June 10, 1930. A. SORENSEN 1,762,898

WATER STILL

Filed May 20, 1927

Fig. 1.

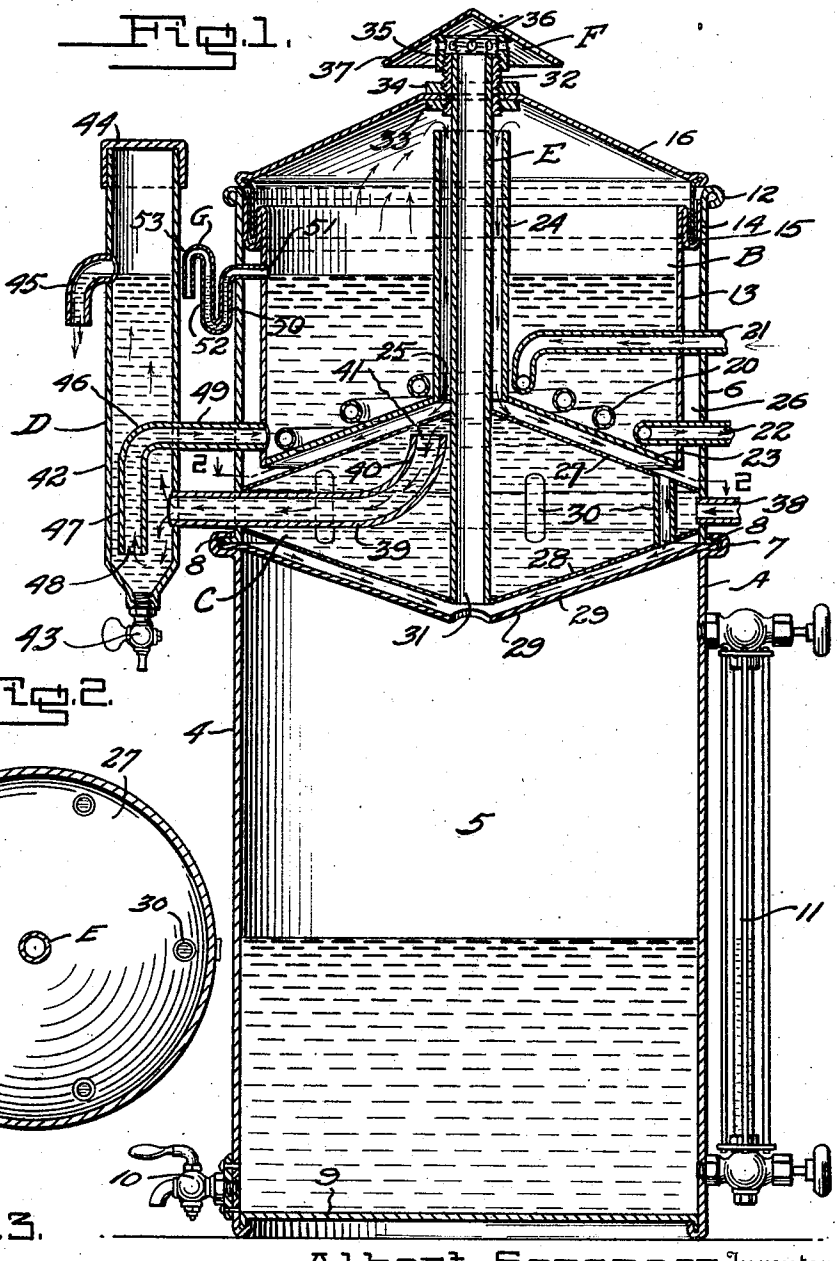
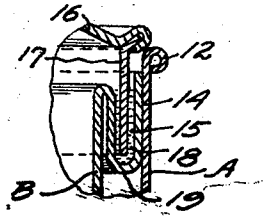


Fig. 2.

Fig. 3.



Albert Sorensen Inventor

By Lancaster and Allwine

Attorneys

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UNITED STATES PATENT OFFICE

ALBERT SORENSEN, OF WASHINGTON, DISTRICT OF COLUMBIA

WATER STILL

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One of the principal objects of the present invention is to provide stills having condensers located intermediate the boilers and the storage tanks for the supply of condensed water, which latter are lowermost, so that heat of the boilers will not be communicated to the supply of distilled water. Thus the supply of distilled water in a still unit may be drawn from the storage tank and will be at normal room temperature, or may even be cooled while in the storage tank of the still without waste, since the boiler will be remote from the cooling medium, such as ice, or refrigerating coils.

