(No Model.)

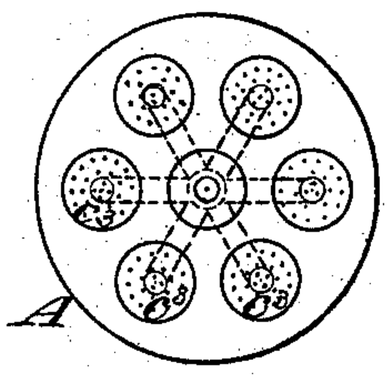
F. M. F. CAZIN.

APPARATUS FOR REFINING PETROLEUM.

No. 400,634. Patented Apr. 2, 1889.

Fig 1.

Fig 2.



Witnesses:
J. W. Roe
Emil Herter

Inventor:
Francis M. F. Cazin
by his atty
Brown & Hall

UNITED STATES PATENT OFFICE.

FRANCIS M. F. CAZIN, OF NEW YORK, N. Y.

APPARATUS FOR REFINING PETROLEUM.

SPECIFICATION forming part of Letters Patent No. 400,634, dated April 2, 1889.

Application filed August 29, 1887. Renewed February 6, 1889. Serial No. 298,938. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS M. F. CAZIN, of the city and county of New York, in the State of New York, have invented a new and useful Improvement in Apparatus for Refining Petroleum, of which the following is a specification.

The crude oil which is drawn from many of the more recently-opened wells, particularly in the State of Ohio, and in distinction from the oil drawn from other wells, notably in the State of Pennsylvania, contains, besides the long series of hydrocarbon compounds known to exist in petroleum, also sulphur. Such sulphur is present in the crude oil or oils in specific compounds of the classes—ethyl sulphites, dimethylic sulphates, methyl sulphuric acid, mercaptans, ethyl sulphides, methyl mercaptans, methyl sulphates, methyl sulphites, &c. These specific cympounds contain sulphur, have boiling-points ranging very nearly between the same limits as the boiling-points of merchantable petroleum. The consequence, therefore, is that these sulphur-containing compounds, almost all of which emit a very pungent alliaceous odor, are in distilling carried over into the refined product intended for market, escaping all previously-known methods and apparatus now used in distilling and refining coal-oil.

My improved apparatus is intended to separate from the distilled petroleum the hereinabove-mentioned different sulphur compounds which are the cause of alliaceous odor and of other inconveniences in the use of the refined oil made from Ohio crude oils, which are now generally known as "Lima" oils.

The successful accomplishment of the purpose for which my apparatus is intended results from the construction of that apparatus and its operation according to the method which forms the subject-matter of a separate application for Letters Patent, Serial No. 248,756, filed September 3, 1887.

The invention consists, essentially, in the combination, with a series of upright vessels provided each with a water-supply pipe and with a water-overflow leading upward from a point between its ends and terminating at a point near its top, of an oil-supply pipe leading to the bottom of the first vessel, an oil-overflow pipe leading from each vessel at a point at about the level of the water-overflow to the bottom of the next vessel in the series, and distributers in the lower part of each vessel, whereby the entering oil is finely divided or diffused prior to ascending through the water in the vessel, which results from the lesser specific gravity of the oil. The overflow-pipe, which extends from a point between the ends of the vessel and which terminates at the top of the vessel, usually has a downwardly-extending leg or loop between these points, so that any globules of oil which may enter this overflow-pipe with the water shall have opportunity during the passage of the water downward through the leg or loop to escape upward and return to the vessel, so as not to pass off through the overflow with the water. The oil-supply and oil-overflow pipes which lead to the first and subsequent vessels in the series are terminated in several branches, which communicate with the bottom of the vessel, and which may each be surmounted by a projecting end and a distributer or rose-head, and extending across the vessel at its lower portion are screens of perforated or reticulated metal, which increase gradually in fineness from the bottom up, so as to produce the division or diffusion of the entering oil into very fine globules and the even distribution of these globules throughout the entire horizontal area of the vessel. I also provide upon the exterior of the vessel a gage-glass, which has its lower limb, that communicates with the vessel, provided with a catch-funnel or enlarged mouth, so as to catch some of the rising globules of oil, and thereby forms an indication by the amount of oil rising through the glass and otherwise of the degree of efficiency with which the apparatus is operating.

