M. LEBLANC.

CONDENSER.

APPLICATION FILED SEPT. 27, 1910.

**984,435.** Patented Feb. 14, 1911.

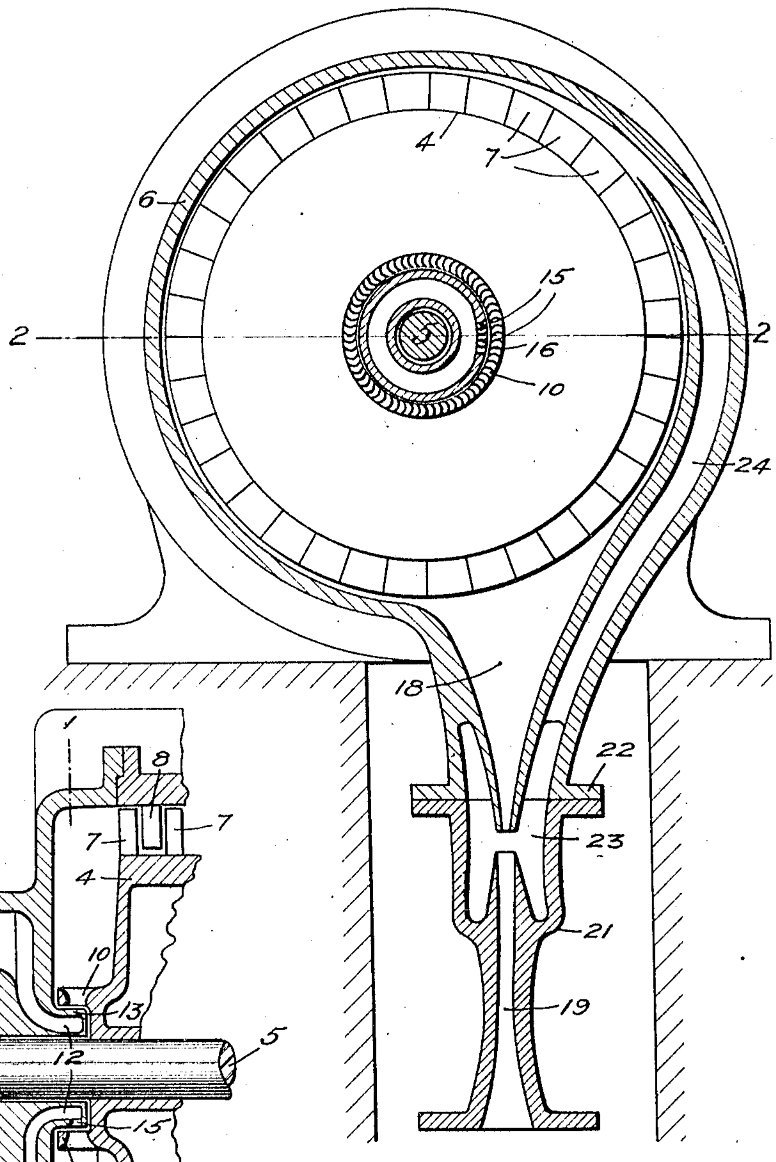


Fig. 1.

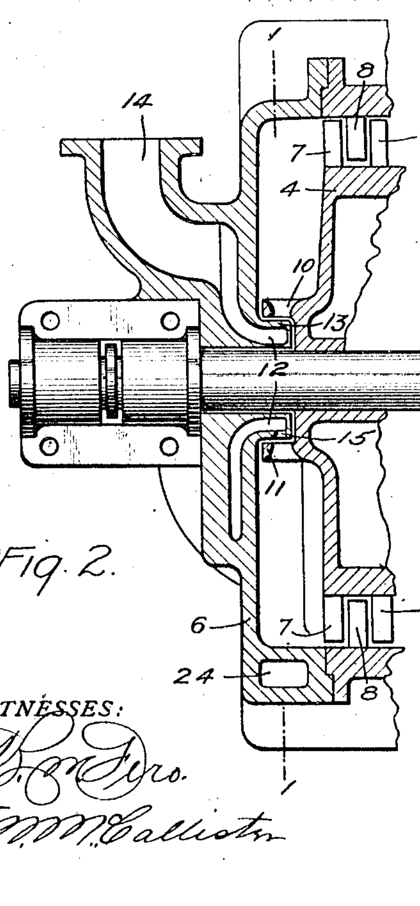


Fig. 2.

WITNESSES:

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# UNITED STATES PATENT OFFICE.

