May 29, 1934. N. B. LEO 1,960,849

HEAT EXCHANGE APPARATUS

Filed Feb. 7, 1933 2 Sheets-Sheet 1

Fig. 2.

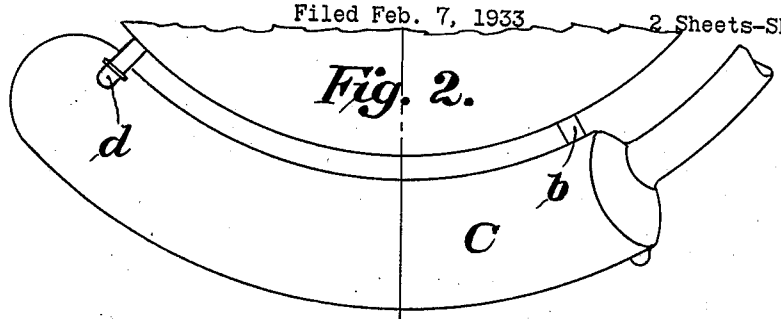
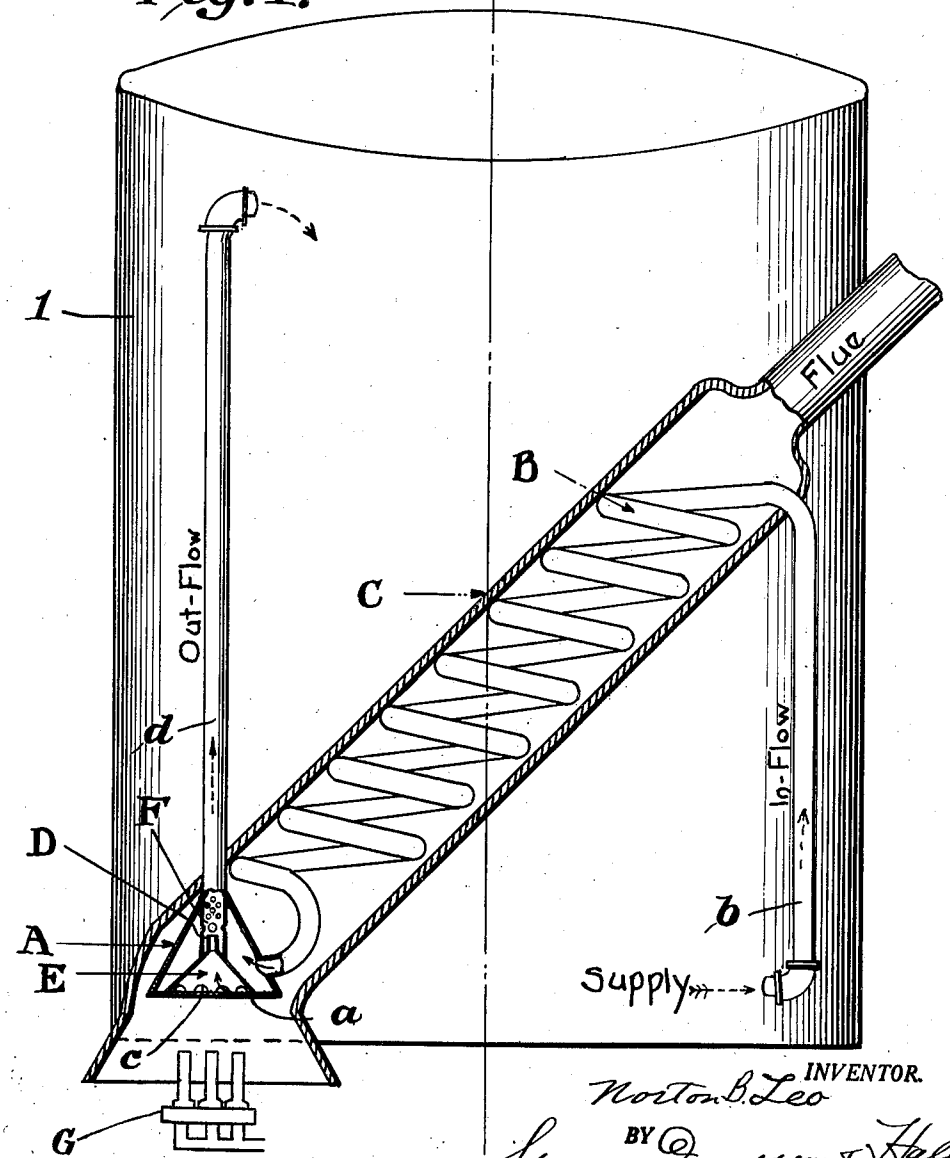


Fig. 1.



