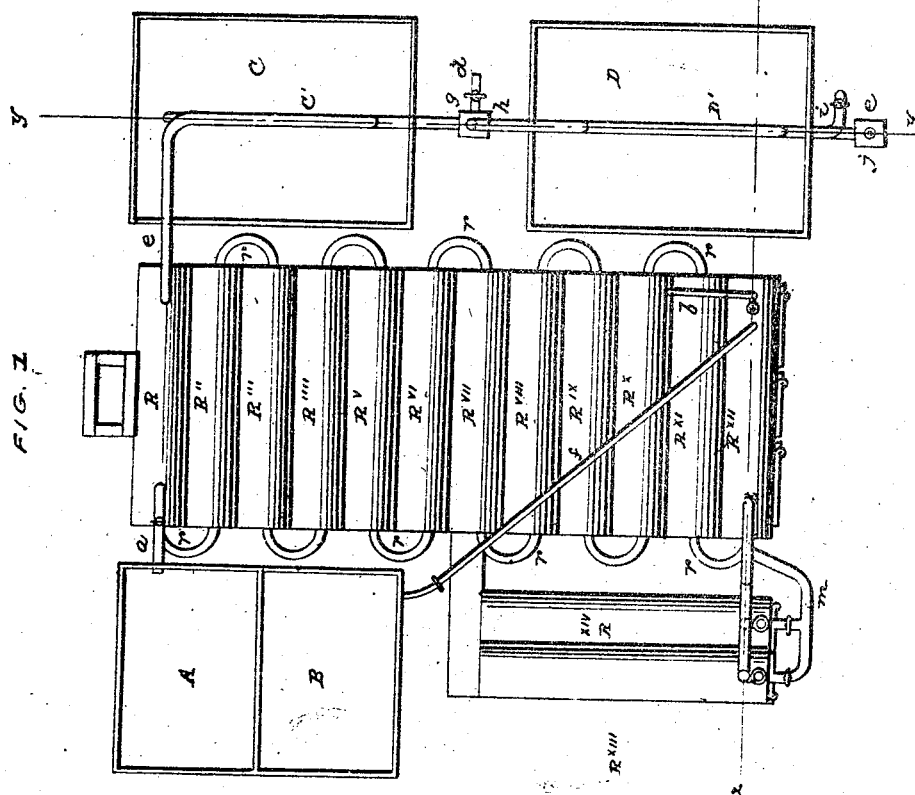


Oil. Still.

Patented March 20, 1866.

No. 53,359.



WITNESSES:

M. H. Livingston
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INVENTOR.

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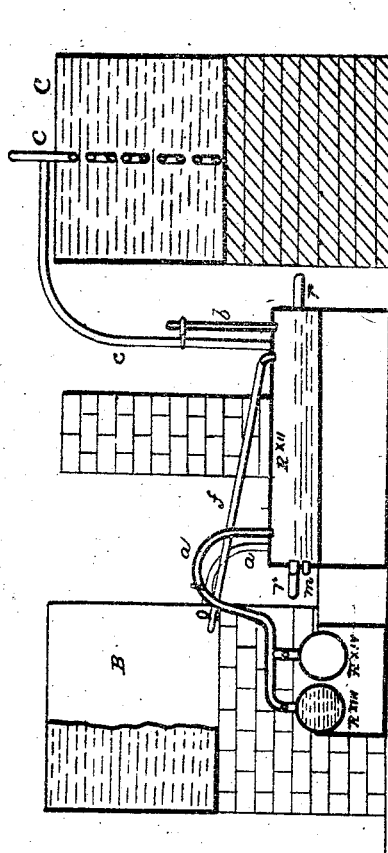
2 Sheets—Sheet 2.

Oil Still.

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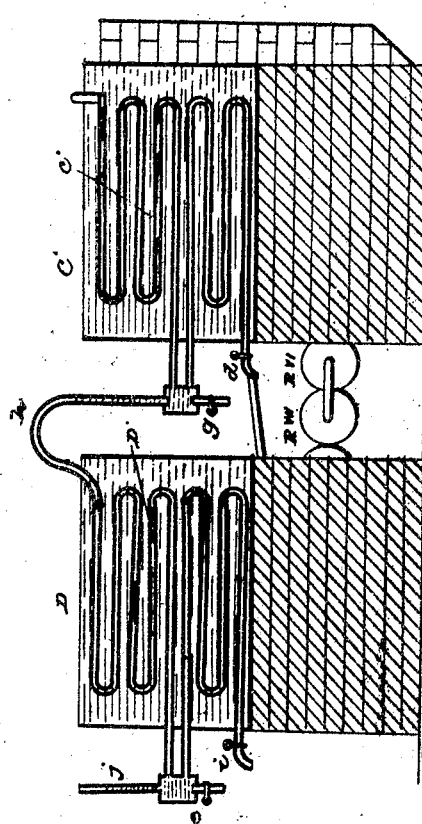
FIG. 2.



