Nov. 10 1925. 1,560,754

B. BROIDO

DEAËRATING APPARATUS

Filed July 28, 1920

Fig. 1

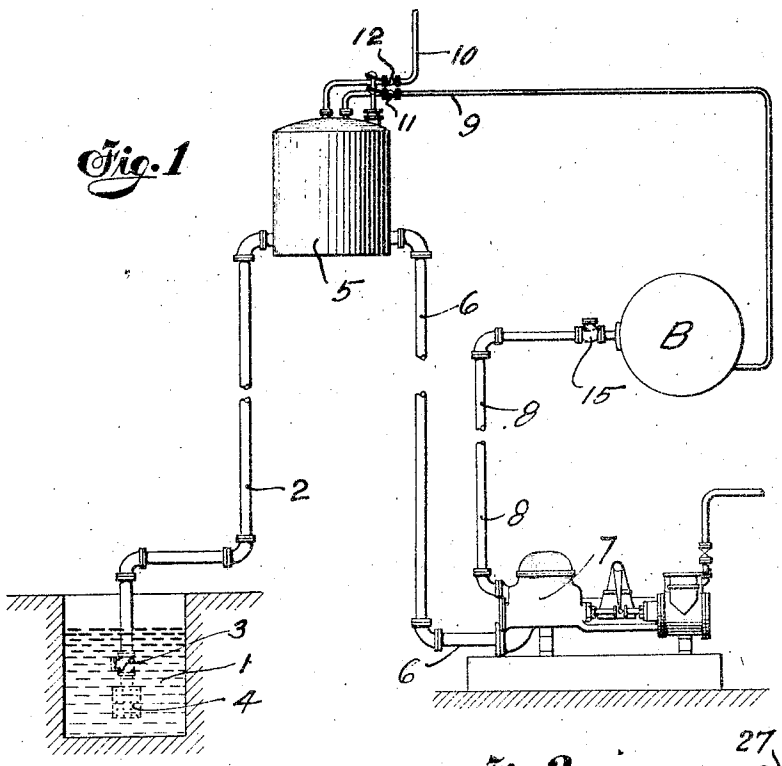


Fig. 3

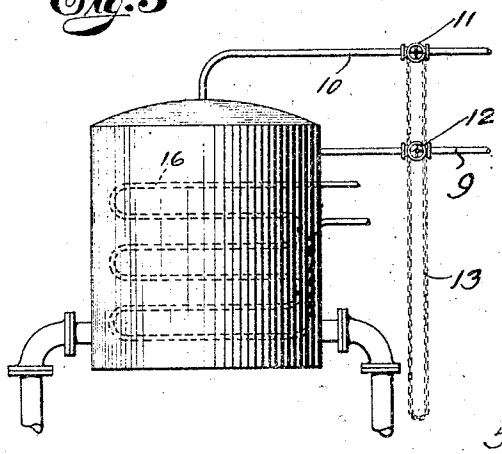
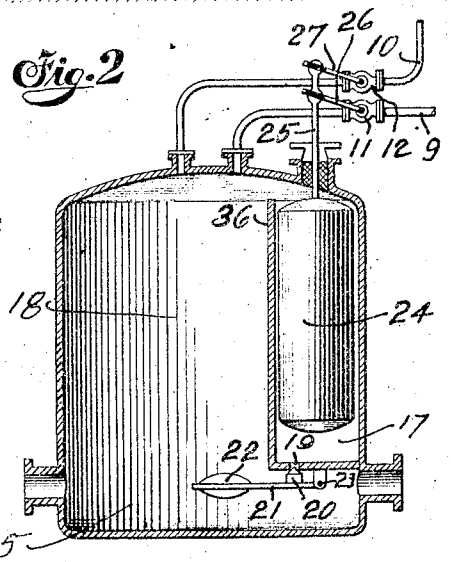


Fig. 2



Benjamin Broido Inventor

By his Attorney O. V. Thiele

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UNITED STATES PATENT OFFICE.

