W. C. McELHENY.

APPARATUS FOR REFINING OIL.

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1,142,826. Patented June 15, 1915.

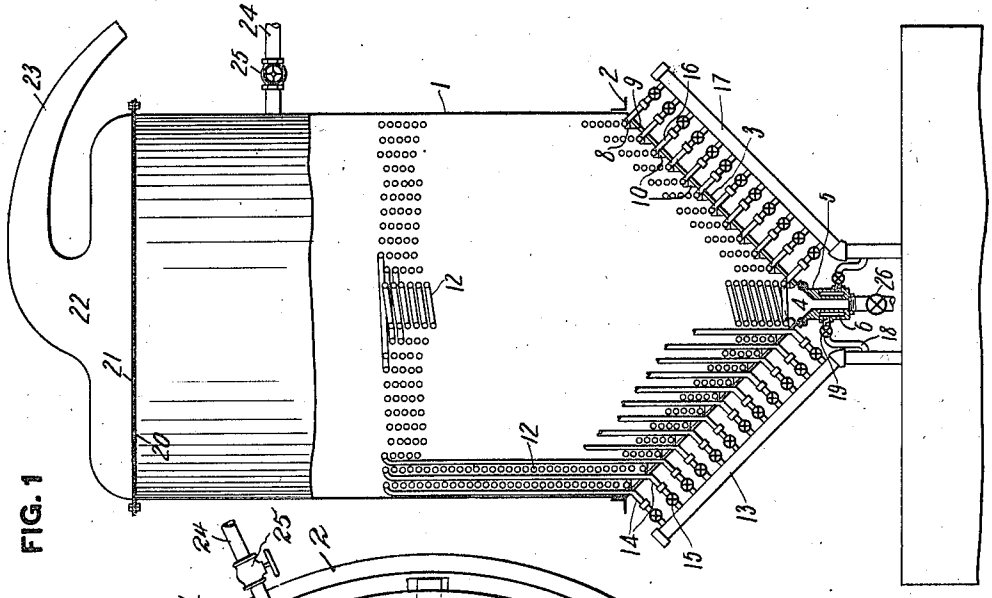


FIG. 1

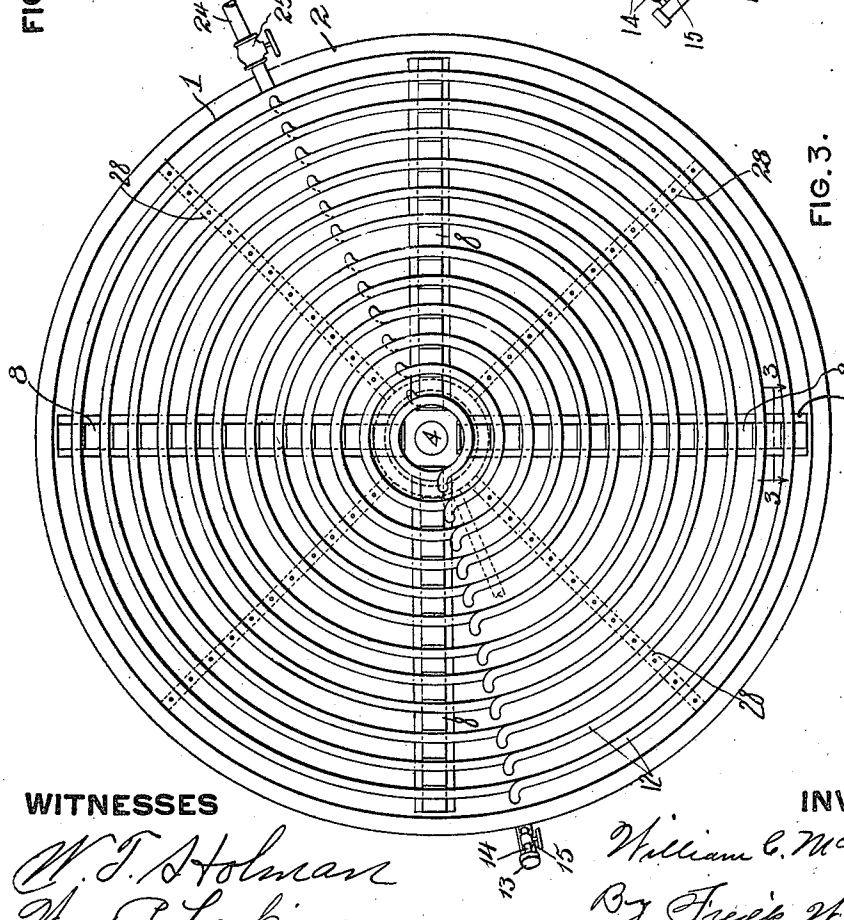


FIG. 2

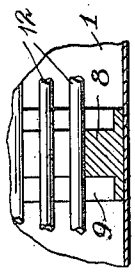


FIG. 3.

WITNESSES

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APPARATUS FOR REFINING OIL.

1,142,826. Specification of Letters Patent. Patented June 15, 1915.

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To all whom it may concern:

Be it known that I, WILLIAM C. McELHENY, a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Apparatus for Refining Oil, of which the following is a specification.

This invention relates to apparatus for refining or distilling oil.

The object of the invention is to provide improved apparatus for refining or distilling oils, whereby a large quantity of oil may be treated rapidly and economically and raised to the desired temperature in a comparatively short period of time, and without liability of over heating any portion of the oil or burning or carbonizing the same.

A further object of the invention is to provide improved oil refining apparatus, having a plurality of heating coils therein, and wherein said coils are connected in parallel to utilize to the best advantage the heating medium passed therethrough, and are supported in such manner as to be out of contact with the walls of the retort, to permit a free flow or circulation of the oil therein.

The invention comprises the apparatus hereinafter described and claimed.

In the drawings Figure 1 is a sectional elevation of a retort embodying the invention; Fig. 2 is a plan view of the same with the cover removed, and Fig. 3 is a detail cross sectional view on the line 3—3, Fig. 2.

