O. C. BUSS.

WET AIR PUMP.

APPLICATION FILED AUG. 7, 1909.

1,192,854.

Patented Aug. 1, 1916.

2 SHEETS—SHEET 1.

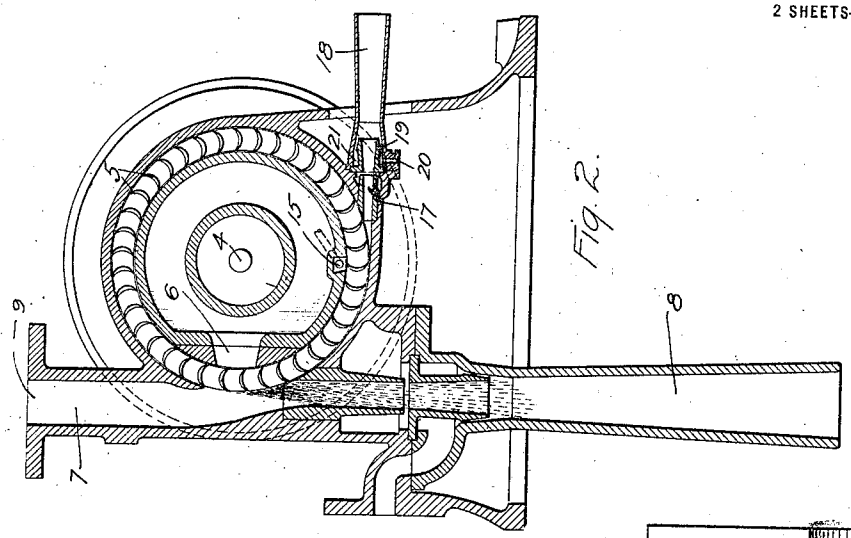

Fig. 2.

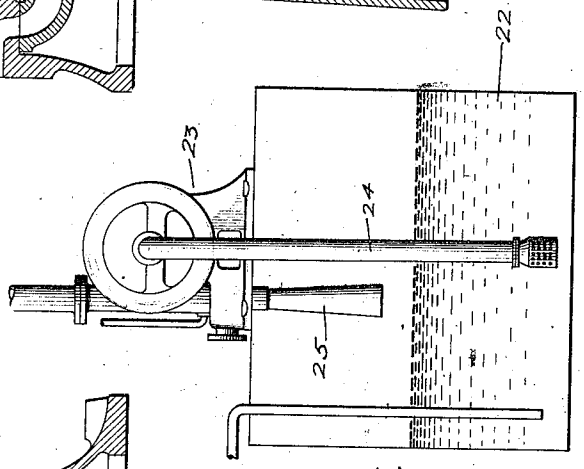

Fig. 3.

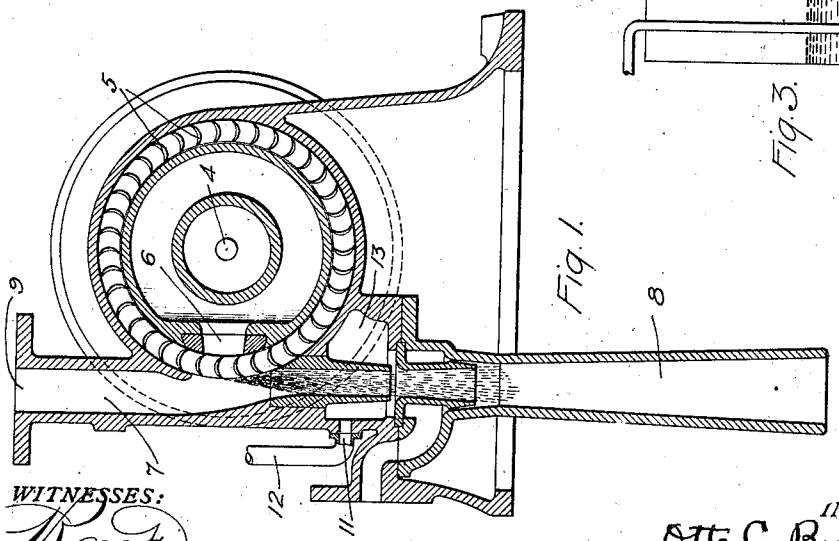

Fig. 1.