BENJAMIN BROIDO, OF NEW YORK, N. Y., ASSIGNOR TO THE SUPERHEATER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

DEAERATING APPARATUS.

Application filed July 28, 1920. Serial No. 399,921.

To all whom it may concern:

Be it known that I, BENJAMIN BROIDO, a citizen of the United States, and resident of New York, N. Y., have invented certain new and useful Improvements in Deaerating Apparatus, of which the following is a specification.

The present invention relates to apparatus for removing air and other gases from boiler feed-water.

The advisability for furnishing to boilers or to economizers water that has had removed from it any air or other gases is now well recognized. In the case of steel economizers such removal is particularly necessary.

The present invention has for its purpose the provision of simple and effective means for accomplishing the removal of such air and other gases. The principle upon which it primarily depends for its operation is the well known one that when the pressure on water is diminished gases in solution are liberated, the liberation being more complete the more the pressure is reduced.

In the accompanying drawing, illustrating the preferred form of my invention, Fig. 1 shows in elevation the entire apparatus; while Fig. 2 shows on an enlarged scale a section of a part of the apparatus. Fig. 3 illustrates a modification.

The water is drawn from the hot-well or other source 1. It enters the pipe 2, passing through check-valve 3. 4 is the usual strainer. The pipe 2 conveys the water to the tank 5 located at a considerable elevation above hot-well 1, this elevation being as high as is consistent with good operation of the system. The elevation can not be greater than the length of a water column corresponding to the atmospheric pressure, and will in practice be somewhat less. Pipe 6 carries the water to pump 7, which forces it through pipe 8 into the boiler B. Tank 5 is connected to a source of water under pressure such as the boiler by pipe 9, and, at its highest point, to the atmosphere by pipe 10. Pipes 9 and 10 are provided with valves 11 and 12 respectively. Pipe 8 is provided with the usual check-valve 15 opening toward the boiler. The valves 11 and 12 are arranged to work in unison, i. e., they are either both open or both closed; and the arrangement shown is a convenient one to effect this automatically. The partition 36 divides a smaller chamber 17 from the larger chamber 18. This partition terminates at its upper end a little below the top of the tank and its bottom is a little above the bottom of the tank. An orifice 19 in the bottom of the partition is controlled by the valve 20 carried by the arm 21 of the float 22, the arm being pivoted at 23.

In the space 17 is a comparatively large float 24; which carries a stem 25 extending through a stuffing box in the wall of the tank and is operatively connected to the arms 26 and 27 of the valves 11 and 12. With the float 24 in its upper position, the valves are closed; while in its lower position, the valves are open.

As long as there is enough water in the tank to float valve-float 22, the valve 20 will keep the orifice 19 closed. When the water level drops sufficiently, due to the accumulation of gases in the tank as will be described more fully below, to open valve 19, the water from chamber 17 will be discharged through this orifice until float 24 drops far enough to open valves 11 and 12. Thereupon, as more fully explained below, the water level will be raised by water entering through pipe 9 and as soon as float 22 is raised sufficiently it will close valve 20 and the water level will rise in 18. No water, however, will enter chamber 17, and valves 11 and 12 will therefore remain open, until chamber 17 is filled by water coming over the top of partition 36. The float 24 then rises and closes valves 11 and 12.

The operation of the system will now be readily understood from the following statement:—

The water being pumped into the boiler and rising in pipe 2 to tank 5 is there exposed to a much diminished pressure, with the result that air and other gases it carries are more or less completely liberated and accumulate in the upper part of tank 5, depressing the water level in the tank. When this water level falls far enough to open valve 20, valves 11 and 12 will automatically open as above described. With these two valves open, water from the boiler or other source of water under pressure, enters the tank through pipe 9. Check valve 3 prevents the water from leaving through pipe 2, and the water level in tank therefore quickly rises, the accumulated gases being forced out through pipe 10. When the gases

have been discharged and water has filled chamber 17 valves 11 and 12 will be automatically closed as described above, and normal operation is resumed.

