M. LEBLANC.

CONDENSER.

APPLICATION FILED NOV. 23, 1905.

953,475.

Patented Mar. 29, 1910.

2 SHEETS—SHEET 1.

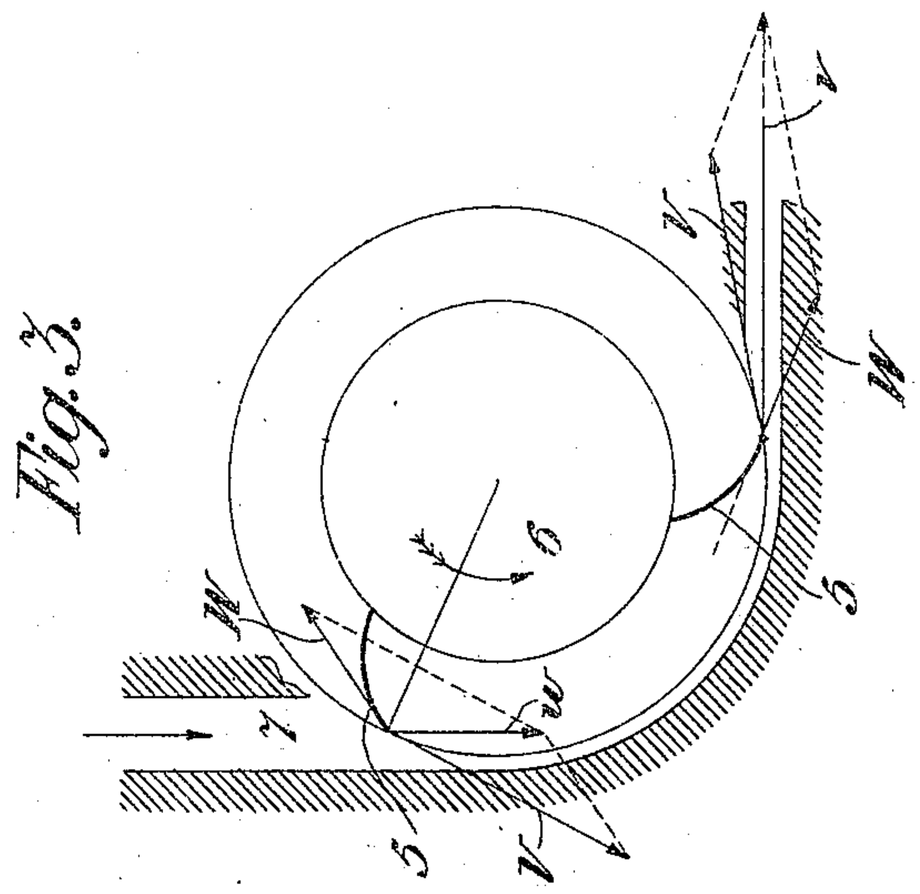

Fig. 3.

Fig. 1.

WITNESSES:

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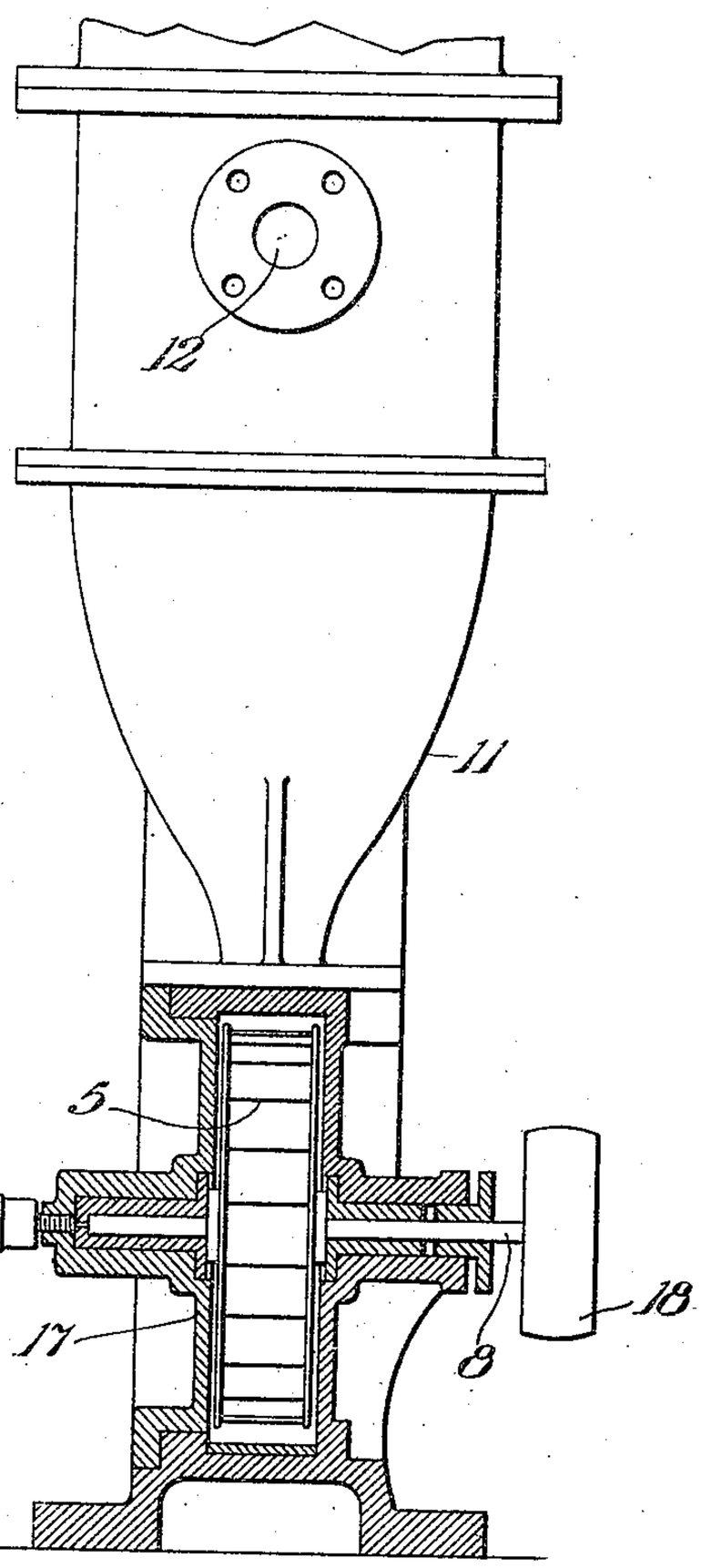

Fig. 2.

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

CONDENSER.

953,475. Specification of Letters Patent. **Patented Mar. 29, 1910.**

Application filed November 23, 1905. Serial No. 288,701.

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 invented a new and useful Improvement in Condensers, of which the following is a specification.

This invention relates to condensers, and more particularly to the type known as jet condensers.

The object of this invention is to produce a simple apparatus of the class above mentioned which is extremely efficient and adapted to a wide range of application.

A further object has been to produce a rotary jet condenser in which simple mechanical means are utilized for breaking up the flow of condensing liquid and causing it to be ejected from the condenser at a high velocity so that it will condense and carry away the vapor or gas to which it is exposed and thereby create and maintain a desired vacuum. This and other objects I attain in a condenser embodying in its make up the elements herein described and illustrated in the accompanying drawings, throughout the several views of which like parts are designated by corresponding characters.

Figure 1 is a vertical section of a condenser embodying this invention. In Fig. 2 the condenser is shown partially in elevation and partially in section for convenience of description. Fig. 3 is a diagrammatic representation of a reversely rotated water turbine embodying a detail of this invention.

The essential features of this invention are a condensing chamber communicating with the exhaust fluid passages of an engine or with other sources of vapor to be condensed, to which the condensing liquid is admitted through a rotating nozzle which is adapted to break up the flow of liquid into a mass of separate drops; a reversely rotated water turbine arranged to receive the condensing liquid issuing from the condensing chamber and discharge it at a high velocity into the exterior passages of the condenser or into the atmosphere and thereby create and maintain a vacuum within the condenser, as will be more fully described hereinafter.

