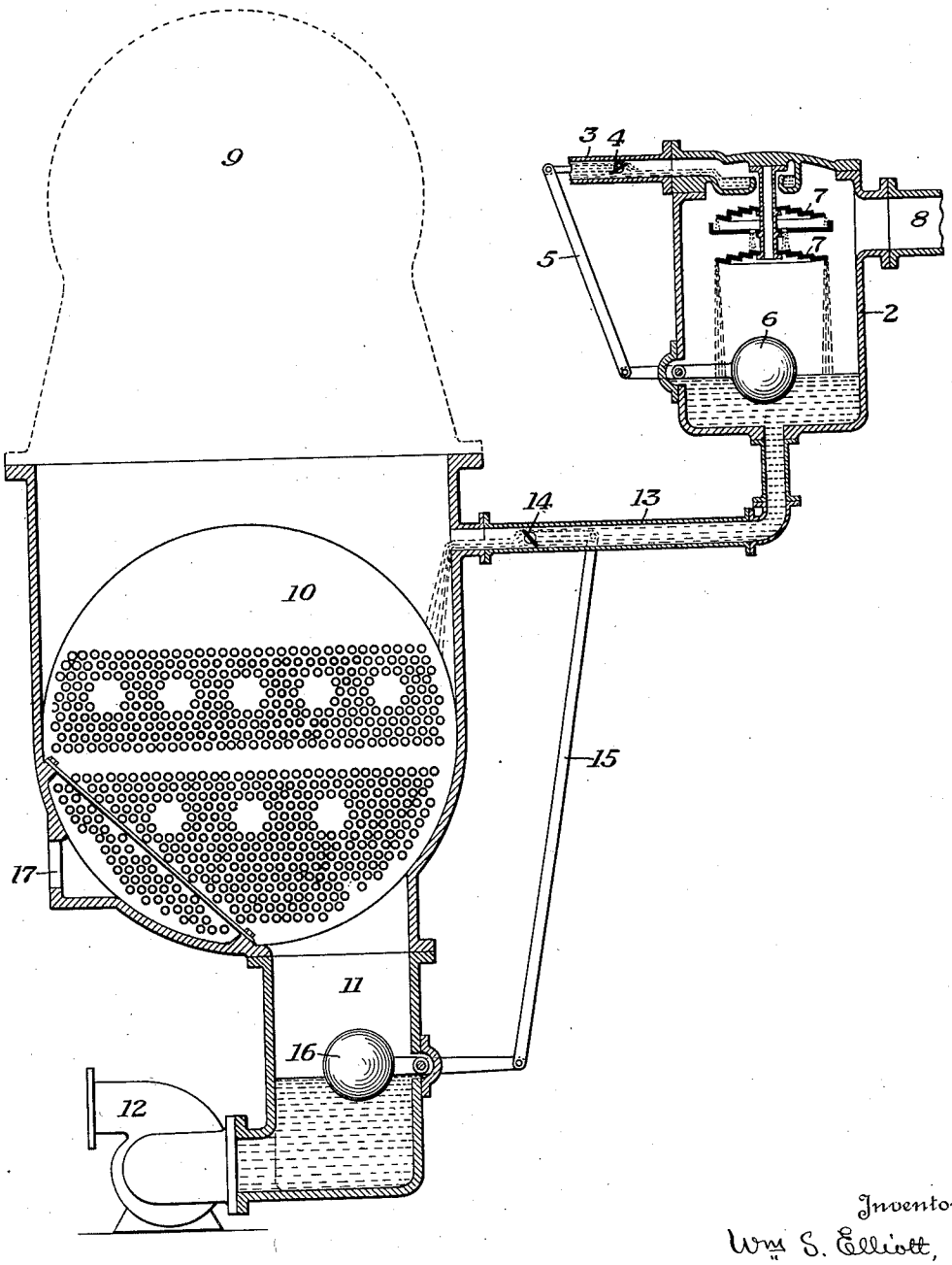
June 16, 1925. 1,542,544

W. S. ELLIOTT

SEPARATION OF AIR AND DISSOLVED GASES FROM LIQUIDS

Filed Nov. 26, 1920



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UNITED STATES PATENT OFFICE.

WILLIAM S. ELLIOTT, OF PITTSBURGH, PENNSYLVANIA.

SEPARATION OF AIR AND DISSOLVED GASES FROM LIQUIDS.

Application filed November 26, 1920. Serial No. 426,665.

To all whom it may concern:

Be it known that I, WILLIAM S. ELLIOTT, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny, and State of Pennsylvania, have invented a new and useful Improvement in the Separation of Air and Dissolved Gases from Liquids, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing, which is a sectional elevation, partly diagrammatic, showing a preferred form of apparatus embodying my invention.

My invention has relation to improvements in the separation of air and dissolved gases from liquids, and particularly from the make-up water used in power plants.

