

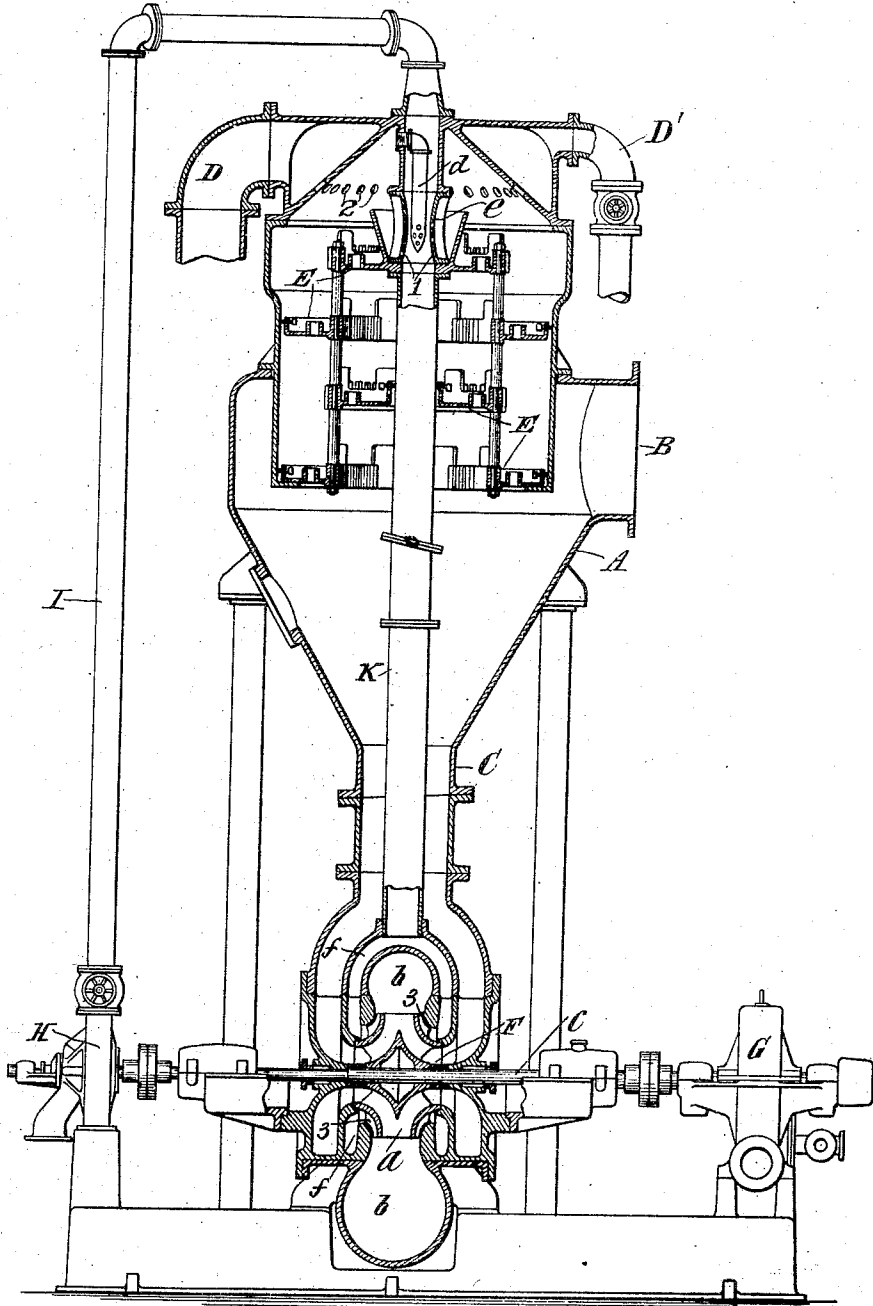
G. DE LAVAL.

JET CONDENSER.

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1,044,504.

Patented Nov. 19, 1912.



Witnesses:
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UNITED STATES PATENT OFFICE.

GEORGE DE LAVAL, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO HENRY R. WORTHINGTON, A CORPORATION OF NEW JERSEY.

JET-CONDENSER.

1,044,504.

Specification of Letters Patent.

Patented Nov. 19, 1912.

Application filed September 17, 1910. Serial No. 582,431.

To all whom it may concern:

Be it known that I, GEORGE DE LAVAL, a citizen of the United States, residing at East Orange, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Jet-Condensers, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates particularly to jet condensers of that class employing a centrifugal discharge pump and sometimes known as centrifugal condensers, although the broader features of the invention may be applied with discharge pumps of other forms, the object of the invention being to provide simple and efficient means for removing the air and uncondensed vapor from the condenser.