Another principal object of the invention is to provide stills which are compact, inexpensive to manufacture, and having safety features tending to keep the stills in good condition for a great length of time and minimizing dangers to the operators or those in the vicinity of the stills.

Another object of the invention is to provide stills that are economical in operation and this is partly accomplished by the disposition of the various compartments, such as of the storage tank, condenser, and boiler, one superjacent to another, thus avoiding the use of numerous pipes, tubes and other ways exposed to room temperature.

A further object of the invention is to provide a still including a boiler so arranged that access can be readily gained to the interior thereof for the removal of accumulations of foreign matter.

A still further object of the invention is to provide stills of columnar form wherein the boiler is above the condenser, and disposed in the main body portion of the still, and with the boiler so supported that ready heat conductivity from the boiler to the portion of the main body supporting the condenser, is avoided.

Other objects and advantages of the invention will appear in the following detailed description, taken in connection with the accompanying drawing, forming a part of the specification, and in which drawing:

Figure 1 is a central vertical sectional view thru a still constructed according to my invention.

Figure 2 is a cross sectional view on a reduced scale thru the main body portion of the still, substantially on the line 2—2 of Figure 1.

Figure 3 is an enlarged fragmentary sectional view thru an upper portion of the still showing a water seal which I have found desirable as a part of same.

In the drawings, A designates the main body of the still, preferably of columnar or stack form and may be either round, oval, square or polygonal in cross section; B a boiler, preferably disposed uppermost in or with respect to the body A; C a condenser preferably disposed below boiler B in the body A; D a water distributor associated with the boiler B and condenser C; E a pipe affording a way for air and vapor from the interior of the body A to the atmosphere at the top of the still, as thru a vent cap F; and G a safety device associated with the boiler B.

Referring first to the main body A, it preferably comprises a lower section 4 providing a compartment 5 for the storage of distilled water, and an upper section 6 joined to the lower section as by crimping the upper portion 7 of the latter about a flange 8 at the lower portion of the upper section. Adjacent the bottom 9 of section 4 there may be provided a drain cock 10 and in order to enable a person to readily determine the quantity of condensed water stored in compartment 5, a water gauge 11 may be provided in connection with lower section 4. The upper section 6 may be provided with a bead 12 at its upper end to strengthen and give finish to this section.

For reasons to be subsequently set forth it is preferred to dispose the boiler B in the main body A with the wall 13 of the boiler in spaced relation to the wall of the main body, and in the example shown, the boiler B is suspended, so to speak, in the main body, by having its upper portion welded, or otherwise secured to the main body as at 14 there being preferably provided a water seal 15 between a lid 16 and the main body portion of the boiler. In the example shown, the lid 16 is frusto-conical in shape and provided with a

flange 17 which extends downwardly into an annular recess 18 formed by a channel shaped flange 19 extending exteriorly about the wall 13. It may thus be noted that steam or vapor condensing on the under side of the lid 16 may flow downwardly into the channel providing the water seal. In the example shown, the arrangement is for steam as a heating medium conducted thru a coil 20 in the boiler B, with an entrance as at 21 and an exit as at 22, this coil being disposed in close proximity to the bottom 23 of the boiler, which bottom is preferably cone-like in shape, or frusto-conical in the example shown, with a pipe or tube 24 extending upwardly from an opening 25 in the bottom 23, this pipe or tube providing a steam passageway having an entrance adjacent the upper interior portion of lid 16 and delivering onto the top wall of the condenser C as hereinafter described.

It is to be distinctly understood that this boiler is merely by way of example adapted for heating of the water so as to generate steam, by means of a steam coil, and that other heating mediums may be used, such as gas, electricity, etc., and its capacity proportionately changed for economical use of the heating medium. The space 26 between the wall 13 of the boiler and the wall of the main body may be materially increased. Also the boiler may be supported in the upper portion of the main body in any suitable manner.

