Oct. 14, 1924. 1,511,876

R. N. EHRHART

DEGASIFYING APPARATUS

Filed Feb. 8, 1922

Fig. 1.

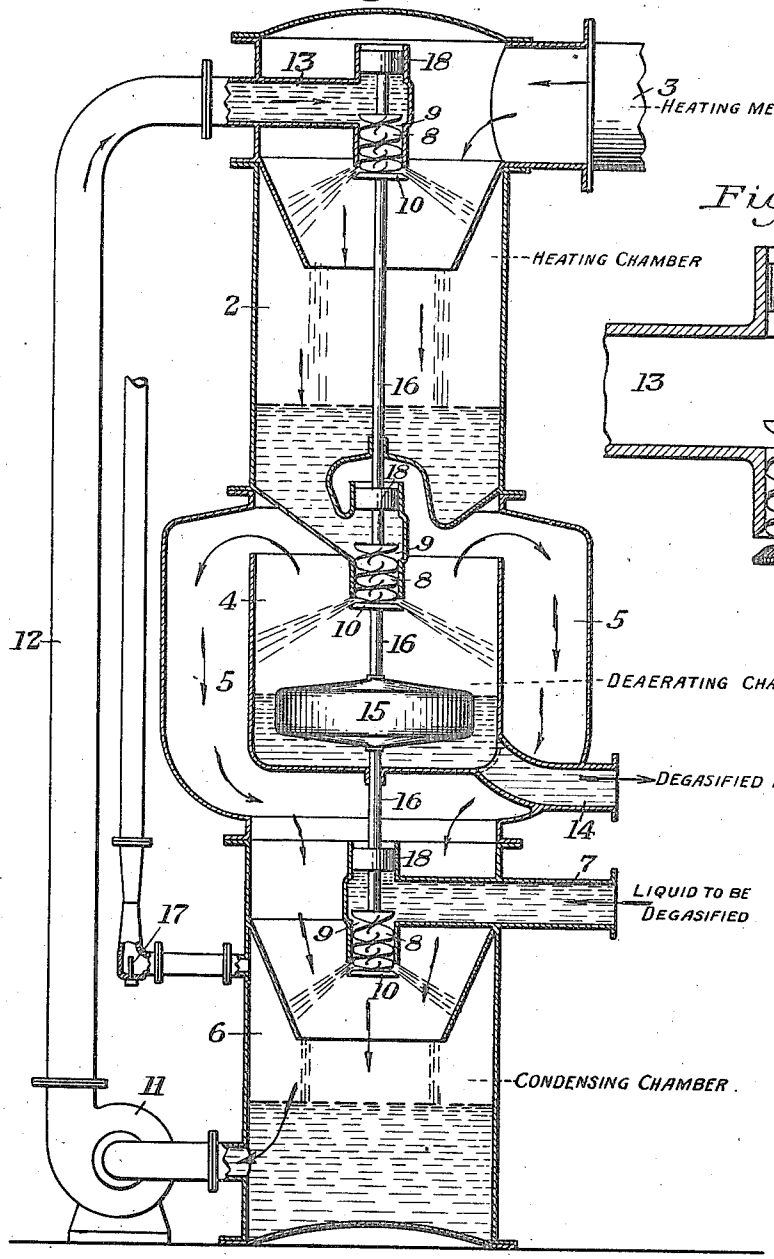


Fig. 2.

INVENTOR

Raymond N. Ehrhart,

by Byrne, Stebbins, Burgess & Parmelee,

his attys.

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RAYMOND N. EHRHART, OF EDGEWOOD, PENNSYLVANIA, ASSIGNOR TO ELLIOTT COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

DEGASIFYING APPARATUS.

Application filed February 8, 1922. Serial No. 535,106.

To all whom it may concern:

Be it known that I, RAYMOND N. EHRHART, a citizen of the United States, residing at Edgewood, Allegheny County, Pennsylvania, have invented a new and useful Improvement in Degasifying Apparatus, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical sectional view, partly in elevation and largely diagrammatic, illustrating an embodiment of the present invention, and

Figure 2 is a sectional detail view on an enlarged scale illustrating one of the spray devices.

At the present time, it is quite customary to utilize suitable apparatus for removing to as large an extent as possible entrained air and gases from water before passing the water to boilers or the like. Such apparatus, commonly referred to as degasifying apparatus, in its commercial form embodies three chambers, viz: the heating chamber in which the liquid to be degasified is heated, the deaerating or evaporating chamber in which the air and other gases are released or separated, and the condensing chamber for condensing the condensible vapors and absorbing the heat of the evaporation from the deaerating chamber. Commercially, it is customary to build each of these chambers as a separate unit, this being especially true of the condenser. This necessitates a great deal of piping for connecting the various chambers and also a relatively complicated system of supports for all of the chambers. By the present invention the objections in this respect to existing apparatus are entirely obviated and there is provided an apparatus in which the entire device is in effect an integral self-contained and self-supporting unit requiring a minimum amount of piping.