The retort may be of any desired shape in cross section, but preferably comprises a suitable tank or vessel 1 of cylindrical shape and provided with an annular flange 2 for supporting the same about a vertical axis. The bottom 3 of the retort is in the shape of an inverted cone, the walls thereof converging downwardly to an outlet 4 formed by a discharge member 5 suitably riveted or otherwise secured to the tank bottom. Said discharge member is preferably formed of cast metal and is chambered, as at 6, to permit the circulation of steam or other heating medium therethrough so as to maintain the temperature of the oil being discharged from the retort, and promote free flow thereof.

Spaced around the conical bottom are two, three, or more chairs 8 for supporting the heating coils. These chairs are in the shape of long bars or castings of substantially T-shape in cross section with the side flanges 9 bolted, riveted or otherwise secured to the tank bottom. They are each provided with a plurality of separate steps or shelves 10, each of which supports one set of heating coils. In the particular embodiment of the invention shown four chairs or supports 8 are provided, spaced at intervals of 90° around the tank.

To heat or vaporize the oil contained in the tank, it is provided with a plurality of separate coiled pipes 12. Each of these coils is in the form of a helix or cylindrical spiral, with the bottom turn of the pipe resting upon one of the steps or shelves 10 of the chairs 8. The upper turns of the pipes in the different coils are all at substantially the same and any convenient level in the tank, say about midway between the extreme top thereof and the upper end of the bottom 3. The several coils 12 are concentrically disposed about the vertical axis of the tank and gradually decrease in diameter by successive steps toward the central coil, which is the smallest in diameter but has the greatest depth. The pitch of the spirals in the separate coils may be the same or different, but if varied the pitch of the inner coils is preferably less than that of the outer coils, to equalize as nearly as possible the total length of pipe in each of the separate coils. This is equalized to some extent by the fact that the inner coils of less diameter are deeper or longer than the outer coils.