The condenser C is of novel formation and preferably includes a cone-like top wall 27; an inverted cone-like bottom wall 28, a frusto-conical baffle plate 29 associated with the bottom wall 28, and means, such as tubes 30 affording passageways for steam, vapor, and products of condensation from the space between the top wall 27 and bottom wall 23 of the boiler, to the space between the bottom wall 28 of the condenser and the baffle plate 29, which latter serves to restrict the steam, vapor, and products of condensation to a path in close proximity to the bottom wall 28. In the example shown, the walls 27 and 28 are preferably frusto-conical in shape, and relatively thin so as to readily conduct cold of the cooling medium which is circulated between these walls, to the space adjacent the walls at the exterior of the condenser. The top and bottom walls 27 and 28 may be joined together at the central portion, by the pipe E which is secured to the walls and extends upwardly thru the pipe or tube 24, thru the boiler and affords a passageway 31 for air and vapor from the compartment 5 to the atmosphere at the upper portion of the still. The upper portion of pipe E may carry a screw threaded sleeve 32 serving to support, as by means of nuts 33 and 34, the lid 16, and also a vent cap F, which latter comprises a screw threaded sleeve 35 having transverse passageways 36, and a conical head 37. By removing the vent cap, and the upper nut 34, the lid 16 may be removed so as to gain access to the interior of the boiler, for the purpose of inspection and the removal of foreign matter. The tubes 30 are disposed adjacent the outer peripheral edges of the walls 27 and 28, but spaced from the wall of main body A, as clearly shown in Figures 1 and 2, it being understood that a portion of the main body A may serve as a wall portion of the condenser.

The cooling medium for the condenser, such as water, may be introduced as thru pipe 38 extending thru the wall of main body A, and the water may find exit from the condenser as by pipe 39 having a bend 40, so as to dispose the intake 41 of pipe 39 adjacent the upper inner face of wall 27, thus compelling the water to circulate between the walls 27 and 28 before finding egress from the condenser.

The water distributor D preferably includes a column 42, for water, disposed alongside the main body A, and having a drain cock 43 at its lower portion. This column may be closed at its upper end by a removable cap 44. The pipe 39 delivers water from the condenser to a portion of column 43 at a point below the plane of the bottom of boiler B, some of the water flowing upwardly in the column and finding egress thru an overflow pipe 45 and some of the water flowing into the boiler, thus replenishing the supply therein as the water in the boiler is converted into steam or vapor. The way for supplying water to the boiler may be had by means of a pipe 46 of angular shape, the lower leg 47 of which is the entrance for water from the column 42 and has its open end 48 adjacent the lower portion of the column. The other leg 49 of pipe 46 delivers into the lower portion of the boiler. The overflow pipe 45 is located so as to determine the approximate water level in the boiler as is obvious from an inspection of Figure 1.

The safety device G is in the form of a trap, one vertical leg 50 of which has communication with the boiler B as thru horizontal section 51 opening at the point of approximate water level, and the other leg 52 of the trap opening into a goose neck 53 provided to direct any steam or water escaping thru the trap, downwardly where it is least apt to be a source of danger, or annoyance.

When bringing the still into use, water is first introduced into the chamber of the condenser C, as thru pipe 38. The inflow of water fills the chamber of the condenser and finds egress thru the pipe 39 to the column 42. Flowing upwardly in the column, some of the water will enter pipe 46 and will be forced into the boiler. As soon as water flows from the overflow 45 it will be understood that the

boiler has a sufficient quantity of water therein to safely utilize the heating medium.

It is to be noted that the inlet pipe 38 is relatively smaller than the outlet pipe 39 of the condenser. This is to prevent material liquid pressure in the condenser which might have a tendency to cause the walls 27 and 28 to bulge outwardly. In other words, by making the inlet pipe smaller than the outlet pipe, there will be rapid circulation of water, without subjecting the walls 27 and 28 of the condenser to full pressure of the source of liquid supply.

By disposing the ingress 48 of pipe 46 below the outlet of pipe 39 in the column 42, the main body of liquid from the condenser, rising in the column 42 has no tendency to suck water from the boiler B. Furthermore, the hot water in the boiler having a tendency to rise prevents counter-currents in the pipe 46. It may be observed that the still is economical in operation, since the supply of water for the boiler passes first thru the condenser, and after the still is in operation, there is a heat exchange, which, to a certain extent, preheats the charges of water introduced into the boiler.

Economical construction is accomplished by disposing the condenser in the main body A, preferably using a portion of the latter as a wall portion of the condenser, yet the transmission of heat from the boiler to the main body A is to a great degree avoided by the space 26 between the main body and boiler. This arrangement also prevents destructive action of the heat and influence of the inflowing cold water adjacent the boiler and condenser, since the boiler may expand when it is heated without materially affecting the adjacent portion of the main body A directly above the condenser C.