WITNESSES:

E. M. McCallister

INVENTOR.

Otto C. Buss

BY

Jno. T. Green

HIS ATTORNEY IN FACT.

O. C. BUSS.

WET AIR PUMP.

APPLICATION FILED AUG. 7, 1909.

1,192,854.

Patented Aug. 1, 1916.

2 SHEETS—SHEET 2.

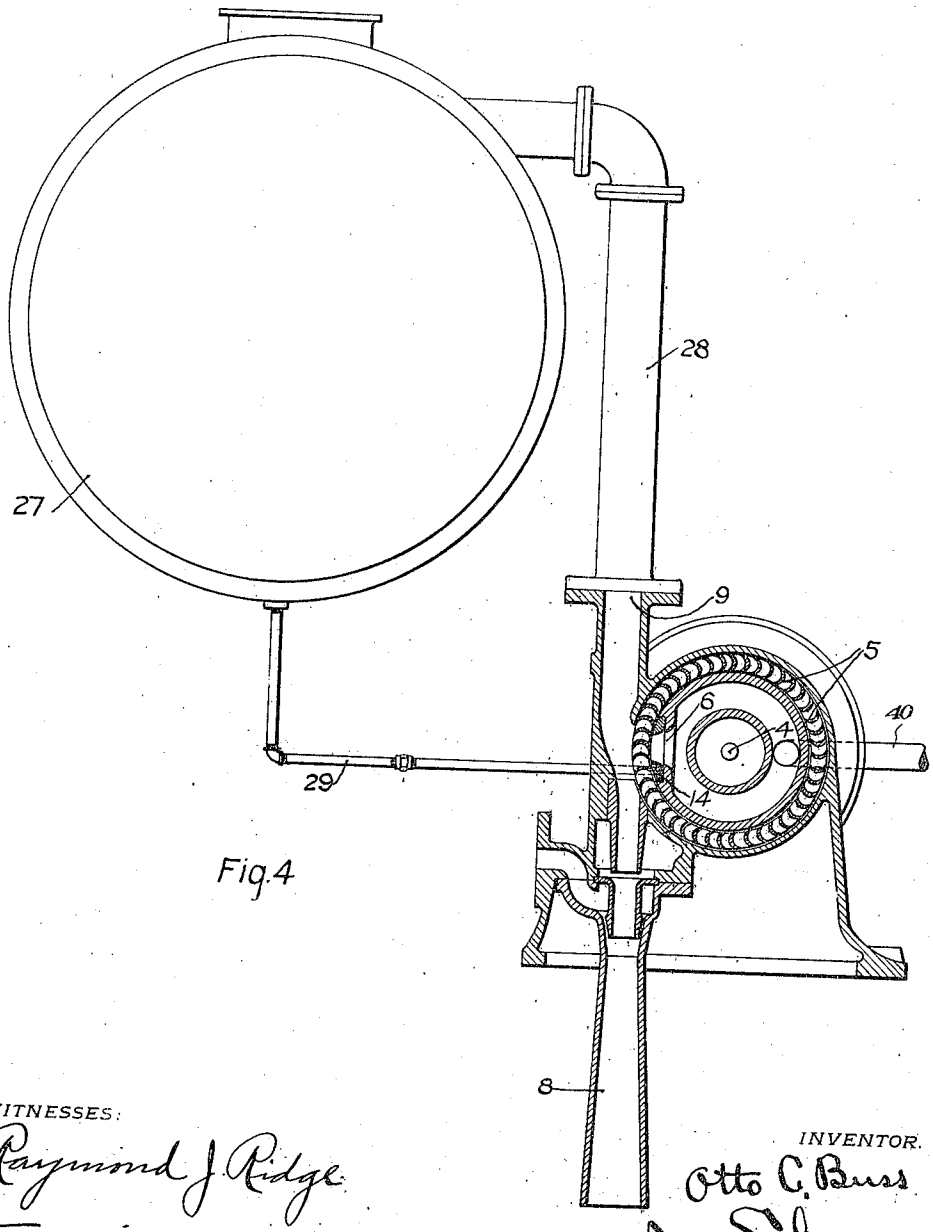

Fig. 4

WITNESSES:

Raymond J. Ridge.

E. M. M. Collister.

INVENTOR.

Otto C. Buss

BY Jno. S. Sheen.