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FIG. 3.



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UNITED STATES PATENT OFFICE.

AUGUSTUS H. TAIT AND JOSEPH W. AVIS, OF NEW YORK, N. Y.

IMPROVEMENT IN DISTILLING APPARATUS.

Specification forming part of Letters Patent No. 53,359, dated March 20, 1866.

To all whom it may concern:

Be it known that we, AUGUSTUS H. TAIT and JOSEPH W. AVIS, of the city, county, and State of New York, have invented a new and Improved Distilling Apparatus; and we do hereby declare that the following is a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a plan or top view of this invention. Fig. 2 is a transverse vertical section of the same, the line *xx*, Fig. 1, indicating the plane of section. Fig. 3 is a longitudinal vertical section of the same, the plane of section being indicated by the line *yy*, Fig. 1.

Similar letters of reference indicate like parts.

This invention refers to a distilling apparatus which is particularly intended for the purpose of refining petroleum and for separating the various ingredients thereof according to their specific gravity, or to their different boiling-points.

The invention consists in the use of a series of cast or wrought iron retorts set horizontally alongside of each other and across the flue, and communicating with each other by zigzag tubes, in combination with a fire-grate the breadth of which is nearly equal to the length of the retorts, said fire-grate being at one end of the series and the chimney at the other end, in such a manner that the oil let into that retort next to the chimney on passing through the several retorts is gradually heated and evaporated. The vapors rising from the oil in the several retorts are swept off by the mechanical force of a current of steam or compressed gas injected through a suitable pipe in that retort immediately over the furnace, the discharge-pipe emanating from the first retort or from that next the chimney. It is obvious that the vapors rising in the different retorts are formed of liquid of more or less specific gravity, according to the greater or smaller heat existing in said retorts, and the heavy vapors of the hottest retorts on passing through the remaining retorts mingle with the lighter vapors contained in said retorts, and on being condensed yield a liquid fit for illuminating purposes. The heavy and light oils are separated during their passage through coils or serpentine pipes situated in

condensers and tapped at different heights or at different distances from their commencement, and the lightest oil is pumped back into a suitable tank and passed again and again through the series of retorts. The tar and pitch pass off into a second set of retorts placed over a separate furnace and somewhat lower than the first series. One of the second set of retorts is always in operation while the other may be cleaned, and the products of evaporation of the contents of these retorts are carried back to the last retort in the first series and caused to mingle with the contents thereof, so as to be redistilled over and over until the same are completely divested of all parts capable of mixing with or forming burning oils.

A represents a tank which contains the crude oil, and which communicates by a pipe, *a*, with the first one of a series of retorts, R^i R^{ii} R^{iii} R^{xii} . These retorts are made of cast-iron or any other suitable material in a cylindrical or any other desirable form or shape, and they are placed horizontally alongside of each other over a flue which is provided with a fire-grate, situated under the retort R^{xii} , and which extends from said grate to the chimney that rises in close proximity to the retort R^i .

The several retorts connect with each other by means of pipes *r*, which extend from the opposite ends of the same, so as to cause the liquid or fluid introduced into the retort at one end of the series to pass through the several retorts in a zigzag course. The crude oil flows in a continuous stream into the retort R^i , and thence through the first pipe *r* to the second retort, and so on until all the retorts are filled up about half or to the middle of the connecting-pipes *r*. At this stage heat is applied by lighting a fire on the grate under the retort R^{xii} . The oil in the retorts is thus gradually heated, that in the retort R^{xii} being hottest and that in the retort R^i remaining coolest, and consequently the lightest components of the oil will be evaporated in the first and the heaviest components in the last retort. The vapors thus formed pass off through the connecting-pipes *r* from the retort R^{xii} to the retort R^{xi} , &c., to the retort R^i , and thence through the pipe *c* to the first condenser, *C*; and in order to drive off the vapors by mechanical force a stream of steam or heated compressed gas is passed in the last retort, R^{xi} , through the pipe *b*, which connects with a

suitable generator, being provided with a stop-cock, so as that the supply of steam or heated gas can be regulated at pleasure. While passing through the retorts the heavy vapors of the retorts R^{xii} , R^{xi} , &c., mix intimately with the light vapors of the first retorts R^i , R^{ii} , &c., and the product of condensation derived from the mixture of vapors is of the requisite density for burning oil.

