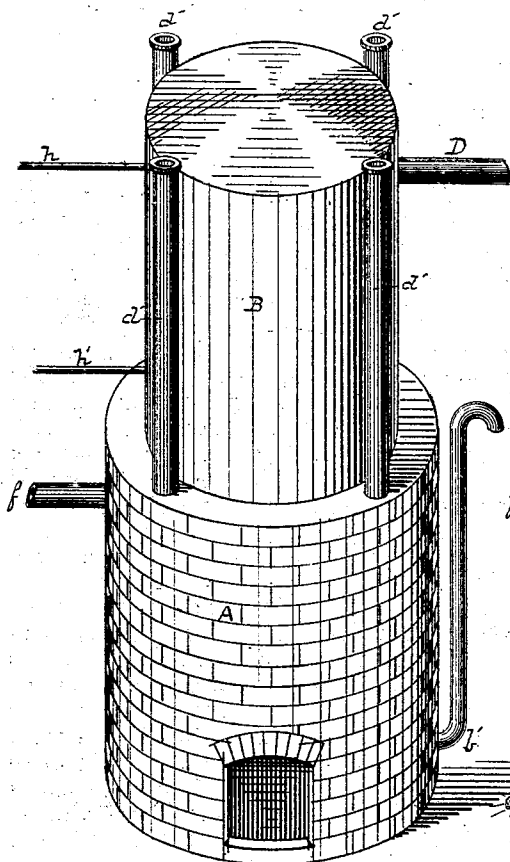


Fig. 1.

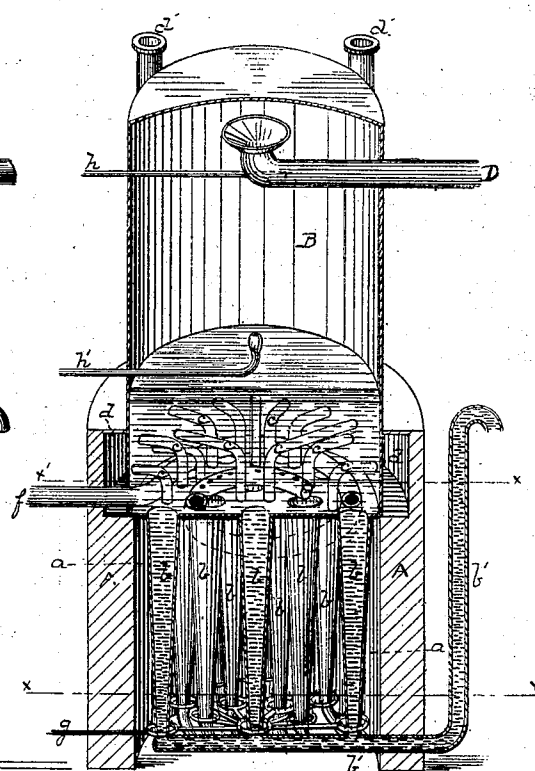


Fig. 2.

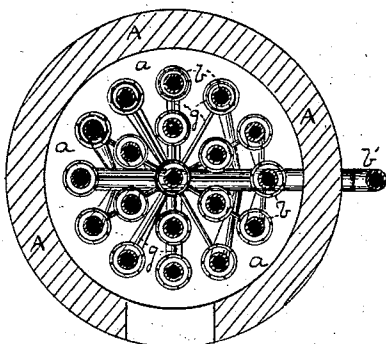


Fig. 3.

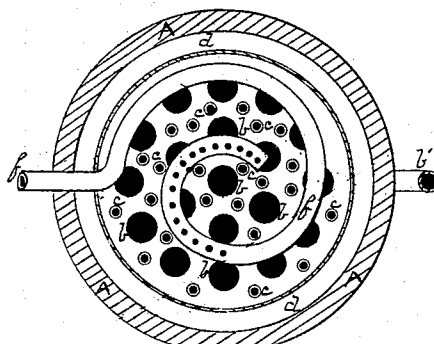


Fig. 4.

