G. HUGUENIN.

CONDENSING APPARATUS FOR STEAM TURBINES.

APPLICATION FILED JULY 22, 1908.

Patented Dec. 8, 1908.

906,232.

Fig. 1

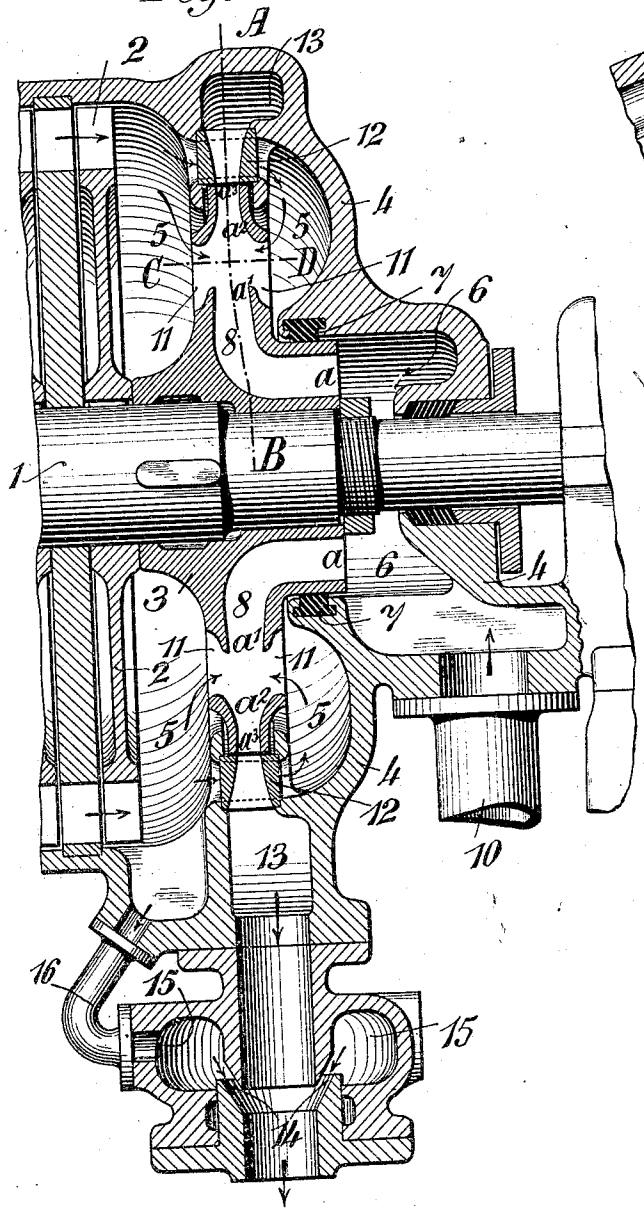



Fig. 2

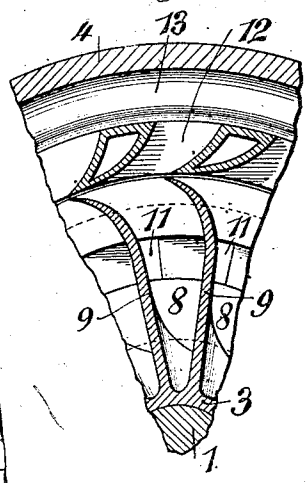
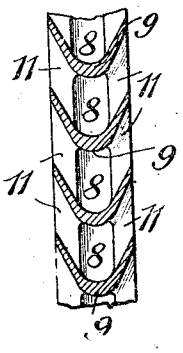



Fig. 3




Witnesses:

Jesse N. Sutton.

B. B. Sommers

Inventor

Gustav Huguenin

by Henry Orth & Co.

# UNITED STATES PATENT OFFICE.

GUSTAV HUGUENIN, OF ZURICH, SWITZERLAND.

## CONDENSING APPARATUS FOR STEAM-TURBINES.

No. 906,232. Specification of Letters Patent. Patented Dec. 8, 1908.

Application filed July 22, 1908. Serial No. 444,815.