Also, with existing apparatus, the complicated system of piping requires a complicated control for the flow of liquid from one of the chambers to another chamber, as required. By the present invention there is provided a greatly simplified control for this purpose. Certain of the constructional features of the present invention are claimed in the co-pending application of Hugo Berquist, Serial No. 547,868, filed March 29, 1922, and in Elliott application Serial No. 437,240, filed January 14, 1921.

Referring more particularly to the drawings, there is illustrated a degasifying apparatus formed as an integral unit, self-contained and self-supporting. This apparatus preferably comprises a heating chamber 2 having an inlet 3 for the heating medium. In accordance with the usual practice this heating medium may be steam at any desired temperature. Below the heating chamber is an evaporating or deaerating chamber 4 which is entirely surrounded by a passage 5 permitting the gases and vapors released in this chamber to pass therefrom into a condensing chamber 6. In the embodiment of the invention illustrated, all of the chambers are arranged coaxially, with the condensing chamber supporting both the deaerating and the heating chambers. It will be obvious, however, to those skilled in the art that the arrangement of the chambers may be varied without departing from the spirit of the invention, and that other changes may be made in the construction and the operation of the various parts of the apparatus within the scope of my broader claims.

The liquid to be degasified is supplied to the apparatus through an inlet connection 7 cooperating with the condensing chamber. The outlet into the condensing chamber is controlled by a combined valve and spray device 8. This spray device may be constructed in any desired manner, for example, as illustrated in my co-pending application Serial No. 477,972, filed June 16, 1921, with the fluid conveying passages 9 so constructed as to present a gradually decreasing cross-sectional area to the flow of the liquid as the device moves to cutting-off position. Below the spray device 8 there may be provided a valve 10 adapted to cooperate with the inlet 7 to completely cut off the supply of liquid to the condensing chamber. By reason of this construction, it will be apparent that irrespective of the volume of flow through the spray device the atomization effected thereby will be substantially constant, as the area of the discharge outlet varies in accordance with the liquid being discharged.

From the condensing chamber 6 the liquid may be conducted by a pump 11 and pipe 12 to the liquid inlet 13 cooperating with

the heating chamber. The discharge of liquid into the heating chamber is controlled by a device similar to that already described and having the parts thereof designated by the same reference characters. The liquid discharged into the heating chamber is subjected to the heating medium supplied thereto and thereby raised to the desired temperature. From the heating chamber, the liquid is adapted to be discharged into the deaerating chamber 4 through a third spray device of the construction hereinbefore set forth. From the deaerating chamber 4 the liquid, in degasified state, may be lead through an outlet connection 14 to the boiler feed pumps for supplying the boilers or economizers with degasified water, or to any other apparatus in connection with which degasified water is desirable.

Located in the deaerating chamber 4 is a float 15 having a piston 16 which is operatively connected with each of the combined spray and valve devices 8. By reason of this construction, the single float 15 simultaneously controls all of these devices, the control being in accordance with the demands upon the apparatus such as tend to produce changes in the liquid level within the chamber 4. By reason of this construction there is provided an efficient means for controlling the intercommunicating connections between the various chambers.

There is preferably maintained within the chamber 4, the passage 5 and the chamber 6 a vacuum which is higher than that which would normally cause the water leaving the heater and entering the deaerating chamber to boil. In other words, there is maintained a difference in pressure and temperature between the heating chamber and the deaerating and condensing chambers. This results in a violent ebullition of the water entering the deaerating chamber from the heating chamber which is very advantageous as it effectively releases from the water all of the entrained air and gases. The spraying device cooperates with this sudden drop in pressure and mechanically breaks up or atomizes the liquid thereby increasing the ebullition and the release of the air and other gases.

The condensible content of the released vapors passes into the condensing chamber and is condensed by the entering liquid. The heat of these vapors is thus conserved in effecting a preliminary heating of the water before it passes to the heating chamber. The non-condensible content of these vapors may be removed from the apparatus by means of a suitable ejecting device such as a steam ejector 17.

For facilitating the operation of each of the spraying devices 8, they may be either entirely or partially balanced by providing equalizing pistons 18 for cooperation therewith. In this manner easy and accurate control is provided.

While the present invention adapts itself to the use of a plurality of floats for controlling the various spraying devices, as suggested, for example, in Elliott Patent No. 1,321,999 of November 18, 1919, such a construction being within the spirit of my invention, the operation is considerably simplified by the provision of a single float in the manner illustrated.

The advantages of the present invention arise from the provision of a compact comparatively simple form of degasifying apparatus in the form of an integral unit which is self-contained and self-supporting, and in which a simplified liquid control of an efficient nature is provided.