In the accompanying drawings, Figure 1 is a vertical section of one vessel and its appurtenances, and an elevation of a portion of the next vessel in the series; and Fig. 2 is a horizontal section upon about the plane indicated by the dotted line $x\ x$, Fig. 1.

Similar letters of reference designate corresponding parts in both figures.

A designates an upright vessel, which will usually be made of boiler-iron, but may be

made of other material, and is here shown of cylindric form. This vessel should be of very considerable height, perhaps from fifteen to thirty feet, and may be of any desired diameter. A series of any desired number of these vessels—three or four, for example, or more—will be arranged and connected in manner hereinafter described, and will be of similar construction.

Each vessel of the series is supplied with water through a pipe, *b*, by means of a pump, B, or from an elevated reservoir, if desired, and at the point where this pipe communicates with the vessel it may be provided with a rose-head or distributer, *b'*, (shown as upon the side of the vessel in Fig. 1,) and by which the entering water is distributed.

In the operation of my apparatus oil rises in a finely-divided or diffused state or in small globules through the water in the vessel, and although I have used the term "water," I mean thereby to include clear or pure water, or water in which any desired chemical has been dissolved.

With the lower part of the vessel A, which constitutes the first of the series, there communicates an oil-supply pipe, *c*, which in this example of my invention is provided with a valve, *c'*, and communicates directly with the bottom of the vessel. Oil is supplied by a pump, C, for example, and the pipe *c* terminates in a number of branches or a spider, c^2, whereby the oil is delivered into the bottom of the vessel at numerous points throughout its horizontal area.

In practice, the aggregate area of the several branches c^2 should be exactly or approximately equal to the area of the pipe *c*, and these proportions, with the construction shown, provide for the supply of oil to the vessel A in uniform quantity through the several branches. Each of the branches c^2, communicating with the vessel, is prolonged upward within the vessel and has a rose-head or distributer, c^3, whereby the oil is divided or diffused, and to provide for still further and more minutely dividing or diffusing the oil I provide within the vessel A screens c^4, which may be of perforated or reticulated material, and which gradually increase in fineness from the bottom up, the middle screen being finer than the one below it and coarser than the one above it. The first or coarser screen divides the oil into drops or globules and the other screens successively subdivide these drops or globules into still smaller ones, and this arrangement of screens provides for the minute diffusion or division of the entering oil and for the uniform distribution of the oil throughout the entire horizonal area of the vessel A.

To secure a uniform pressure of the oil-supply in each of the vessels A, I prefer to employ a pump, C, for each vessel in the series, as well as the first; but the pump for each vessel after the first is supplied with oil from an overflow-pipe, D, leading from the upper part of the vessel before it in the series.

It will be understood that each vessel in the series is supplied with oil distributers or diffusers, as above described, for securing the minute diffusion or division and uniform distribution of the oil.

Each vessel A is provided with a water-overflow pipe, E, which, as here shown, has a funnel-shaped mouth, *e*, at its one end within the vessel, and which communicates with the vessel at a point between its ends and above the last of the screens, c^4. As here represented, this pipe extends from the vessel first downward and thence upward, forming a loop or leg, *e'*, and its upper end terminates in a water trough, tank, or vat, F, at about the level of the oil-overflow pipe D; but the point of overflow may be varied by a sliding section, e^2, applied to the upper end of the pipe E. The end of this overflow-pipe should be about on a level with the oil-overflow D, and of course the water will rise no higher in the trough or tank F than the level of liquid within the vessel A, and the simultaneous overflow of both oil and water on about the same level may thus be regulated.

I have also represented a gage-glass, G, as arranged external to the vessel A and communicating therewith at top and bottom, and the lower limb, *g*, of this glass is provided within the vessel with a funnel-shaped mouth, *g'*, which is presented downward and which serves to catch a quantity of the fine globules of oil which rise through the glass G, where they are visible and indicate the working of the apparatus.

