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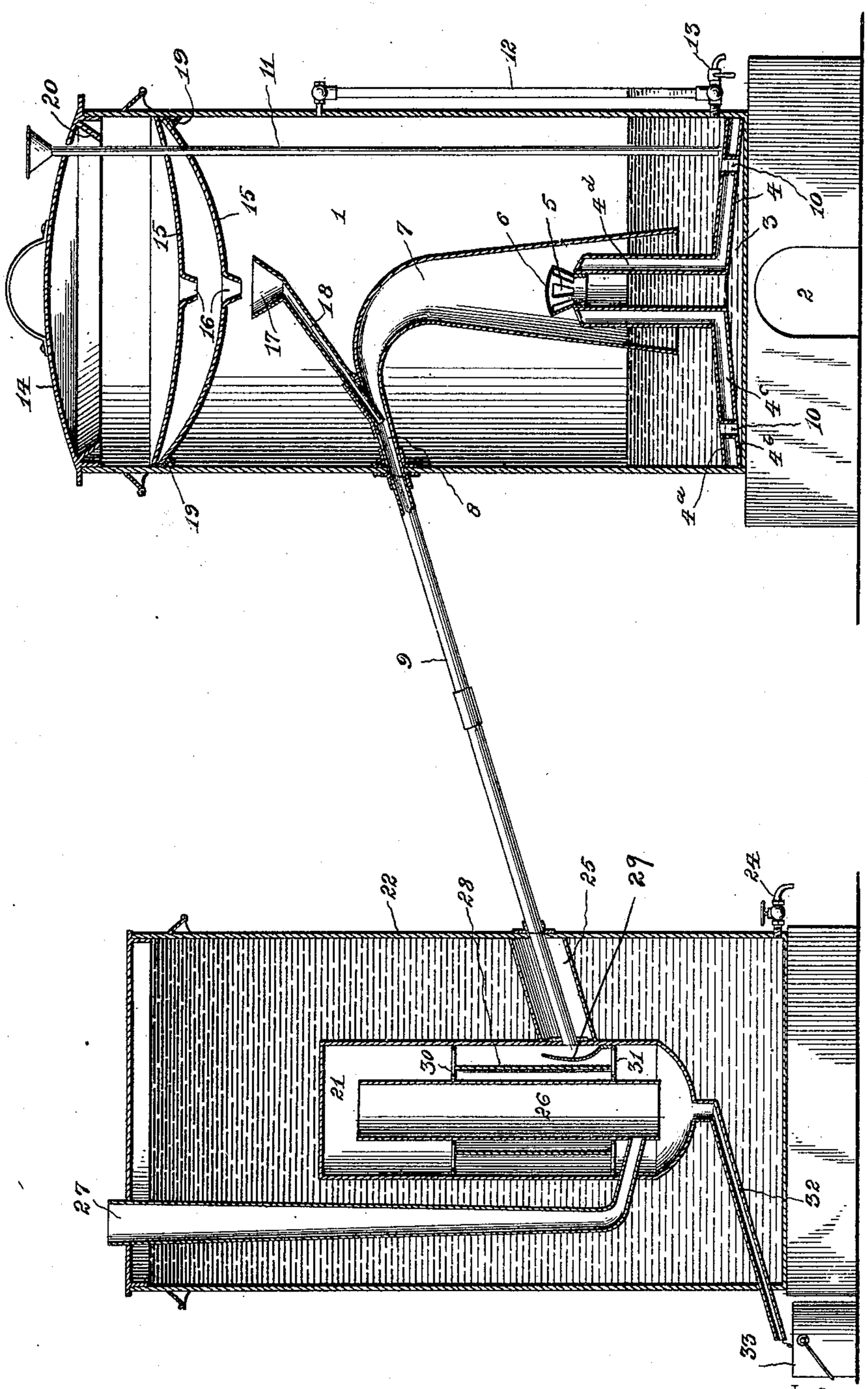
J. E. CROSS.

DISTILLING APPARATUS.

(Application filed Nov. 15, 1898.)

(No Model.)



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UNITED STATES PATENT OFFICE.