MAURICE LEBLANC, OF PARIS, FRANCE, ASSIGNOR TO SOCIÉTÉ ANONYME POUR L'EXPLOITATION DES PROCEDES WESTINGHOUSE-LEBLANC, OF PARIS, FRANCE.

## CONDENSER.

984,435. Specification of Letters Patent. Patented Feb. 14, 1911.

Original application filed March 22, 1905, Serial No. 251,392. Divided and this application filed September 27, 1910. Serial No. 583,992.

*To all whom it may concern:*

Be it known that I, MAURICE LEBLANC, a citizen of the Republic of France, residing at Villa Montmorency, Auteuil, Paris, France, have made a new and useful Invention in Condensers, of which the following is a specification, this application being a division of an application filed by me on March 22, 1905, serially numbered 251,392.

This invention relates to fluid translating devices; that is to devices for translating or moving fluid from one point to another.

An object of my invention is to produce a fluid translating device for mechanically forming a stream or jet of fluid of high velocity and for employing the stream or jet so formed in removing or translating the condensable as well as non-condensable fluids or gases.

A further and more specific object of my invention is to produce a translating device adapted to be located within the casing of a fluid impelled turbine, and to be operated by the turbine shaft and which is capable of removing the condensable and non-condensable gases and fluid from the turbine casing.

These and other objects I attain by means of a device embodying the features herein described and illustrated in the drawings accompanying this application and forming a part thereof.

In the drawings Figure 1 is a transverse section along the line 1—1 of Fig. 2 of an elastic fluid turbine equipped with an embodiment of my invention. Fig. 2 is a fragmental section, along the line 2—2 of Fig. 1, and discloses the exhaust end of a turbine in connection with the embodiment of my invention, illustrated in Fig. 1.

Referring to the drawings: A turbine rotor element 4 is mounted on a shaft 5 and is inclosed within a turbine casing 6. Annular rows of moving blades 7 are mounted on the element 4 and are alternately arranged with annular rows of stationary blades 8 mounted on the casing 6.

Ordinarily the motive fluid discharged from the final row of working blades of a turbine is received by an exhaust passage, formed in the turbine casing, and of adequate area to conduct the low pressure fluid to a condenser.

In carrying out my invention, I locate the condensing apparatus within the casing at the exhaust end of the turbine and discharge the condensable as well as the non-condensable fluids and gases from the turbine casing with the condensing liquid and the liquid of condensation. I accomplish this by providing a rotatable bladed impeller in the exhaust end of the turbine and by providing passages for delivering condensing liquid, hereinafter called water for convenience of description, to the impeller, a collecting or combining tube for collecting the water projected by the impeller, and a transformer tube or spout for receiving fluid delivered from the collecting tube and for transforming velocity energy into pressure energy.

In the illustrated embodiment of my invention, I provide an impeller, integrally formed with the rotor element 4, and provided with an annular row of radial blades 10. By radial blades I mean blades which extend axially of their mounting element and between which, the working passages extend in substantial radial directions. The blades 10 are provided with a shroud 11 which is so formed that it coöperates with a specially formed mounting element of the blades to form divergent passages between the blades. An annular chamber 12 is formed within a reëntrant annular flange 13 of the end wall of the turbine casing, which flange surrounds the shaft 5 and projects into the space surrounded by the row of blades 10. The chamber 12 communicates with any suitable source of water supply through a flanged passage 14 formed integrally with the end wall of the turbine casing. A water discharge port or outlet 15 is formed in the walls of the chamber 12 and is provided with directing or partition vanes 16 which extend in substantial radial direction with reference to the annular row of blades 10.

The outlet 15 is so constructed that it delivers water around a portion only of the circumference of the annular row of blades; or in other words, it simultaneously delivers water to less than the total number of blades 10. The blades 10 are so constructed that each blade delivers or projects a thin film or leaf of water. The outlet 15 is so located and the partition vanes 16 so constructed relative to the blades 10, and the blades 10 are so formed that these leaves or films of water are projected in a straight line in the direction of the axis of a collecting or combining tube 18. The divergency of the passages between the separate blades 10 causes the projected leaves of water to assume a fan like formation.

The collecting or combining tube illustrated, is integrally formed with the turbine casing 6 and consists of a convergent passage formed wholly beyond, or as illustrated, below the working blades 7 of the turbine. This passage is so constructed that it will receive and compress the stream of water projected by the impeller and reduce its cross sectional area without increasing the pressure. The stream of water thus collected and compressed is discharged from the combining tube 18, by virtue of the velocity imparted to it by the impeller blades, and is delivered to a diffuser spout 19 in which the velocity energy is converted into pressure energy.