I claim:

1. Degasifying apparatus, comprising a plurality of serially connected chambers having liquid spray means discharging the contents of one chamber into the next chamber of the series, said spray means having an automatically variable flow capacity effecting substantially uniform atomization of the liquid issuing therefrom irrespective of the quantity of liquid flowing therethrough, there being means insuring removal of non-condensible gases from the apparatus, and means for heating the liquid in one of said chambers, substantially as described.

2. Degasifying apparatus, comprising a plurality of serially connected chambers having liquid spray means discharging the contents of one chamber into the next chamber of the series, said spray means effecting substantially uniform atomization of the liquid issuing therefrom irrespective of the quantity of liquid flowing therethrough, and means for automatically actuating all of said spray means in accordance with the demands on said apparatus, substantially as described.

3. Degasifying apparatus, comprising a plurality of serially connected chambers having liquid spray means discharging the contents of one chamber into the next chamber of the series, said spray means effecting substantially uniform atomization of the liquid issuing therefrom irrespective of the quantity of liquid flowing therethrough, and a common means for automatically actuating all of said spray means in accordance with the demands on said apparatus, substantially as described.

4. Degasifying apparatus, comprising a plurality of serially connected chambers having liquid spray means discharging the contents of one chamber into the next chamber of the series, said spray means effecting substantially uniform atomization of the liquid issuing therefrom irrespective of the quantity of liquid flowing therethrough, and a

common actuating means for all of said spray means, substantially as described.

5. Degasifying apparatus, comprising a plurality of serially connected chambers having liquid spray means discharging the contents of one chamber into the next chamber of the series, said spray means effecting substantially uniform atomization of the liquid issuing therefrom irrespective of the quantity of liquid flowing therethrough, and a common float controlled means for actuating all of said spray means, substantially as described.

6. Degasifying apparatus, comprising a plurality of serially connected chambers having intercommunicating liquid flow connections, and means for simultaneously controlling all of said connections, substantially as described.

7. Degasifying apparatus, comprising a plurality of serially connected chambers having intercommunicating liquid flow connections, and means for simultaneously and uniformly controlling all of said connections, substantially as described.

8. Degasifying apparatus, comprising a plurality of coaxially disposed serially connected chambers having intercommunicating liquid flow connections, and means for simultaneously controlling the flow through all of said connections, substantially as described.

9. Degasifying apparatus, comprising a plurality of chambers having intercommunicating liquid flow connections, and float operated means in one of said chambers for simultaneously controlling all of said connections, substantially as described.

10. Degasifying apparatus, comprising a plurality of chambers having intercommunicating liquid flow connections, and substantially balanced means for controlling the flow through all of said connections, substantially as described.

11. Degasifying apparatus, comprising a heating chamber, a deaerating chamber and a condensing chamber, said deaerating chamber having a vapor passage formed therearound and communicating with the condensing chamber, substantially as described.

12. Degasifying apparatus, comprising a heating chamber, a deaerating chamber and a condensing chamber assembled in coaxial relationship as an integral unit, and connections for supplying the liquid to be treated to all of said chambers, substantially as described.

13. Degasifying apparatus, comprising a heating chamber, a deaerating chamber and a condensing chamber, one of said chambers forming the supporting base for the other two, and connections for supplying the liquid to be treated to all of said chambers, substantially as described.

14. Degasifying apparatus, comprising a heating chamber, a deaerating chamber and a condensing chamber, said condensing chamber forming the support for at least one of the other chambers, and connections for passing the liquid to be treated serially through said chambers, substantially as described.

15. Degasifying apparatus, comprising a heating chamber, a deaerating chamber and a condensing chamber in coaxial relationship, said deaerating chamber forming a support for at least one of the other chambers, and connections for passing the liquid to be treated serially through said chambers, substantially as described.

16. Degasifying apparatus, comprising an automatically adjustable liquid passage for uniformly atomizing the liquid traversing said apparatus, substantially as described.

17. Degasifying apparatus adapted to impart a whirling motion to the liquid passing therethrough for spraying and atomizing the same, and automatically adjustable means for controlling the spraying of the liquid traversing said apparatus, substantially as described.

18. Degasifying apparatus comprising an adjustable liquid spraying and atomizing nozzle, and float operated means for controlling said liquid spraying nozzle to maintain uniform atomization of the liquid within the capacity range of said nozzle, substantially as described.

19. Degasifying apparatus, comprising a directly connected heating chamber, a deaerating chamber, and a condensing chamber assembled in coaxial relationship as an integral unit, and adapted to serially receive the liquid to be degasified to perform different operations thereon, substantially as described.

20. Degasifying apparatus, comprising a condensing chamber, a heating chamber and a deaerating chamber in coaxial relationship and serially connected to successively receive the liquid to be treated, one of said chambers forming the sole support for the other two, substantially as described.

In testimony whereof I have hereunto set my hand.

RAYMOND N. EHRHART.