Referring to Fig. 3, the water leaving the condensing chamber enters the blades 5 of a turbine wheel 6 through a passage 7 with an absolute velocity w. The turbine wheel 5 is rotated by some mechanical means in the direction of the feathered arrows so that the blades 5 have a peripheral velocity V. The water entering the turbine is acted on by the blades and the absolute velocity w of the water combines with the peripheral velocity V of the blades to form a velocity W relative to the blades. The relative velocity W is overcome by the centrifugal force occasioned by the rotation of the turbine and the water is then projected radially by this centrifugal force and tends to leave the wheel with a velocity approximately equal to and of opposite sign from the velocity W. This velocity combines with the peripheral velocity V of the blades and forms an absolute velocity v, superior to the velocity w of the water at its entrance to the wheel. The blades 6, as in all analogous cases, are so arranged that the water is received and discharged by them with as little shock as possible. During the action of the blades on the water, the turbine wheel turns through an angle, which may easily be determined, and which, by experiment, has been found to be approximately 100°. This angle varies of course for different velocities of the turbine and of the entering water.

Referring to Fig. 1: The vapor to be condensed enters a condensing chamber 9, through an inlet opening 10. The walls of the condensing chamber 9 gradually converge, forming a passage or combining tube 7. Condensing liquid is introduced into the chamber 9 through a supply pipe 12 and is discharged into a rotary distributer 13 mounted on brackets 14 which are supported by walls 11. The distributer 13 consists of two or more branch pipes 15 connected to a main pipe 16 and is adapted to be rotated by the water passing through it so that the issuing jets of water flow successively through all parts of the lower portion of the chamber 9. The combining tube 7 connects with a collecting or pump chamber 19 in which the reversely rotated water turbine 6 is located. The portion referred to as the reversely rotated turbine is in reality a pump impeller and will be so termed throughout the following description. The impeller 6 is mounted on the shaft 8 which is suitably journaled in the frame portion 17 of the

condenser and is provided with an operating pulley 18. The condensing liquid, discharged from the combining tube 7, is received by the blades 5 of the impeller and discharged from the chamber 19 through a converging nozzle 21. The nozzle 21 connects with a diffuser spout 23, to which is connected the exterior passage 24 of the condenser. The pump chamber 19 besides being connected to chamber 9 by the passage 7 is also connected to said chamber 9 by means of a passage 20 which enters said chamber above the distributer 13. The converging nozzle 21 is provided with a lateral opening 22 which connects with the chamber 19. A chamber 25 surrounds the converging nozzle 21 and is provided with a steam inlet passage 26 and an outlet passage 27 connecting with the diffuser spout 23.

In starting the condenser, the impeller 6 is driven at a high speed and live steam is introduced into the chamber 25 through the passage 26. The steam in discharging through the passage 27 and the diffuser spout 23 into the atmosphere acts as an ejector and the air or other non-condensable fluid contained within the condensing chamber is drawn through the passage 20 and opening 22 in the discharge nozzle 21 and carried by means of the stream passing through the discharge nozzle through the diffuser and away from the apparatus. By this means the air in the steam entering the condenser, as well as the air liberated from the condensing water, is removed from the apparatus. By creating a partial vacuum in the condenser, the condensing liquid is caused to enter the chamber 9 through the supply pipe 12 with a velocity corresponding to the difference in the pressure between the condensing chamber and the atmosphere. After a desired entrance velocity of the condensing liquid has been attained, the steam supplied to the chamber 25 is shut off, since the water in passing through and out of the condensing apparatus will maintain the vacuum. The condensing water issuing from the supply pipe 12 enters and rotates the distributer 13 from which it is discharged in a shower of spray into the chamber 9. The shower of condensing water, in passing through and out of the condensing chamber, condenses and carries with it the vapor, air or other gas to which it is exposed. The converging walls of the combining tube 7 collect the spray and form it into a stream which is discharged onto the rotating blades of the impeller. The condensing water discharged from the impeller 6, because of its high velocity, passes through the nozzle 21 and the diffuser spout 23 into the atmosphere or exterior passages of the condenser. The water or condensing liquid in passing through the condensing apparatus, because of its condensing action and its high velocity, creates and maintains a vacuum.