JOSEPH E. CROSS, OF BRATTLEBOROUGH, VERMONT.

DISTILLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 641,437, dated January 16, 1900.

Application filed November 15, 1898. Serial No. 696,530. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH E. CROSS, a citizen of the United States, residing at Brattleborough, in the county of Windham and State of Vermont, have invented a new and useful Distilling Apparatus, of which the following is a specification.

My invention relates to a distilling apparatus, and has for its object to provide means whereby liquid may be conveniently and economically distilled with rapidity, the condensing devices being such as to accomplish the desired object as rapidly as vapor is supplied thereto.

Further objects and advantages of this invention will appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawing the figure represents a sectional view of a distilling apparatus constructed in accordance with my invention.

1 designates a reservoir designed for the reception of liquid to be distilled and designed to be arranged in operative relation with a heating device or furnace 2, said reservoir having at its bottom and preferably coextensive therewith a boiler 3, which is separated from the body portion of the interior of the reservoir by a partition 4, which in the construction illustrated is of conical shape. This separating-partition, beneath which is the boiler, wherein the liquid is to be heated from the interior of the body portion of the reservoir and wherein is arranged the supply of liquid to be distilled, is of hollow construction, having upper and lower walls 4^a and 4^b, with an intervening space 4^c forming a chamber for air or other heat non-conducting medium to prevent the contents of the boiler from being reduced in temperature by the proximity of the liquid in the body portion of the reservior. The hollow partition-walls are extended vertically at the center of the boiler, as shown at 4^d, to form a central outlet-tube for the vapor generated in the boiler, said central tube having a vapor-outlet 5 at its open upper end. This vapor-outlet 5 is provided with a deflector or hood 6 to prevent the liquid contents of the boiler from being blown vertically any considerable distance beyond the extremity of the outlet or into the condensing devices hereinafter described, any liquid which is forced through the outlet being caused to drop exteriorly of the tube forming said outlet into the body portion of the reservoir.

Centered over the outlet-tube of the boiler with its lower edge submerged in the contents of the main portion of the reservoir is a goose-neck conveyer 7 of conical construction, the upper reduced outlet 8 thereof extending through a suitable opening in the side wall of the reservoir and being in communication with a conductor 9 for vapor discharged through the passage 5.

Communication between the body portion of the reservoir and the boiler is established by means of feeders 10, of which any desired number may be employed, and water or other liquid to be distilled may be introduced into the body portion of the reservoir by means of a supply-tube 11, a suitable gage 12 being arranged in communication with the interior of the reservoir to indicate the height of the liquid therein; also, a discharge-faucet 13 may be located at the bottom of the main chamber of the reservoir to withdraw the contents thereof for cleansing or analogous purposes.

Any portion of the vapor generated in the boiler-chamber which finds its way into the interior of the main chamber of the reservoir and is condensed upon the surface of the cover 14 may be collected by means of a tier of pans 15, having depressed centers, at which are located outlets 16, arranged in vertical alinement, with a funnel 17 at the inlet end of an auxiliary conveyer 18, which is in communication with the downwardly and outwardly inclined outlet-arm of the main conveyer 7, said collecting-pans being separate from the reservoir and being supported by suitable means, such as a rib 19, below the plane of said top or cover 14. Also said top or cover may be provided with a downwardly-contracted flange 20 for carrying condensed vapor inward and dropping it upon the surface of the uppermost collecting-pan to prevent the liquid from flowing down the walls of the main chamber of the reservoir.