My invention is designed to provide apparatus of simple, efficient, and economical character, for carrying out the method of separation described and claimed in my Patent No. 1,321,999, dated November 18, 1919.

The nature of the present invention will be best understood by reference to the accompanying drawing in which I have shown a preferred embodiment thereof, which will now be described, it being premised, however, that various changes can be made in the details of construction, arrangement, and combination of the various parts without departing from the spirit or the scope of my invention as defined in the appended claims.

In this drawing, the numeral 2 designates a heater, which is shown as being of the general character of the heater described in my said patent. The liquid to be heated enters the heater from the supply connection 3, having a control valve 4, operated by suitable connections 5 with a float 6 in the heater, whereby a substantially constant level of the liquid will be maintained in the heater. 7 designates suitable spray pans or baffles for distributing the liquid in the heater; and 8 is a connection through which steam from any suitable source enters for the purpose of raising the temperature of the liquid in the heater.

9 designates (in dotted lines) a steam turbine, and 10 is the condenser therefor, this condenser being shown as of the tubular type. 11 is the hot well of the condenser, and 12 is an off-take pump connected with the hot well. 13 is a pipe connection leading from the lower portion of the heater into the upper portion of the condenser. The flow of water through the pipe 13 may be controlled in any suitable way, as by means of a valve 14 having actuating connections 15 with a float 16 in the hot well, whereby the level of the liquid in the hot well will be kept substantially constant.

The operation is as follows: The water entering the heater through the supply pipe 3 may be raw water, or water which has been evaporated and condensed in the ordinary evaporator. The heated water passes from the heater through the connection 13 into the condenser, this water flowing over the condenser tubes and being divided up into relatively small streams. In turbine condenser installations, very high vacua are usually obtained in the condenser, and as soon as the water from the heater enters the condenser it is subjected to a drop in pressure sufficient to cause it to flash or explode into small particles in the manner set forth in my said patent, the condenser in the present apparatus taking the place of and having the function of the evaporator or receiver shown and described in said patent. Being further subdivided and spread over the surfaces of the condenser pipes, the water is subjected to a most effective action of the vacuum so that a very high percentage of the air and other dissolved gases contained in the water is extracted and may be removed by any suitable exhausting means applied to the condenser at 17.

All the water delivered from the heater which is not exhausted from the condenser as steam or vapor, is discharged from the condenser into the hot well 11, where it is mixed with the condensate from the turbine. In consequence of the high vacua which usually obtain in these condensers, the amount of air remaining in the condensate has been greatly reduced as compared to the amount contained in the raw water, or in the steam before the steam is condensed; and by the provision of the heater 2 in the arrangement described, all wastage in the condensate is made up with water from which the air and other dissolved gases has also been removed to a high degree. The invention renders it possible to also employ make-up

water which has been more or less contaminated with air and other gases in heating systems and other apparatus about the plant, in which steam is employed.

It will be noted that the present invention makes it possible to eliminate the use of the special evaporator forming a part of the system described in my said patent: and to utilize for such evaporator the ordinary condenser employed in connection with the power plant. The invention also eliminates the necessity for the use of a special condenser for condensing purposes.

I claim:

1. In a power plant, the combination with a prime mover and a condenser serving the prime mover, of a heater arranged to discharge heated water to the condenser under conditions in which the water upon its entrance to a region of vacuum in the condenser is caused to violently boil or flash at the expense of its contained heat, said condenser having an outlet for the removal of air therefrom, substantially as described.

2. In a power plant, the combination with a prime mover and a condenser serving the prime mover, of a heater arranged to discharge heated water to the condenser under conditions in which the water upon its entrance to a region of vacuum in the condenser is caused to violently boil or flash at the expense of its contained heat, the entrance from the heater to the condenser being so disposed with respect to the tubes of the condenser that the latter act as distributors for the entering water, said condenser having an outlet for the removal of air therefrom, substantially as described.

3. In a power plant, the combination with a prime mover and a condenser serving the prime mover and having a hot well, of a heater arranged to discharge heated water to the condenser under conditions in which the water upon its entrance to a region of vacuum in the condenser is caused to violently boil or flash at the expense of its contained heat, together with means controlled by the level of the liquid in the hot well for controlling the flow from the heater to the condenser, said condenser having an outlet for the removal of air therefrom, substantially as described.

4. In the method of deaerating water, the steps consisting in discharging steam from a prime mover into a condenser to condense the same, heating water to serve as make-up water to a temperature materially higher than the temperature corresponding to the vacuum in the condenser, discharging the heated water into the condenser under conditions in which the water upon its entrance into the region of vacuum in the condener is caused to violently boil or flash at the expense of its contained heat, and making provision for the removal of air from the condenser, substantially as described.

In testimony whereof, I have hereunto set my hand.

WILLIAM S. ELLIOTT.