In the operation of the apparatus, oil is supplied to the first vessel of the series by the pump C, and, rising through the water, it is deprived of some of its sulphur compounds and passes to the next vessel of the series for further treatment, and so on throughout the entire apparatus. The temperature of the water within the vessels should be so regulated as to never be lower than 39° Fahrenheit, but preferably at about midway between 39° Fahrenheit and the boiling-point of refined coal-oil or petroleum. The sulphur compounds may be separated from the oil, some of them being decomposed or dissolved in the water, and may be removed in such manner from the oil, and some of them may be carried off directly by the water, being of lighter density than refined oil and of about the same specific gravity as water, and some compounds may require certain chemicals to be dissolved in the water; and the series of vessels which I employ provides for subjecting the oil in succession to the action of water having different chemicals dissolved therein and for the successive removal from the oil of impurities until the refined oil is entirely relieved of the objectionable ingredients of which it has been possessed. The coal-oil, as it rises in minute globules or division upward through the slowly-descending water in the vessel A, has

its ascending velocity reduced by the descending motion of the water, thus increasing the time of contact of the oil with the water, and thus increasing and rendering the operation of the apparatus the more efficacious. When the oil reaches the surface of the water, its minute particles reunite, and it can be drawn off or it can flow off by the overflow D, in order to be acted upon again in similar apparatus or to be delivered into a collecting-tank for the rerefined oil.

In the operation of my apparatus a small quantity of sediment will deposit in the bottom of some of the vessels, and this may be drawn off through the pipe *s*. This sediment is not disturbed by the entering oil because of the prolongation of the branches c^2 within the vessel.

I am aware that it is not new to treat oil by hot water for the purpose of removing the coarser impurities and the earthy matter from the oil, and in an apparatus for performing this operation the oil-supply pipe has been provided with a perforated distributer arranged at the bottom of the water-vessel, and from which the oil escapes upward through the water. I do not seek, therefore, to include in my invention such an apparatus as I have just described as old.

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

1. The combination, with a series of upright vessels provided each with a water-supply pipe and with a water-overflow leading upward from a point between its ends and terminating at a point near its top, of an oil-supply pipe leading to the bottom of the first vessel, an oil-overflow pipe leading from each vessel at a point at about the level of the water-overflow to the bottom of the next vessel in the series, and distributers in the lower part of each vessel, whereby the entering oil is finely divided or diffused prior to its ascent through the water in the vessel, substantially as herein described.

2. The combination, with an upright vessel having a water-supply pipe and an oil-supply pipe leading to its lower part, of a water-overflow pipe leading from a point between the ends of the vessel, first downward and thence upward to a point near the top of the vessel, thus forming a loop to permit the oil entering the pipe with the water to escape back to the vessel by reason of its lighter specific gravity, oil-distributers arranged in the lower part of the vessel, whereby the entering oil is finely divided or diffused prior to rising through the water, and an oil-overflow pipe at about the level of the water-overflow, substantially as herein described.

3. The combination, with an upright vessel having a water-supply pipe, and an oil-supply pipe leading to its lower part and communicating by several branches with its bottom, of oil-distributers covering the outlet ends of said branches, and screens placed one above another in the lower part of the vessel and of gradually-increasing fineness from the bottom up, a water-overflow extending from the vessel between its ends and terminating at a point near the top of the vessel, and an oil-overflow leading from the vessel at about the level of the water-overflow, substantially as herein described.

4. The combination, with the upright vessel A, a water-supply pipe, *b*, leading to its upper part, and an oil-supply pipe, *c*, leading to its lower part, and oil distributers or diffusers in the vessel above the oil-inlet, of the oil-overflow pipe D, the water-overflow pipe E, leading from the lower part of the vessel and terminating at about the level of the oil-overflow, and the glass gage G, having its lower limb provided with the enlarged and downwardly-presented mouth *g'*, substantially as herein described.

FRANCIS M. F. CAZIN.

Witnesses:
C. HALL,
FREDK. HAYNES.