All of the coils are supplied with steam, hot air, or other heating medium from a manifold or supply main 13, suitably supported on the outside of the tank, and preferably in inclined position and parallel to the bottom 3, as shown. Connected to said manifold are a plurality of supply pipes 14, each of which is provided with a suitable regulating valve 15 and passes through the wall of the bottom 3 and then directly upwardly between the coils 12 to the upper level of the coils where it is connected with one thereof. The discharge outlets 16 from the coils are tapped from the bottom turns of the pipe and preferably lead directly through the inclined bottom 3 to a common discharge pipe 17, located on the opposite side of the still from the manifold or supply main 13 and similarly inclined.

It will of course be understood that the separate coils 12 are connected in parallel.

That is to say, each coil is supplied with steam or other heating medium from one of the supply connections 14 and the heating medium passes through the entire coil and thence out at the bottom through the corresponding discharge pipe 16. This produces a more even temperature and uniform distribution of the heat than where the whole quantity of steam is passed through all of the coils.

To permit the passage of the heating medium through the chamber 6 in the discharge pipe 5, as described, a suitable connection 18 may be tapped off from the manifold 13 and led to the discharge pipe, said connection being provided with a suitable regulating valve 19. The discharge from the chamber of the outlet connection 5 may also be led to the common discharge pipe 17.

At its upper end the retort is provided with a peripheral flange 20 to which is secured the flange 21 of a cap or cover 22, having a gooseneck 23 which leads to a suitable condenser, as will be readily understood. It may also be provided with a suitable oil supply connection 24 having a regulating valve 25 therein. A suitable regulating valve 26 may also be placed in the discharge pipe 5, to regulate the flow of the material from the bottom of the tank.

The apparatus is used in the following manner: The tank is first filled with the proper quantity of oil. A supply of steam is then admitted to the manifold or main 13 and passes through the supply connections 14 to the several heating coils 12 and then out through the discharge connections 16 to the discharge pipe 17. The steam is preferably under pressure and passes through the coils in a number of parallel streams and thus acts simultaneously throughout the entire body of oil contained in the retort. The large number of coils of pipe provides a large amount of radiating surface so that the steam rapidly gives up its heat to the oil, thereby raising its temperature uniformly and comparatively rapidly. The process is carried on gradually and as the temperature rises the lighter oils are first volatilized and pass off from the gooseneck 23 to a condenser, where they are condensed and withdrawn to be stored for use. By manipulating the regulating valves 15, or the supply of steam to the manifold 13, the rise in temperature may be rapid, or if desired, the temperature may be maintained for a suitable length of time at any point. In this manner fractional distillation may be carried on with as fine lines of division as desired, the various constituents of the oil being separated successively.

The steam circulated through the various coils gives up its heat to the oil and is thereby condensed to water, which flows out through the discharge main 17. The latter may, however, also be used as a supply main for steam in addition to the main 13. That is, both of the mains 13 and 17 may be connected to a common boiler or other source of steam 20^a, as shown. In this case the main 17 will be made of large size and serves to carry off all the condensed steam and return it to the boiler to be used over again, and will also be large enough to permit a certain amount of live boiler steam to flow therethrough to the coils, which it will enter at the bottom, where the highest temperature is desirable. This arrangement, however, is not essential and may be dispensed with.