The condensing apparatus through which

the vapor is conveyed from the still consists of a condenser-chamber 21, arranged in a cooling-tank 22, which is adapted for containing a cooling liquid, such as water, such cooling agent being introduced through open top of tank and being removable by means of a stop-cock or faucet 24. The condenser-chamber 21 is wholly submerged in the contents of the cooling-pan, and the conductor 9, which is in communication with the condenser, is held out of contact with the cooling agent by means of a tubular shield 25, extending from the wall of the tank inwardly to the wall of the condenser, it being the object to cause the condensation to occur in the condenser rather than in the conductor 9. Disposed centrally in the condenser is a cooling-tube 26, with which, at its lower end, communicates an air-pipe 27, extending through the cooling liquid in the tank and having an exterior open end. Also surrounding the cooling-tube for a distance above and below the plane of the discharge end of the conductor 9 is a cylindrical shield 28, and in front of the discharge end of said conductor is a guard or deflector 29, which serves to spread the vapor as it is discharged into the condenser and prevent the concentration thereof upon any particular point of the cooling-surface. The cylindrical shield 28 is supported by upper and lower collars or spiders 30 and 31, which also serve to hold in place the cooling-cylinder 26. The discharge-tube 32 for liquid communicates with the lower end of the condenser and may be extended to any desired point to discharge the liquid into the desired receptacle 33.

In order to secure a proper circulation of air through the cooling-tube 26, this tube is left open at both ends, so as to be in direct communication with the interior of the cooling-tank 21, which is surrounded by water, and also in communication with the discharge-tube 32, which latter tube necessarily forms a cold-air inlet-tube, which supplies cool air from the outer atmosphere to the interior of condensing apparatus. The air-pipe 27, which is surrounded for the greater portion of its length by the water within the cooling-tank 22, acts in the capacity of a vent-pipe for the interior of the condensing apparatus and serves to throw off any odor without an appreciable loss of steam. The said pipe 27 also permits of a sufficient displacement of heated air by the cool air rising through the tube 32 to maintain the interior parts of the condenser at a condensing temperature. By reason of the construction and arrangement of parts described it will be obvious that the cool air rising through the discharge-tube 32 will circulate through and around the cooling-tube 26, thus materially assisting the action of the water in the tank 22 to maintain the condensing-surfaces materially cooler than the incoming steam.

From the above description it will be seen in the first place that while the area of the boiler-surface exposed to the heating device is extended the depth of such boiler is slight to accomplish a rapid generation of vapor, said boiler being fed continuously by means of the feeders 10, and the gage 12 serving to indicate to the operator the depth of water in the main chamber of the reservoir. By reason of the fact that the boiling-chamber 3 is very shallow and that its upper side or wall is conical and inclines from the outer edge toward the center, and, further, by reason of the central vapor-outlet tube being of a much larger area and capacity than the tubular feeders 10, the relatively small quantity of liquid contained in the boiler 3 is rapidly vaporized and, naturally seeking its escape through the largest outlet, passes through the vapor-outlet 5 into the conveyer 7. As the liquid in the boiler becomes vaporized the same is necessarily replenished by the liquid passing from the main portion of the reservoir through the feeders 10, and at this point it may be observed that inasmuch as the feeders 10 are arranged near the outer surface of the boiler and contiguous to the shallowest portion thereof the liquid is quickly heated and brought to the boiling-point, and the vapor impinging against the inclined top wall of the boiler rushes toward and into the central vapor-outlet. On account of the small size of the feeders 10, although convection-currents passing therethrough will necessarily heat up to some extent the main body of the water in the reservoir, yet this will not interfere in the least with the independent and quick ebullition of the relatively small amount of water contained in the boiler 3. The vapor escaping from the boiler passes through the conveyer 7 and the conductor 9 to the interior of the condenser, of which the inner and outer concentric walls are formed by surfaces maintained at a condensing temperature by suitable cooling agents—in other words, the condenser is of annular construction and is arranged between two cooling elements consisting, respectively, of the inner tube 26 and the tank 22. From the generator the condensed vapor passes directly into the discharge-tube 31 and thence to the vessel provided for its reception.

The described arrangement of the boiler-outlet and the hood 7 submerged at its lower end in the contents of the liquid-receiving chamber provides for maintaining an even pressure throughout the reservoir to avoid injury to the parts thereof, it being obvious that an excessive pressure in the hood will cause the depression of the liquid within the lower edge thereof, and consequently the communication of such pressure to the interior of the liquid-receiving chamber. It also insures the passage of the vapor directly through the conveyer 9 to the condenser and as far as possible avoids condensation within the receptacle 1.