*To all whom it may concern:*

Be it known that I, GUSTAV HUGUENIN, a citizen of the Republic of Switzerland, residing at Zurich, Switzerland, have invented certain new and useful Improvements in Condensing Apparatus for Steam-Turbines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

The object of the invention is to provide an improved condensing-apparatus for steam turbines. In said apparatus the discharge chamber of a rotary injector-condenser is connected to an ejector-condenser, the suction-chamber of which latter is connected separately to the exhaust chamber of the turbine so as to make use of the energy spent to accelerate the condensing water in said rotary condenser for the purpose of increasing the vacuum in the exhaust-chamber of the turbine.

In the accompanying drawings one form of apparatus embodying the invention is shown as an example.

Figure 1 is a vertical section of the apparatus. Fig. 2 is a cross-section at A—B. Fig. 3 is a cross-section at C—D.

1 designates the shaft of a steam turbine and 2 the last revolving wheel. A rotatable body 3 forming the rotary injector-condenser is mounted on the shaft at the end of the turbine which is closed by a casing 4 in which is formed an exhaust chamber 5 and a water chamber 6 separated by a packing ring 7 to prevent leakage. The rotatable body 3 has channels 8 formed by the blades 9, changing from an axial to a radial direction (see Figs. 2 and 3). The axial parts of channels 8 open into chamber 6, which has an inlet-tube 10 for the cooling-water, and openings 11 at both sides of the body 3 connect channels 8 with chamber 5. Around the body 3, opposite channels 8, a ringshaped diffuser 12 is arranged, which opens into an annular discharge-chamber 13, which is connected to an ejector-condenser 14, the suction-chamber 15 of which connects again through pipes 16 with exhaust chamber 5 of the turbine.

The operation is as follows: The rotatable body 3 acts in its innermost part $a$—$a^1$ as an ordinary centrifugal pump, which sucks water through pipe 10 and chamber 6 and accelerates it to a certain speed. From $a^1$ to $a^2$ steam is sucked from chamber 5 in through the openings 11 from both sides and the steam is mixed with the cooling water and condensed. From $a^2$ to $a^3$ condensed steam and water are forwarded together into diffuser 12 where the kinetic energy is changed in pressure so as to allow discharge into the atmosphere. Because of the considerable velocity of the water and the resulting high pressure a great amount of energy would be wasted and to make use of part of the energy the ejector-condenser 14, 15 is connected with chamber 5 by pipes 16, one of which is shown in the drawing. In passing through the ejector-condenser, the flow of water sucks air, steam and water out of chamber 5 thereby increasing the vacuum.

The rotary-condenser as described is a rotating injector-condenser (jet-condenser) which mixes the steam and water in the rotating body, thereby condensing the steam, and forwards them together.

I claim:

1. A condensing apparatus for steam turbines, comprising an exhaust chamber, a discharge chamber, a rotary injector-condenser through which said chambers communicate, and an ejector-condenser communicating with the exhaust and discharge chambers.

2. In a condensing apparatus for steam turbines, an exhaust chamber, a hollow rotary injector-condenser rotatably mounted in the chamber, a discharge chamber communicating with the rotary-injector and an ejector-condenser communicating with the exhaust and discharge chambers.

3. In a condensing apparatus for steam turbines, an exhaust chamber for the turbine, a water-chamber, a discharge chamber, a rotary injector-condenser communicating with said chambers, and an ejector-chamber communicating with the exhaust and discharge chambers.

4. In a condensing apparatus for steam turbines, an exhaust chamber communicating with the turbine, a water-chamber, an ejector-condenser rotatably mounted in the exhaust-chamber and having radial channels communicating with the latter and axial channels communicating with the water-chamber, a discharge chamber communicating with said radial channels and an ejector-chamber communicating with the exhaust and discharge chambers.

5. In a condensing apparatus for steam turbines, an exhaust chamber communicating with the turbine, a water-chamber, an ejector-condenser rotatably mounted in the exhaust-chamber and having radial channels communicating with the exhaust chamber through lateral openings on each side of the channels and communicating with the water chamber through axial channels, a discharge chamber surrounding the ejector-condenser and communicating with said radial channels, an ejector-condenser communicating with the discharge chamber, an annular suction chamber communicating with the ejector-condenser and a conduit connecting the suction chamber and exhaust chamber.

In testimony that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

GUSTAV HUGUENIN.

Witnesses:
ERNST FISCHER,
JOSEPH SIMON.