Witnesses { Fred. Standish
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Inventor Samuel Vansyckel,
by Batewell, Christy Kerr,
his Attys.

UNITED STATES PATENT OFFICE.

SAMUEL VAN SYCKEL, OF TITUSVILLE, ASSIGNOR TO HIMSELF AND JOHN JOHNSON & CO., OF MEREDITH, PENNSYLVANIA.

IMPROVEMENT IN THE DISTILLATION OF HYDROCARBON OILS.

Specification forming part of Letters Patent No. 152,440, dated June 23, 1874; application filed November 21, 1873.

To all whom it may concern :

Be it known that I, SAMUEL VAN SYCKEL, of Titusville, in the county of Crawford and State of Pennsylvania, have invented a new and useful Improvement in Distillation of Hydrocarbon Oils; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings making a part of this specification, in which—

Figure 1 is a perspective view of my improved still. Fig. 2 is a vertical sectional view thereof in perspective. Fig. 3 is a horizontal sectional view through the line xx of Fig. 2; and Fig. 4 is a like sectional view through the still, just above the level of the oil-supply pipe, in the line $x'x'$.

Like letters of reference indicate like parts in each.

The object especially in view in my present improvement is the construction of a still particularly designed for the distillation of petroleum oils by a continuous process—that is, with a continuous supply of oil to be distilled, a continuous driving off and condensing of vapors, with a continuous deposit of refuse or tarry matter, under such conditions that it may be drawn off continuously from the still, or drawn off from time to time, at pleasure, without interfering at all with the continuous operation of the still; but, at the same time, the still may be run in the usual way when desired. And while the still which I have invented may be employed advantageously with the ordinary crude oils as produced from the wells, I especially design it for use in distilling oils as produced from an apparatus patented to me by Letters Patent No. 143,945, dated October 21, 1873, in which apparatus the gases contained in the oil are removed as a preliminary step to the further treatment of the oil.

To enable others skilled in the art to make and use my improvement, I will proceed to describe its construction and mode of operation.

The walls A inclose any desired area of fire-space a , according to the diameter of the still B, which is mounted thereon. The height of

the walls A may be varied at pleasure, but for ordinary purposes a height of from ten to twelve feet will be sufficient. The still B consists of a cylinder, say of from twelve to twenty feet in height, more or less, with a series of inverted cones or pipes, b , extending downward into the fire-box a , which is situated immediately under the bottom sheet of the still B, such cones tapering downward to near the lower part of the fire-chamber a , at which point their contracted tubular apexes make a connection with a pipe or series of pipes, b' , which extend outside the walls A. These inverted cones b are made hollow, and preferably are arranged at the point of their junction with the still B, as close together as practicable, in order that in the operation to be described little or none of the tarry refuse may lodge or rest on the bottom plate or sheet of the still B. Through this bottom sheet, in any desired number and arrangement, a series of pipes, c , extend up and laterally outward, opening at their lower ends into the fire-space a , and at their outer ends into an annular heating-chamber, d , which surrounds the lower end of the still to a height of, say, three or four feet, more or less, but not above the level of the oil in the still; or, in other words, the level of the oil in the still should always be above the upper level of the heating-chamber d . At any desired level I introduce, by the pipe g , any desired gas or hydrocarbon vapor or carbureted air into the fire-space a ; and inside such fire-space I extend the pipe in various directions by radial arms, a worm-coil, or, as shown, by a ring around each of the cones b , in any way that may be desired with reference to giving the best application of the heat produced therein by the ignition of such gas or vapor to the inverted cones b .