Whatever gas is left in the tank at the time the two valves 11 and 12 are again closed is of course at atmospheric pressure, and will on expansion under the reduced pressure when normal operation is resumed occupy a comparatively large volume and at once allow the water level to drop correspondingly. It is for this reason obviously desirable to have the pipe 10 connect to the tank 5 at the highest possible point, and to expel substantially all of the accumulated gases.

The liberation of the gases from the water is aided by raising the temperature of the water. To take advantage of this fact the water may be heated in the tank 5. In the drawing an arrangement for the latter method is shown. This consists in a set of steam coils 16, through which live or exhaust steam is circulated. It will be understood that while the liberation of the gases is aided by this heating, such heating is not essential. Where it is used the degree to which the temperature of the water is raised will be dictated somewhat by conditions. At times it will be advisable to raise it to the boiling point, which, with the diminished pressure involved, will of course be comparatively low.

It should be noted that whatever vaporization occurs within the tank involves no heat loss, as any vapor in the tank is at the low pressure prevailing during normal operation, and is at once condensed when valve 12 is opened and the pressure rises.

It may at times be desired to use manually operated means for opening and closing valves 11 and 12, and such means are shown in Fig. 3. The partition 36, float 24, and float-controlled valve 20 are entirely omitted, and valves 11 and 12 are directly opened from time to time by means of chain 13. While the valves are open, water entering from the boiler through pipe 9 forces the accumulated gases out through pipe 10. The valves are closed when the gases have all been driven out and normal pumping is resumed.

What I claim is:

1. In apparatus of the class described, the combination of a source of water, a closed tank at a considerable elevation above the source, a pump, a pipe from the source to the tank, a pipe from the tank to the pump, a delivery pipe from the pump, a check-valve in the first pipe, a valved pipe from a source of water under pressure to the tank, a valved pipe from an elevated point of the tank to the atmosphere, and automatic means to operate the two valves in unison in response to the water level in the tank.

2. In apparatus of the class described, the combination of a source of water, a tank at a considerable elevation above the source, a pump, a pipe from the source to the tank, a pipe from the tank to the pump, a delivery pipe from the pump, a check-valve in the first pipe, a valved pipe from a source of water under pressure to the tank, a valved pipe from an elevated point of the tank to the atmosphere, and automatic means to operate the two valves in unison, opening them when the water level in the tank falls below a predetermined point and closing them when it rises above a predetermined higher point.

3. In apparatus of the class described, the combination of a boiler a source of water supply, a closed tank at a considerable elevation above the source, a pump, a pipe from the source to the tank said pipe being equipped with a check-valve preventing flow from the tank to the source, a pipe from the tank to the pump, a pipe from the pump to the boiler, a valved pipe from the water space of the boiler to the tank, a valved pipe from substantially the highest point of the tank to the atmosphere, and automatic means to open the valves in said last-named two pipes when the water level in the tank falls below a predetermined point, and to close them when it has risen to a predetermined higher point.

4. In apparatus for separating from water gases held in it in solution, the combination of a source of water supply, a closed tank located above the surface of the water supply at a distance approximately equal to that to which the air pressure will raise water, a pump, a pipe from the water supply to the tank, a pipe from the tank to the pump, a delivery pipe from the pump, a check-valve in the first pipe, a valved pipe to the tank from a source of water under pressure above atmospheric, and a valved pipe to the atmosphere from an elevated point of the tank.

5. In apparatus for separating from water gases held in solution by it, the combination of a pump, a conduit to carry water to the pump including a closed tank, a check-valve in said conduit, said tank being so located that the pressure in it approximates zero, whereby said gases are liberated from the water, valved means to supply water under pressure above atmosphere to the tank, and a valved passage from an elevated point of the tank to the atmosphere.

BENJAMIN BROIDO.