If the still should be kept in operation until after the chamber 5 has its full capacity of condensed water, thus closing off communication between the way 31 and the compartment 5, for air, vapor, etc., steam or air under pressure may find exit from the boiler thru the safety device G, however, this safety device may be omitted, since the pressure may also cause the lid 16 to move upwardly, as by flexing, or steam under pressure may find exit thru the water seal.

The interposition of the condenser, that is, with the boiler superjacent thereto, and the compartment for the storage of distilled water subjacent thereto, keeps the supply of condensed water from the heat of the boiler and permits use of ice, or refrigerating coils, (not shown in the drawings) for the purpose of cooling the condensed water for drinking purposes, without that waste which would result if the heat of the boiler passed upwardly adjacent the storage tank for distilled water.

Changes in details may be made without departing from the spirit or scope of my invention; but,

I claim:

1. In a still, a main body providing a chamber in its lower portion for storage of distilled water, a boiler in said body above said chamber including a removable lid, and a pipe extending thru said boiler providing a way for air and vapor from said chamber to the atmosphere at the top of the still, said lid carried by said pipe.

2. A still comprising a main body providing a chamber in its lower portion for storage of distilled water, a boiler in said body above said chamber, a condenser subjacent to said boiler in said main body, and a pipe connected to and extending thru said condenser and boiler providing a way for air and vapors from said chamber to the atmosphere at the top of the still.

3. A still comprising a main body providing a chamber in its lower portion for storage of distilled water, a boiler in said body above said chamber including a removable lid, a condenser subjacent to said boiler in said main body, and a pipe connected to and extending thru said condenser and boiler providing a way for air and vapors from said chamber to the atmosphere at the top of the still, said lid carried by said pipe.

4. A still comprising a main body providing a chamber in its lower portion for storage of distilled water, a condenser in said body above said chamber and including a bottom wall and a top wall, a boiler in said body above said condenser and including means providing a way for downward passage of steam from the upper portion of the boiler and thru the bottom of the boiler to impinge upon said walls of the condenser, and a pipe secured to said walls of the condenser and extending thru said steam way of the boiler affording a way for air and vapor from said compartment to the atmosphere at the top of the still.

5. In a still, a condenser including a cone-like top wall upon which steam from the boiler is primarily delivered and down which products of condensation flow, an inverted cone-like bottom wall, with means to confine the steam and products of condensation leaving the top wall to close proximity to the bottom wall, and means to circulate a cooling medium between said walls.

6. In a still, a condenser including a cone-like top wall upon which steam from the boiler is primarily delivered and down which products of condensation flow, an inverted cone-like bottom wall, ways for passage of steam or vapor and products of condensation from proximity to the outer peripheral edge of said top wall to adjacent the periphery of said bottom wall, means to confine vapor and products of condensation during a portion of their travel to a path in close proximity

to the under side of said bottom wall, and means to circulate a cooling medium between said walls.

7. A still comprising, a main body providing a chamber in its lower portion for storage of distilled water, a boiler within said body above said chamber, a condenser within said body between said boiler and chamber and including relatively thin walls, a tube for conducting steam, vapor and products of combustion from the boiler to the said walls of the condenser, and an inlet and an outlet for a cooling medium to and from the space between the walls of a condenser, the said inlet being relatively smaller than the outlet.

8. In a still, a boiler, a condenser subjacent thereto, means for delivery of water to said condenser, a water distributing column, means providing a passageway for water from said condenser to said column below the plane of the bottom of said boiler, means providing a passageway for water from said column to the lower portion of said boiler, the entrance to said last mentioned passageway in said column being adjacent the bottom of the latter and below the entrance of the said passageway from said condenser, and an overflow for water adjacent the upper portion of said column for determining the approximate water level in said boiler.

9. In a still, a boiler including a cone-like bottom wall, a condenser including a cone-like top wall below said boiler, said boiler and condenser walls in nested spaced apart relation, and means providing a way for downward passage of steam from the boiler to impinge upon said cone-like top wall of the condenser.

10. In a still, a condenser including a cone-like top wall upon which steam from the boiler is primarily delivered, an inlet for a cooling medium to the interior of the condenser, and an outlet for the cooling medium from the interior of the condenser, said outlet including a pipe, the entrance to which is adjacent the upper interior face of said cone-like top wall.

ALBERT SORENSEN.