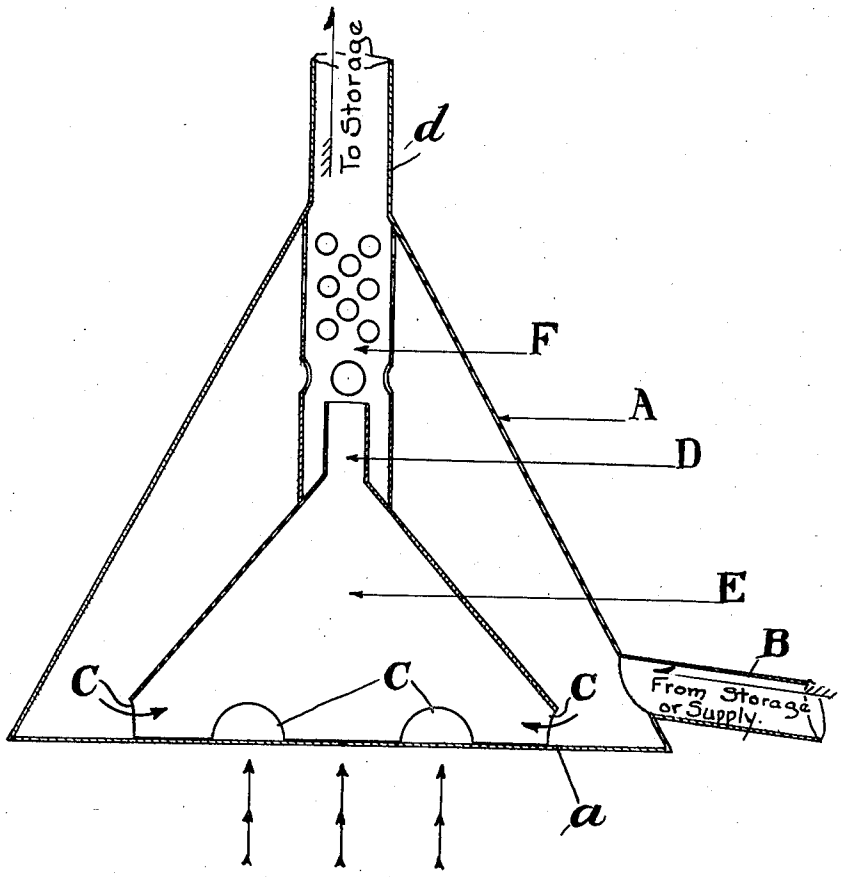
INVENTOR.
Norton B. Leo
BY Spear, Donaldson & Hall
ATTORNEYS.

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Fig. 3.



INVENTOR.
Norton B. Leo
BY
Spear, Donaldson & Hall
ATTORNEYS.

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HEAT EXCHANGE APPARATUS

Norton B. Leo, New York, N. Y.

Application February 7, 1933, Serial No. 655,633

22 Claims. (Cl. 257—229)

The invention relates to apparatus for treating fluids, such, for instance, for heating water for domestic, or other, uses.

The invention consists in the features hereinafter described and pointed out in the claims.

In the drawings forming a part of the specification,

Figure 1 is a side view of an organization embodying the invention partly in section.

Fig. 2 is a plan view of part of the apparatus.

Fig. 3 is a vertical sectional view of the retort structure in which the fluid is heated.

In these drawings, 1 is a tank, or container, in which the treated fluid is stored ready for use. This is provided with a suitable outlet pipe for the heated fluid and an inlet pipe for furnishing a supply of fluid to take the place of that drawn off from the tank.

For treating the fluid within the tank a retort composed of an outer conical member, or shell, A and an inner shell E of conical form are used, both having their apices directed upwardly. The bottom plate *a* receives the heat from any suitable heating means, such, for instance, as a gas jet G disposed below the retort, so that its flames will heat the retort. The water, or other fluid to be heated in this retort, is drawn from the tank through a pipe *b* which emerges from the tank preferably at the lower part thereof, and extends upwardly to provide a riser section. At its upper end, considerably above the level of the retort, the riser supply pipe *b* is connected to a coil B which extends in an inclined position from the upper end of the riser, or supply pipe, to the retort, with which it connects at its lower end through the side wall of the outer retort member A near the base thereof. The water is then delivered, after passing downwardly through the inclined coil, to the space between the inner and outer conical members, or shells, of the retort. Access of the water from the outer shell to the inner shell is permitted through the openings *c* at the lower part of the inner shell E. The comparatively small volume of water in this inner cone, or shell, is quickly heated and it is directed upwardly through the nozzle D at the apex of said inner cone, and is delivered into the delivery pipe *d* which extends to a level considerably above the supply pipe *b* and also above the upper end of the inclined coil B so that the hot water will be delivered into the upper part of the tank ready to be drawn off for use.