With the construction illustrated, the passage 7, the converging nozzle, and the diffuser spout may be of elongated cross section, the largest cross-sectional diameter being parallel to the impeller and therefore a condenser of larger capacity can be obtained without increasing the diameter of the reversely rotated turbine.

Having now described my invention, what I claim as new and useful and desire to secure by Letters Patent is:

1. A fluid ejecting device, comprising a fluid chamber, a liquid supply pipe, provided with a rotatable diffuser, communicating therewith, a pump chamber, a bladed impeller, a converging passage communicating with said fluid chamber and delivering fluid tangentially to said impeller, a diffuser spout, a discharge nozzle receiving fluid from said impeller and communicating with said diffuser spout and a passage connecting said pump chamber to said fluid chamber.

2. In a fluid ejecting device comprising a fluid chamber, a liquid supply pipe communicating therewith, a pump chamber, a bladed impeller operating therein, a passage communicating with said fluid chamber and delivering fluid tangentially to the external periphery of said impeller, a diffuser spout and a discharging nozzle receiving fluid from said pump chamber and communicating with said diffuser spout.

3. A fluid ejecting device comprising a fluid chamber, a liquid supply pipe communicating therewith, a pump chamber, a bladed impeller operating in said pump chamber, a converging passage communicating with said fluid chamber and arranged to discharge liquid therefrom tangentially onto said impeller and a pressure equalizing passage communicating with said pump chamber and said fluid chamber.

4. A fluid ejecting device comprising a pump chamber, a bladed impeller operating therein, a converging passage communicating with said pump chamber and disposed tangentially with reference to said impeller, a diffuser spout for receiving fluid discharged from said impeller, and a discharge nozzle communicating with said spout and axially alined therewith, said diffuser spout and said discharge nozzle extending at right angles to said converging passage and being located tangentially with respect to said impeller.

5. A fluid ejecting device comprising a pump chamber, a bladed impeller operating therein, a converging passage communicating with said pump chamber and disposed tangentially with reference to said impeller, a convergent diffuser spout communicating with said pump chamber and adapted to receive fluid discharged from said impeller,

and a divergent discharge nozzle communicating with said diffuser and located between it and said impeller, said diffuser spout extending at right angles to said converging passage and being located tangentially with reference to said impeller.

6. A fluid ejecting device comprising a pump chamber, a bladed impeller operating therein, a converging passage communicating with said pump chamber and disposed tangentially with reference to said impeller, a diffuser spout adapted to receive fluid discharged from said impeller, a discharge nozzle located between said spout and said impeller axially alined with said spout and extending at right angles to said converging passage, and an equalizing passage between said pump chamber and said converging passage.

7. A fluid ejecting device comprising a converging passage, a liquid supply pipe provided with a rotatable distributer communicating therewith, a pump chamber, a bladed impeller operating therein and arranged to receive fluid tangentially from said converging passage, a diffuser spout, a discharge nozzle communicating with said pump chamber and said diffuser spout and a pressure equalizing passage communicating with said converging passage and said pump chamber.

8. A fluid ejecting device comprising a fluid chamber, a liquid supply pipe communicating therewith provided with a rotatable distributer, a pump chamber provided with a bladed impeller, a converging passage communicating with said pump chamber and said fluid passage and adapted to discharge fluid tangentially onto said bladed impeller, a converging and diverging discharge passage communicating with said pump chamber and a pressure equalizing passage between said pump chamber and said fluid chamber.