The diffuser spout illustrated, is formed in a separate casting 21 which is suitably flanged and is secured in any suitable manner to a flange 22 integrally formed with the turbine casing and surrounding the delivery end of the combining tube 18. The diffuser 19 is divergent in form and is axially alined with the combining tube 18. A pressure equalizing chamber 23, partially formed in the casing 20 and partially formed in the walls of the combining tube 18, surrounds the delivery end of the combining tube and the admission end of the diffuser spout 19. A pressure equalizing passage 24 is formed in the metal of the casing 6 of the turbine and connects the chamber 23 with the interior of the turbine casing at a point adjacent to the final row of blades 7 so that the chamber 23 is maintained at the same pressure as the pressure existing in the exhaust end of the turbine casing.

The operation of the apparatus is as follows: Water is delivered to the chamber 12 so that a continuous stream is delivered through the outlet 15. This stream of water is broken up by the rotating blades 10 of the impeller into a stream which consists of a succession of fan like leaves projected at a high velocity through a portion of the exhaust end of the turbine and through the combining tube 18. The fluid, hereinafter called steam, exhausted from the working blades of the turbine is exposed to the stream of water projected by the impeller and is condensed or carried by it into the combining tube 18. It will be apparent that the separate leaves of water discharged from the impeller are in effect water pistons and that the uncondensed steam and the non-condensable fluids such as air, are carried between the leaves from the exhaust end of the turbine casing into the combining tube. In passing through the combining tube, the convergent walls of the tube gradually compress the leaves so that they, with the water resulting from the condensation of the steam, the uncondensed steam and the non-condensable gases are discharged through the chamber 23 into the diffuser spout 19. The velocity imparted to the water by the impeller and imparted by the water to the condensable and non-condensable gases is converted into pressure in the diffuser spout 19 and the water and the non-condensable gases are delivered or discharged from the delivery end of the tube. With such a construction, the steam discharged from the turbine blades is condensed by the water, and it, with the non-condensable gases is discharged from the turbine casing and a high vacuum is maintained in the exhaust end of the casing.

What I claim is:

1. In combination with a turbine, a rotatable impeller driven by the shaft of the turbine and located in the exhaust end of the turbine casing, a passage for delivering liquid to said impeller, and a converging passage for receiving the liquid discharged from the impeller.

2. In combination with a chamber located in the exhaust end of a turbine casing, a rotatable bladed impeller driven by the turbine shaft and located in said chamber, means for simultaneously delivering liquid to a portion only of the blades of said impeller, and a passage for receiving the liquid discharged from said impeller and communicating with said chamber.

3. In combination with a chamber located in the exhaust end of a turbine casing, a rotatable bladed impeller driven by the turbine shaft and located in said chamber, means for delivering liquid to the blades of said impeller, a converging passage for receiving the liquid discharged from said impeller, a pressure equalizing passage communicating with the outlet end of said converging passage and with said chamber and a diverging passage communicating with said converging passage.

4. In combination with a chamber located in the exhaust end of a turbine casing, a partial efflux impeller located in the chamber and driven by the turbine shaft, means for delivering liquid to said impeller, a converging passage for receiving the liquid discharged from said impeller and communicating with said chamber and a divergent spout communicating with said passage.

5. In combination with a chamber located in the exhaust end of a turbine casing, a partial efflux impeller located in said chamber and driven by the turbine shaft, means for delivering liquid to the impeller, a con-

verging passage for receiving the liquid discharged by said impeller and communicating with said chamber a diverging passage communicating with said passage, a pressure equalizing chamber located between said passage and said spout, and a pressure equalizing passage connecting said equalizing chamber with said first mentioned chamber.

6. In combination with a chamber located in the exhaust end of a turbine casing, a partial efflux rotatable impeller located in said chamber, means for delivering condensing liquid to said impeller, a converging passage for receiving the fluid discharged from said impeller and communicating with said chamber, a diverging passage communicating with said converging passage, and a pressure equalizing passage located between said passages.

7. In combination with a chamber located in the exhaust end of a turbine casing, a partial efflux rotatable impeller located in said chamber, means for delivering condensing liquid to said impeller, and means for delivering the liquid discharged by said impeller from said chamber.

In testimony whereof, I have hereunto subscribed my name this 13th day of September, 1910.

MAURICE LEBLANC.

Witnesses:
DEAN B. MASON,
P. LEBLANC.