Oil is supplied to the still, at or near the bottom, by means of a pipe, F, which is coiled or bent, or in other manner arranged so that the oil shall be heated to a greater or less degree of temperature before its discharge into the still, and such pipe, at or near its delivery end, is preferably perforated, so that the oil shall be delivered at various points over the bottom of the still rather than at a single point. At

or near the upper end of the still B I arrange the pipe D, by which the vapors are carried over to the condenser; but, instead of making the opening of this in such form that it will most readily take the vapors from the center of the still, I arrange it as shown in the drawing, with an elbow and mouth upward so that the vapors which rise most rapidly from the oil below at or near the center of the still will be somewhat retarded in their escape, and be compelled to diverge outwardly toward the sides of the still before entering the pipe D, as a result of which feature I retard those vapors which ordinarily give a colored oil, or allow them to be condensed and drop back, and carry over those vapors which experience has shown give the whitest and best quality of oil; and in order to promote the movement of the vapors, and also to lower the vaporizing-point, I introduce into the pipe D a steam-jet, *h*, and also into the still, above the level of the oil, a steam-jet, *h'* the operation of which will be readily understood. The heating-chamber *d* is connected, by the flues *d*, with the smoke-stack, so as to carry off the products of combustion.

As the process of distillation is carried on, the refuse and tarry matter is gradually deposited in the cones *b*, and as it descends and comes nearer to the level of the pipe *g*, which is the fire-level, it becomes subject to a more intense heat, and consequently the oily ingredients which go down therewith are by such heat vaporized and driven off. The tarry refuse or residuum, being thus deprived of all or nearly all its oleaginous ingredients, passes down the cones *b*, below the fire-level, and is then drawn off, either continuously or intermittently, from the cones at their smaller ends, by means of the pipe or pipes *b'*. In practical use, the best results are attained when the level of the pipe *g* is arranged at or about the point at which the tarry residuum shall, in the operation described, have become freed from all or the greater part of the oil. In this way, while the tar is carried downward through and beyond the reach of the fire by a continuous operation, the oil is distilled above and driven upward, converted into vapor, and carried over and condensed, as set forth. The heat is applied from the heat of the fire-level upward to the outer faces of the cones *b*, and by means of the pipes *e*, which pass through the body of the oil to the oil which so covers them, and by means of the heating-chamber *d*, to the outside of the body of the oil in the bottom of the still B.

I have found that by such apparatus I can carry on the operation of distillation continu-

ously, keeping up a continuous feed through the pipe *f*, a continuous supply of gaseous fuel through the pipe *g*, a continuous drawing off of the tar or residuum through the pipe *b'*, and a continuous carrying over and condensation of the vapors through the pipe D.

The smoke-pipes *e* may open at their lower ends through the sides of the cones *b*, at or near their upper ends, if so preferred. Also, an ordinary grate for heating may be substituted for the devices described, and the vaporization of the oil may be facilitated by the introduction therein of superheated steam; but, for heating purposes, that described is preferable, since thereby the degree of heat may be more perfectly regulated, and thereby the gravity of the distillate may be likewise regulated. The degree of heat applied regulates the gravity of the distilled product.

Where the operation is carried on continuously it is generally better to carry the pipe *b'* upward to a little below the level of the oil in the still, allowance being made for the difference of specific gravity of descending and ascending columns of matter so formed. The supply of oil to the still and the degree of heat then being properly regulated, the work may go on without interruption.

The shape of the pipes *b* may be varied at pleasure, as, for example, they may be made cylindrical, and with a connection at the lower ends with the refuse-pipe *b'*.

I do not claim applying the heat above the bottom of the still to prevent burning the deposit thereon, as this is not of my invention.

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

1. A still, B, provided with a series of pipes, *b*, extending downward from the bottom plate into the fire-box, and opening into a common refuse-pipe at a point below the fire-level, substantially as described.

2. A still, B, having a series of pipes, *b*, in combination with the fire-box *a*, the pipes *e*, and the annular heating-chamber *d*, as and for the purposes described.

3. The arrangement of the vapor-pipe D, with its receiving-aperture opening upward, substantially as set forth.

4. The combination of the still B, pipes *b*, and upwardly-extending refuse-pipe *b'*, substantially as set forth.

In testimony whereof I, the said SAMUEL VAN SYCKEL, have hereunto set my hand.

SAMUEL VAN SYCKEL.

Witnesses:

G. H. CHRISTY,
T. B. KERR.