HIS ATTORNEY IN FACT.

UNITED STATES PATENT OFFICE.

OTTO C. BUSS, OF HAVRE, FRANCE, ASSIGNOR TO SOCIÉTÉ ANONYME POUR L'EXPLOITATION DES PROCÉDÉS WESTINGHOUSE-LEBLANC, OF PARIS, FRANCE.

WET AIR-PUMP.

1,192,854. Specification of Letters Patent. Patented Aug. 1, 1916.

Application filed August 7, 1909. Serial No. 511,817.

To all whom it may concern:

Be it known that I, OTTO C. BUSS, a citizen of the Republic of Switzerland, and a resident of Havre, France, have made a new and useful Invention in Wet Air-Pumps, of which the following is a specification.

This invention relates to air pumps and more particularly to air pumps for use in connection with condensing apparatus such as surface condensers.

Maurice Leblanc in a French Patent No. 342,599 issued on April 23, 1904, describes and illustrates a form of air pump especially used in connection with condensing apparatus. I have discovered that when the same is utilized in connection with surface condensers it is necessary to have two pumps, one for the air and one for the condensed water. This invention relates to a single device for accomplishing the purpose of both of said pumps.

In the drawings: In Figure 1 I have illustrated such device; in Fig. 2 I have illustrated a modification thereof; and Fig. 3 illustrates an arrangement of apparatus in which it is essential to recover all the water of condensation. Fig. 4 illustrates an arrangement of apparatus embodying my invention in connection with an end view of a surface condenser.

The pump illustrated in the drawings includes a rotatable impeller mounted on a shaft 4 and provided with an annular row of blades 5. The impeller is adapted to be driven by any suitable means, such as a motor or turbine, not shown. The blades 5 are adapted to receive water or other ejecting or operating liquid from a distributer 6, supplied from any suitable source, so located within the ring of blades that the liquid delivered by it is discharged from only a partial number of the blades at a time in the form of thin sheets or leaves through a collecting chamber or combining tube 7 and a diffuser 8, thus making the impeller a partial injection impeller. The leaves of liquid traversing the combining tube segregate small portions of air or other non-condensable gases and, by imparting a high velocity to them, discharge them through the diffuser tube against a pressure higher than that existing in the combining tube 7. The source of air or gas to be removed communicates with the upper end of the combining tube 7 through a port 9.

The apparatus is particularly adapted to remove the air as well as the water of condensation from surface condensers. In the apparatus illustrated in the drawing, I have shown three ways of discharging the water of condensation from surface condensers; this may be accomplished, however, in four ways, the first of which requires no change to the original air pump apparatus disclosed in the above referred to French patent.

The apparatus for carrying out all of the method consists of a rotatable impeller provided with an annular row of blades, a distributer chamber located within the row of blades and supplied with water from any suitable source of supply and provided with a distributing nozzle 6 for distributing water to the row of blades, a combining tube into which the water is projected by the blades in a finely divided state and a diffuser in line with the discharge end of the combining tube. The water of condensation, by mingling with the water projected from the blades 5, will attain a high velocity and in this manner will be projected through the combining tube and the diffuser tube.

In Fig. 1, I have illustrated a second method of discharging the non-condensable gases and the water of condensation from a condenser. In carrying out this method, I may deliver the water of condensation from the condenser, through one or more orifices 11 and connecting piping 12 to a chamber 13, which surrounds the delivery end of the combining tube 7 and which is exposed to vacuum pressure. The water of condensation is discharged from the chamber 13 by the ejector action of the water issuing from the combining tube 7 and traversing the distributer 8. With this arrangement the air or other non-condensable gases are delivered to the port 9 of the combining tube in the usual manner. This arrangement of apparatus is more fully described in my application, Serial No. 555,718, filed April 15, 1910.

In Fig. 4 I have illustrated appartus for carrying forward a third method of discharging the water of condensation from a condenser. I deliver the air or non-condensable gases to the port 9 in the usual manner and deliver the water of condensation to an

auxiliary distributer 14, which is arranged to deliver the water of condensation to the rotating blades 5 in the same manner that the ejecting water is delivered by the distributer 6. It is preferable to place the distributer 14 below the distributer 6, because the water of condensation is generally warmer than the operating or ejecting liquid and by placing the distributer in this way I avoid the evolution of vapors. This evolution of vapor could not be prevented in the combining tube 7 if the auxiliary distributer 14 was placed above the distributer 6.