In the accompanying drawings forming a part of this specification, the invention is illustrated as applied in its preferred form, in connection with a counter-current condenser, and this condenser will now be described in detail and the features forming the invention then particularly pointed out in the claims.

In the drawing, which is a vertical central elevation of the condenser, there is shown a counter-current condenser of the general type of United States Letters Patent No. 899,063, in which A is the condenser shell, B the exhaust steam inlet, C the discharge outlet or tail pipe, D the injection or condensing water inlet, and E a series of inner and outer water spray forming trays through which the water passes downward from the inlet D to the tail pipe C at the bottom of the condenser and through which sprays the steam passes upward for condensation. The tail pipe C terminates in the suction of the centrifugal discharge pump F, having the impeller *a* and delivery chamber *b* and preferably being direct driven by a small steam turbine G on the impeller shaft *c*. The injection water is, drawn in through pipe D by the condenser vacuum, and a force injection pipe D' is shown for use in starting the condenser, or when otherwise required.

Referring now to the means for removing from the condenser the air and uncondensed vapor, H is a small pump, preferably a centrifugal pump with its impeller driven from the shaft *c*, as shown, which delivers water

through a pipe I extending to and entering the top of the condenser, where it connects with a pipe K extending downward centrally through the condenser. This pipe K has a contracted portion *e* which forms a water ejector, and is provided with openings 1 through which the air and uncondensed vapor is drawn into the pipe K from the upper part of the condenser and carried by the water from pipe I downward through pipe K. Within the ejector *e* is shown and preferably used a small pipe *d* perforated within the ejector and communicating at its upper end with the space above the injection water openings 2, so that the ejector *e* through this pipe *d* will draw off any air collecting above the injection water inlet.

The pipe K in the preferred construction shown delivers to the centrifugal pump F, so that the discharge water from the tail pipe C and the water from air pipe K are delivered by a single pump. In the construction shown, the pipe K communicates with a chamber *f* surrounding impeller *a* and the impeller is provided with outside vanes 3 which discharge the water and air from pipe K and chamber *f* into the discharge chamber *b* with the discharge water from tail pipe C.

It will be understood that the invention is applicable to injector or jet condensers generally, including parallel flow condensers as well as counter-current condensers, and that various modifications may be made in carrying out the invention.

What I claim is:—

1. The combination with a jet condenser and its condensing water supply and discharge pipe, of an ejector within the condenser for drawing off air and uncondensed vapor, and an ejector discharge pipe separate from the condenser discharge.

2. The combination with a jet condenser and its condensing water supply and discharge pipe, of a liquid ejector in the upper part of the condenser for drawing off air and uncondensed vapor, and a discharge pipe through which the ejector delivers extending downward through the condenser and closed to the condensing chamber.

3. The combination with a jet condenser, its condensing water supply, discharge pipe and discharge pump, of a liquid ejector within the condenser for drawing off air and uncondensed vapor, and a discharge pipe

separate from the condenser discharge pipe through which the ejector delivers to the condenser discharge pump.

4. The combination with a jet condenser, its condensing water supply, discharge pipe and centrifugal discharge pump, of a liquid ejector within the condenser for drawing off air and uncondensed vapor, and a discharge pipe separate from and arranged within the condenser discharge pipe through which the ejector delivers to the condenser discharge pump.

5. The combination with a jet condenser, its condensing water supply, discharge pipe and centrifugal discharge pump, of a liquid ejector within the condenser for drawing off air and uncondensed vapor, a discharge pipe separate from and arranged within the condenser discharge pipe through which the ejector delivers to the condenser discharge pump, and a centrifugal pump supplying water to said ejector.

6. The combination with a jet condenser, of water ejector *e*, a water supply for said ejector, ejector discharge pipe *K*, and centri-

ugal condenser discharge pump *F* having separate inlets and impelling vanes for the discharge from pipe *K* and the condenser.

7. The combination with a jet condenser, its condensing water supply, discharge pipe and discharge pump, of a liquid ejector within the condenser for drawing off air and uncondensed vapor, and a discharge pipe separate from the condenser discharge pipe through which the ejector delivers.

8. The combination with a jet condenser and its condensing water supply and discharge means, of a liquid ejector within the condenser for drawing off air and uncondensed vapor, and a pump and connections independent of said condensing water supply and discharge for supplying water to said ejector.

In testimony whereof I have hereunto set my hand, in the presence of two subscribing witnesses.

GEORGE DE LAVAL.

Witnesses:

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JAMES E. CALLAHAN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."