The coil is covered by a casing C which is of substantially the same diameter interiorly as the outer diameter of the coil. This casing extends throughout the length of the coil. At its lower end, the casing surrounds the retort structure and its extreme lower end is flared downwardly and is open. The flame, or the heat from the heating means, which may be a suitable form of gas burner, is directed up into this flared open end of the casing, and is thus made to impinge upon the retort structure heating the same on its bottom and sides. The heat after acting upon the retort passes along the casing C to the upper end thereof where it is discharged into any suitable flue at a point above the upper end of the coil. The heated air flowing through this casing from its lower open end to the upper flue serves to heat the coil and the fluid passing therethrough from its upper to its lower end, so that when this fluid is delivered from the lower end of the coil into the retort, it is heated to a considerably high degree. This heated water passes in part into the inner retort, and in part into the delivery pipe *d*, where it is joined by the highly heated water issuing upwardly from the nozzle D of the hotter inner retort, and delivery of this hot water then takes place through the pipe *d*.

A perforated pipe section, or collar, F extends between the apices of the conical members A and E, and the nozzle D from the inner cone extends into this pipe section. The heat applied to the bottom of the retort structure heats the contents of both the inner retort shell and the outer retort member.

It will be seen that with my structure a comparatively small volume of water, or fluid, is temporarily isolated from the main body of fluid in the retort structure by introducing said water, or fluid, into the small, inner, hotter retort where it receives a greater proportion of the heat supplied than the balance of the water within the retort structure, and this isolated and comparatively small volume of water being confined within the inner retort is highly heated and pressure due to tendency to expand is therefore developed within the inner chamber of the retort structure so that the discharge of the highly heated water passes through the small diametric nozzle D under considerable pressure and speed.

This jet of hot water is discharged under this pressure centrally of the larger pipe *d* leading from the outer larger retort, thus giving rise to an injector or ejector effect creating suction at the inlet to the said discharge pipe *d* which causes the fluid in the larger retort to be drawn into the larger pipe *d*, thereby accelerating circulation of the water, or other fluid, to be heated, thus facilitating the absorption of heat by the

fluid. This jet action of the nozzle overcomes any tendency of the fluid to rise in the coil, and, at the same time, it assists in raising the water.

It will be noted that the helical coil is so formed that the opposite sides of each turn, or helix, bears substantially the same inclination, or is at the same angle, to a horizontal plane, just as in a standard coil having its axis vertical all the turns lie in planes substantially at the same angle to the vertical. Thereby each turn presents practically the same friction resistance to the flow of the fluid, or water, thus contributing to uniform rate of circulation at all points along the coil.

This form of coil also presents, when properly housed, a series of baffles to retard the passage of the heated air, thus promoting the absorption of heat by the fluid.

I do not limit myself to a system of water heating, as the apparatus may treat fluid in either liquid or gaseous form, and a cooling action may be carried on instead of a heating action.

The delivery pipe *d* instead of extending vertically may extend at an inclination axially of the coil and thence to the container.

The inclined casing with its inclined coil retards the free flow of the hot air and causes maximum absorption of the heat by the water in the coil.

When space permits the coil may be positioned lower down than shown in the drawing so that the supply pipe 5 passes substantially horizontally into the top of coil B.

I claim:

1. In combination, a container for fluid, a retort with means for heating the same, a delivery pipe leading from said retort to an elevated point of said container to discharge heated fluid thereinto, a supply pipe for delivery of fluid from said container to said retort, a coiled portion intermediate the said supply pipe and the relatively low positioned retort and connected to said retort, said coil being disposed with its axis at an inclination, and an inclined casing extending along and enclosing said inclined coil, said casing receiving heat at its lower end from the heating means to direct it along the coil and having a discharge opening leading from its upper end.

2. Apparatus according to claim 1 in which the said coil enclosing casing has the retort within its lower end.

3. Apparatus according to claim 1 in which said coil enclosing casing at its lower end directs the heat from the heating means to the retort.

4. Apparatus according to claim 1 in which the delivery pipe from the retort to the container extends substantially vertically from the said retort.

5. Apparatus according to claim 1 in which the coiled portion of the supply pipe from the container extends at an inclination and along the container.

6. Apparatus according to claim 1 in which the inclined coil has all the turns of its pipe arranged at equal inclinations to the vertical substantially similar to the spirals of a vertical coil having its turns of uniform angularity.

7. Apparatus according to claim 1 in which the inclined coil has its turns so disposed as to act as a baffle to the flow of heated air passing through the inclined casing.