In practice various changes in the form, proportion, and the minor details of construc-

tion may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

Having described my invention, what I claim is—

1. In a distilling apparatus, a reservoir divided interiorly by a partition consisting of parallel-spaced walls, respectively forming the bottom of a superjacent liquid-receiving chamber and the top of a subjacent boiler-chamber, said walls being extended upwardly at their centers to form the spaced walls of a vapor-outlet, which is in communication with the boiler-chamber and extends into the liquid-receiving chamber, feeders spanning the interval between said partition-walls to connect the liquid-receiving chamber with the boiler-chamber, and a vapor-conveyer in communication with said outlet, substantially as specified.

2. In a distilling apparatus, a reservoir provided with a boiler having a vapor-outlet projecting therein, a main conveyer arranged within the liquid-chamber of the reservoir, in communication with said vapor-outlet, vapor-condensing pans also arranged in the liquid-chamber, and a conveyer for receiving liquid from said pans and conducting it to said main conveyer, substantially as described.

3. In a distilling apparatus, a reservoir provided with a boiler having a vapor-outlet, a vapor-conveying device within the liquid-chamber of the reservoir in communication with said outlet, centrally-depressed condensing-pans also arranged in the liquid-receiving chamber and provided with central outlets, and a conveyer in communication with said vapor-conveying device, and provided with a hopper for receiving liquid from the condensing-pans, substantially as specified.

4. In a distilling apparatus, a reservoir provided with a boiler having a vapor-outlet, a vapor-conveying device within the liquid-chamber of the reservoir in communication with said outlet, an interior annular support arranged on the wall of the liquid-chamber, separate centrally-depressed vapor-condensing pans of different depths peripherally mounted upon said support and provided with central outlets, and a conveyer in communication with said vapor-conveying device and provided with a hopper for receiving liquid from the condensing-pans, substantially as specified.

5. In a distilling apparatus, a reservoir provided at its bottom with a boiler having an upwardly-extending vapor-outlet, a vapor-conveying device including a hood, inclosing the discharge end of said vapor-outlet, and water sealed by submersion in the liquid-chamber within the reservoir, and a deflector spanning said vapor-outlet to prevent liquid from passing through the hood, substantially as specified.

6. In a distilling apparatus, a reservoir provided at its bottom with a boiler having an upwardly-extending outlet, and above the boiler with a liquid-receiving chamber into which the outlet projects, and vapor-conveying devices including a hood fitted over the boiler-outlet for submersion at its lower edge in the contents of the liquid-receptacle, substantially as specified.

7. In a distilling apparatus, the combination with a vaporizing device, of the condenser having a tank or receptacle for a cooling agent, a vapor-condensing chamber arranged within the tank or receptacle and in communication with the vaporizing device, said vapor-condensing chamber being provided with an outlet for condensed vapor, a tubular shield arranged inside of the vapor-condensing chamber adjacent to the inlet-port thereof, and a deflector interposed between said tubular shield and said inlet-port, substantially as set forth.

8. In a distilling apparatus, the combination with a vaporizing device, of a condenser having a tank or receptacle for a cooling agent, a vapor-condensing chamber arranged within the tank or receptacle and provided with an outlet for condensed vapor, a vapor-conveyer connecting the vaporizing device with said vapor-condensing chamber, and extending through the tank or receptacle at a point intermediate the top and bottom thereof, a tubular guard or shield inclosing the portion of the conveyer within the tank or receptacle, a tubular shield arranged inside of the vapor-condensing chamber adjacent to the inlet-port thereof, and a deflector interposed between said shield and the inlet-port, substantially as set forth.

9. In a distilling apparatus, the combination with a vaporizing device, of a condenser having a tank for a cooling agent, a vapor-condensing chamber arranged within the tank and in communication with the vaporizing device, said vapor-condensing chamber being provided at one end with an outlet for condensed vapor, said outlet being in communication with the outer air to also form a cool-air inlet, a cooling-tube supported within the vapor-condensing chamber and open at both ends, and a pipe leading through the tank and connected at one end with said interior cooling-tube, substantially as set forth.

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

JOSEPH E. CROSS.

Witnesses:

H. H. CROSBY,

J. H. MERRIFIELD.