The condenser C consists of a plain tank of sheet metal or any other suitable material, in which is situated a serpentine pipe, C'. The several bends of this pipe are placed one above another, so that the same are situated in different levels, and consequently the products of condensation derived from the several bends will be of different specific gravity, since the water in the condenser is coolest at the bottom and hottest on top. By tapping said serpentine pipe at different levels, therefore, liquids of different specific gravity will be obtained.

We do not wish to confine ourselves, however, to the precise form of serpentine pipe shown in the drawings, since an ordinary coil placed in a vertical or in a horizontal position will produce the same or a similar result; but we use said serpentine pipe by preference, as the products of distillation drawn from it at different levels can be readily distinguished according to their specific gravity.

The heavier oil, which has a high boiling-point, is condensed in the upper bends, where the water is hottest, and can be drawn off through the trap and cock g , while the light oils are drawn off at the tail-pipe d . The specific gravity of the oil drawn from said tail-pipe can be regulated by drawing off more or less of the heavy oil through the trap and cock g , and, if desired, by an additional supply of cold water to the condenser the quantity of light oils condensing in the serpentine pipe can be increased. If a heavier oil is required at the tail-pipe d the cock g must be checked or closed and the heavy oil allowed to pass on to the tail-pipe d , and the supply of cold water must be checked, so as to allow a greater portion of the light oil of the distillate to pass over into the second condenser, D, which connects with the first condenser, C, by the pipe h . These light oils and heavy naphtha are again separated during their passage through the second condenser, which is furnished with a serpentine pipe, D', trap and cock e , and tail-pipe i . By regulating the supply of cold water the light oil and naphtha of a density under 68° are drawn off at the trap and cock e , and collected in a separate receiver, whence it is pumped up into the tank B for future use, while the gasoline or light naphtha is received at the tail-pipe i and collected in a separate receiver, and the undensifiable gases pass off by the gas-pipe j .

The lower part of the first condenser, C, below the trap g , may be considered as a refrigerator to thoroughly cool the distillate.

The light oils and naphtha collected in the

tank B, as previously stated, may be run back to the retort R^{xii} through the pipe f , and the vapors rising therefrom, by being mixed with the heavy vapors contained in the last retorts, produce a distillate of the desired specific gravity.

The heavy products, such as tar and pitch, remaining in the retort R^{xii} are passed into one of the retorts R^{xiii} or R^{xiv} , which are placed separate from but contiguous to the first series, set lengthwise over a separate fire-place divided by a partition wall, so that they can be used alternately. They are set a little lower than the first series, so as to allow a fall for the tar and pitch to pass through the connecting-pipe m , which is provided with suitable branch pipes and cocks, so that either of the retorts R^{xiii} or R^{xiv} can be brought in communication with the retort R^{xii} . The object of having two or more additional retorts is to enable the operator to clean out the coke from one retort while the other is working without stopping the process. By means of this apparatus all the available constituents of crude petroleum are saved, and the percentage of burning-oil obtained is considerably larger than that obtained by ordinary distilling apparatuses. Furthermore, by our apparatus the distilling process can be carried on without interruption, and its operation requires a comparatively small expenditure of fuel.

It is obvious that this apparatus may be used for distilling other liquids besides petroleum, such as coal-oil or spirituous liquors.

We claim as new and desire to secure by Letters Patent—

1. The arrangement of a series of retorts, R^i R^{xii} , set horizontally alongside of each other over and across the fire-flue, with the breadth of the fire-grate nearly equal to the length of the retorts, the furnace being placed at one end and the chimney at the other end of the series, substantially as and for the purposes set forth.

2. The use of an impelled current of steam or suitable gas, in combination with the series of retorts R^i R^{xii} , substantially as specified, whereby the vapors are expelled from said retorts, and at the same time the heavy vapors of the last retorts are caused to mingle intimately with the light vapors of the first retorts, for the purposes described.

3. The condensers CD, provided with condensing-coils C' D', and applied, in combination with each other and with the retorts R^i R^{xii} , substantially in the manner and for the purposes set forth.

4. Tapping the condensing-coils C' or D' at different levels, substantially as and for the purposes described.

5. The coking retorts R^{xiii} R^{xiv} , (two or more,) applied, in combination with the retorts R^i R^{xii} , substantially as and for the purpose specified.

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