9. A fluid ejecting device comprising a fluid chamber, a liquid supply pipe communicating therewith, a pump chamber, a bladed impeller in said chamber, a passage communicating with said fluid chamber and delivering fluid to said impeller, a diffuser spout, a discharge nozzle communicating with said pump chamber and said diffuser spout and receiving liquid from said impeller, an opening in said discharge nozzle communicating with said pump chamber and communicating with said pump chamber and with said fluid chamber.

10. A fluid ejecting device comprising a fluid chamber, a liquid supply pipe communicating therewith and provided with a rotatable distributer, a pump chamber, a bladed impeller operating therein, a converging passage communicating with said fluid chamber arranged to discharge fluid tangentially onto said impeller, a diffuser spout, a converging nozzle communicating with said pump chamber and said diffuser spout and a lateral opening in said converging nozzle communicating with said pump chamber.

11. A fluid ejecting device comprising a fluid chamber, a supply pipe, provided with a rotatable distributer, communicating therewith, a pump chamber, a bladed impeller operating therein, a converging passage communicating with said pump chamber and said fluid chamber and disposed tangentially with reference to said impeller, a diffuser spout, a discharge nozzle receiving fluid discharged from said impeller and communicating with said diffuser spout, a lateral opening in said nozzle communicating with said pump chamber, a pressure utilizing passage between said pump chamber and said fluid chamber, a steam chamber communicating with a source of steam supply surrounding said nozzle and passages communicating therewith and with said diffuser spout.

12. A fluid ejecting device comprising a fluid chamber, a pump chamber, a bladed impeller operating in said pump chamber, a passage communicating with said pump chamber and said fluid chamber, a diffuser spout, a discharge nozzle communicating with said pump chamber and said diffuser spout, a chamber communicating with a source of steam supply and passages communicating therewith and with said diffuser spout.

13. A fluid ejecting device comprising a fluid chamber, a pump chamber, a bladed impeller operating in said pump chamber, a passage communicating with said pump chamber and said fluid chamber, a diffuser spout, a discharge nozzle communicating with said pump chamber and said diffuser spout, a chamber communicating with a source of steam supply and surrounding said nozzles and passages communicating therewith and with a diffuser spout.

14. In combination in a fluid ejecting device, a rotatable impeller, means for delivering a liquid stream tangentially to the external periphery of said impeller and means receiving the liquid discharged by said impeller and formed so as to transform fluid velocity into pressure.

15. In a fluid ejecting device, in combination with a chamber from which the fluid is to be ejected, a rotatable impeller, means communicating with said chamber for delivering a liquid stream tangentially to the external periphery of said impeller and means for collecting the liquid stream discharged by said impeller and for delivering it from said device.

16. In combination in a fluid ejecting device, a chamber, a rotatable impeller, a passage disposed so as to discharge liquid tan-

gentially to the external periphery of said impeller, a nozzle device for receiving the liquid discharged by said impeller and a passage disposed so as to place said nozzle device in communication with said chamber.

17. In a condensing apparatus, a condensing chamber provided with converging walls terminating in an outlet, means for supplying condensing liquid to said chamber, a rotatable impeller arranged so as to receive the liquid discharged through said outlet, a diffuser, a passage or chamber for collecting the liquid discharged from said impeller and delivering it to said diffuser, and means arranged so that the non-condensable vapors in said condensing chamber are removed therefrom at a point above the inlet of the condensing liquid.

18. In a condensing apparatus, a condensing chamber provided with converging walls terminating in an outlet, means for supplying condensing liquid to said chamber, a rotatable impeller arranged so as to receive the liquid discharged through said outlet and adapted to directly impart thereto a relatively high velocity, a combining or collecting chamber receiving the liquid discharged from said impeller, a diffuser communicating with the outlet of said combining chamber, and means utilizing the velocity imparted to said liquid by said impeller for removing the non-condensable vapors from said condensing chamber at a point above the inlet of the condensing liquid.

In testimony whereof I have hereunto subscribed my name this sixth day of November, 1905.

MAURICE LEBLANC.

Witnesses:

PIERRE LAVAUR,

HANSON C. COXE.