In Fig. 2 I have illustrated a fourth method of discharging the water of condensation and the non-condensable gases from the condenser. Instead of mixing the ejecting water and the water of condensation, and delivering them to the combining tube 7 and the diffuser 8, I may introduce the water of condensation at another point of the turbine and exhaust it to the atmosphere by a special diffuser. I accomplish this by providing a separate distributer 15 which is removed some distance from the main distributer 6 and which delivers water of condensation to the blades 5. The water delivered to the blades by the distributer 15 is discharged through a combining tube 17 and a diffuser tube 18. The diffuser 18 is divided into two portions, the main diffuser tube and a priming tube 19 around the delivery end of which priming liquid may be delivered from a port 20 and a communicating annular chamber 21 to start the apparatus into operation.

In Fig. 4 I have illustrated one embodiment of my invention in connection with a surface condenser 27. The port 9 of the combining tube, communicates with the air discharge ports of the condenser through piping 28, and the auxiliary distributer 14 communicates with the condensing water discharge port of the condenser through the piping 29.

In carrying out each of the methods disclosed the apparatus should be so arranged, relative to the condenser, that the water of condensation will flow of its own accord, that is, by gravity to the discharging apparatus.

The present invention can be employed to advantage in installations on ship-board, where it is desirable to retain the water of condensation and all of the condensable vapors. It is commonly known that any dry vacuum pump, operating in connection with a surface condenser, draws in and discharges air saturated with vapor and that this results in a loss of water. This disadvantage may be avoided by employing the water of condensation as the operating or ejecting liquid of the air pump. In accomplishing this, I provide a tank 22 as shown in Fig. 3, to which the water of condensation is delivered. The air pump 23 draws in its operating water from the tank 22 through the piping 24 and returns it again to the tank through the diffuser tube 25.

Any of the apparatus for discharging the water of condensation from the condenser may be employed in connection with the tank 22. The water of condensation together with the operating water will of course be discharged into the tank 22 either through the diffuser 25 or through the diffuser 25 and a supplemental diffuser. The feed pumps will draw water from the tank for the boilers and consequently the water level in the tank will remain approximately constant. The water in the tank may be cooled the desired amount by means of coils through which cooling liquid circulates.

The third and fourth methods described are preferred and the apparatus disclosed in connection with them is the preferred apparatus. In each of these methods the efficiency of the pump is increased for the reason that little or no more power is required to discharge the water of condensation and the pump does the double duty of withdrawing the air from the condenser and discharging the water of condensation. The water of condensation, whether delivered through the diffuser 14 of Fig. 4 or the diffuser 15 of Fig. 2, assists in withdrawing air from the condenser.

In Fig. 4 a pipe 40 is shown which leads water from any suitable source of water supply to the interior of the water distributer to the distributing chamber within the row of blades.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention together with the apparatus which I consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means.

What I claim is:—

1. In combination with a condenser, a combining tube communicating therewith, a diffuser communicating with said tube, a bladed impeller for discharging ejecting liquid through said tube and said diffuser, a distributer for delivering ejecting liquid to said impeller and a distributer for delivering the water of condensation from said condenser to the blades of said impeller whereby it is discharged from said condenser.

2. In combination with a condenser, a combining tube communicating therewith, a diffuser communicating with said combining tube, a bladed impeller for discharging ejecting liquid through said tube and said diffuser, a distributer for delivering ejecting liquid to said impeller, a supplemental distributer communicating with said condenser

for delivering the water of condensation therefrom to the blades of said impeller, and a combining tube for receiving the water of condensation discharged from the impeller.

3. In combination with a condenser, a combining tube communicating therewith, a bladed impeller for discharging ejecting liquid through said combining tube, a distributer for delivering ejecting liquid to the blades of said impeller, a supplemental distributer communicating with said condenser for delivering water of condensation therefrom to the blades of said impeller and a combining tube and diffuser for receiving the water of condensation discharged from said impeller.

In testimony whereof, I have hereunto subscribed my name this 7th day of August, 1909.

OTTO C. BUSS.

Witnesses:
JNO. S. GREEN,
H. WINDT.