During the process of distillation the oil immediately surrounding the heating pipes or coils rises as it becomes heated and the cooler oil in the top of the tank descends, thus causing a circulation of the oil within the tank and consequently uniformly heating the entire mass. The coils or pipes are supported upon the chairs 8 out of contact with the wall of the bottom 3, so that the oil freely circulates around the entire mass of coils or pipes. As distinguished from retorts heated solely by an external flame, there is no liability of the layers of oil in contact with the outer wall of the retort or the bottom thereof being overheated and thereby burning or carbonizing. In externally heated retorts, it is necessary to apply a large quantity of heat to the outside to insure the heating of the oil in the center, at least within a reasonable time. This results in burning or carbonizing the layers of oil in contact with the walls of the retort and not only destroys this oil but also forms deposits of coke or crust on the interior surface of the wall, which deposits in time become so thick as to materially retard heating of the oil in the tank. Such deposits are practically entirely avoided with my improved retort. Moreover, should any deposits be formed on the interior thereof, they can be easily washed down and out through the bottom outlet, as the bottom of the tank is unobstructed and a free flow of material along the bottom wall to the outlet may be obtained. It will also be noted that the manifold 13 and discharge pipe 17 are both comparatively close to the wall of the bottom 3, and that the supply pipes 14 leading from the manifold 13 and extending to the top turns of the separate coils, pass up between adjacent coils and through the mass of oil within the retort. Thus the steam supply through the connections 14 begins to give up its heat to the oil almost immediately after it leaves the manifold 13, thereby avoiding dissemination of the heat contained in the steam before it enters the tank.

With the apparatus described, and using boiler steam under a pressure of say 150 pounds, the oil may be readily heated to 325° or over. If, however, this temperature

is not sufficiently high the steam may be passed through a superheater before going to the retort, or, if desired, the oil may be heated as high as possible in the retort and may then be withdrawn and raised to a higher temperature in a separate externally heated retort. I may also mount one or more gas burners 28 of any suitable type beneath the retort and between the manifolds 13 and 17, which burners can be used to raise the temperature of the oil above that to which it is raised by the steam alone. In other words, the steam coils in the tank may be used to preheat the oil, the final heat being given by gas or other burners. In any case, however, the output of the retort is largely increased by the reduction in the time required for heating the oil. Also the period of application of external flame to the tank is so largely reduced that there is little liability of coking, carbonizing, or over heating of the oil.

It will of course be understood that the details of my invention may be considerably varied without departing from the spirit or scope of the invention.

What I claim is:—

1. Apparatus for refining oil, comprising a tank having a bottom outlet, a plurality of helical pipe coils therein concentrically disposed about a common axis, two manifolds lying beneath said tank, and connections from said manifolds to the upper and lower ends of the several coils.

2. Apparatus for refining oil, comprising a tank having a bottom outlet, a plurality of helical pipe coils therein concentrically disposed about a common axis, two manifolds lying beneath said tank, and connections from said manifolds to the upper and lower ends of the several coils, all of said connections passing through the tank bottom.

3. Apparatus for refining oil, comprising a tank having a bottom outlet, a plurality of helical pipe coils therein concentrically disposed about a common axis, two manifolds lying beneath said tank, and connections from said manifolds to the upper and lower ends of the several coils, all of said connections passing through the tank bottom, and each connection being provided with a separate regulating valve.

4. Apparatus for refining oil, comprising a cylindrical tank having an inverted conical bottom provided with a central outlet, a plurality of helical pipe coils therein concentrically disposed about a common axis, the upper ends of said coils lying at substantiallv the same level and the lower ends of said coils lying closely adjacent to the tank bottom, two manifolds lying beneath the tank bottom, and connections from said manifolds to the upper and lower ends of the several coils.

5. Apparatus for refining oil, comprising a cylindrical tank having an inverted conical bottom provided with a central outlet, a plurality of helical pipe coils therein concentrically disposed about a common axis, the upper ends of said coils lying at substantially the same level and the lower ends of said coils lying closely adjacent to the tank bottom, two manifolds lying beneath the tank bottom, and connections from said manifolds to the upper and lower ends of the several coils, all of said connections passing directly through the tank bottom, and each being provided with a separate regulating valve.

6. Apparatus for refining oil, comprising a cylindrical tank having an inverted conical bottom provided with a central outlet member having a hollow wall forming an annular chamber therein, a plurality of helical pipe coils in said tank concentrically disposed about a common axis, two steam supply manifolds lying beneath said tank, connections from said manifolds to the upper and lower ends of the several coils, and connections for supplying steam from said manifolds to said annular chamber.

In testimony whereof, I have hereunto set my hand.

WILLIAM C. McELHENY.

Witnesses:
ELBERT L. HYDE,
WM. P. LARKIN.