8. In apparatus according to claim 1, retort means comprising an inner member of substantially conical form having an outlet nozzle directed upwardly from its apex, an outer conical member spaced apart from the inner member and to the upper apex portion thereof the delivery pipe is connected, said heating coil delivering the fluid into the lower part of the outer conical member, a port, or ports, connecting the space between the cones with the lower part of the inner cone, said cones being closed on their lower sides by a plate upon which the heating means delivers its heat.

9. In apparatus according to claim 1, retort means comprising an inner member of substantially conical form having an outlet nozzle directed upwardly from its apex, an outer conical member spaced apart from the inner member and to the upper apex portion thereof the delivery pipe is connected, said heating coil delivering the fluid into the lower part of the outer conical member, a port, or ports, connecting the space between the cones with the lower part of the inner cone, said cones being closed on their lower sides by a plate upon which the heating means delivers its heat, and a perforated collar extending from the upper end of the inner conical retort to the upper end of the outer retort, the said nozzle of the inner retort discharging into said collar.

10. In a fluid treating apparatus of the class described, a retort comprising an inner chamber in which a comparatively small volume of fluid may be isolated, said inner chamber being surrounded by and connecting with an outer chamber, means for heating the fluid in said chambers, whereby fluid in the inner chamber is heated to a higher degree than that in the outer chamber and a common discharge from said chambers into a common delivery pipe, said inner chamber having a discharge outlet adapted to produce a jet effect to create suction on the fluid at the discharge outlet of the outer chamber, substantially as described.

11. Apparatus according to claim 10 in which both chambers are conical and discharge fluid through their upwardly directed apices.

12. Apparatus according to claim 10 in which an inclined coil at its lower end is connected with and supplies fluid to the retort at the outer chamber thereof, said jet effect inducing circulation of water downwardly through said coil, substantially as described.

13. In combination, a container for fluid, a retort with means for heating the same, a delivery pipe leading from said retort to an elevated point of said container to discharge heated fluid thereinto, a supply pipe for delivery of fluid from said container to said retort, said supply pipe comprising a riser portion extending to a point above the level of the retort and a coiled portion intermediate the upper end of said riser portion and the relatively low positioned retort and connected to said retort, said coil being disposed with its axis at an inclination, and an inclined casing extending along and enclosing said inclined coil, said casing receiving heat at its lower end from the heating means to direct it along the coil and having a discharge opening leading from its upper end.

14. In apparatus of the class described, means for isolating a body of fluid from another body of said fluid, means for highly heating said isolated body of fluid, and means whereby the highly heated fluid creates an ejector action upon the other body of said fluid to stimulate circulation to bring the bodies of fluid to the heating means, substantially as described.

15. In apparatus of the class described, a fluid conducting conduit, means for isolating a portion of the fluid in said conduit whereby the isolated

portion may be highly heated, and means for adding the highly heated portion to the remaining portion to accomplish a stimulated circulation of the fluid through the conduit.

16. In apparatus of the class described, means for dividing a body of the fluid being treated into substantially separate streams, means for highly heating one of said streams, and means for recombining said streams whereby the highly heated stream creates an ejector action upon the other stream to stimulate circulation.

17. In combination, a container for fluid, a retort for heating the fluid, connecting conduits for the circulation of the fluid through the container and the retort, the conduit leading to the retort having a portion thereof coiled, means for heating said retort, and a casing for confining the heat passing from the retort, along said coiled conduit portion.

18. In combination, a container for fluid, means comprising a preheater and a retort for heating the fluid and circulating it through the container, said preheater being connected to the retort and supplying fluid thereto from the container, and said retort having means for isolating a portion of the preheated fluid whereby the isolated portion may independently be heated to a high temperature, and means for recombining the isolated portion with the remaining portion of the preheated fluid to induce circulation of the fluid.

19. In apparatus of the class described, a conduit comprising a plurality of coils disposed about a common inclined axis, and all portions of said coils being equally inclined from the vertical.

20. In apparatus of the class described, a helical conduit having an inclined axis, corresponding portions of said conduit being uinformly curved, and all portions of said conduit being equally inclined from the vertical.

21. In apparatus of the class described, means for isolating a portion of a fluid supply from another portion of said supply, means for heating said isolated portion, and means for injecting the heated isolated portion of the supply into the other portion of the fluid and delivering the combined fluid portions to a container, said injecting action stimulating circulation of the fluid, substantially as described.

22. Apparatus according to claim 10 in which an inclined coil at its lower end is connected with and supplied fluid to the retort at the outer chamber thereof, and a flue encloses said coil to direct heated gases against the coil, said jet effect inducing circulation of water downwardly through said coil counter to the flow of heated gases through the flue.

NORTON B. LEO.