No. 825,364. PATENTED JULY 10, 1906.

A. VOGT.

STEAM TURBINE.

APPLICATION FILED MAR. 6, 1906.

Fig. 2

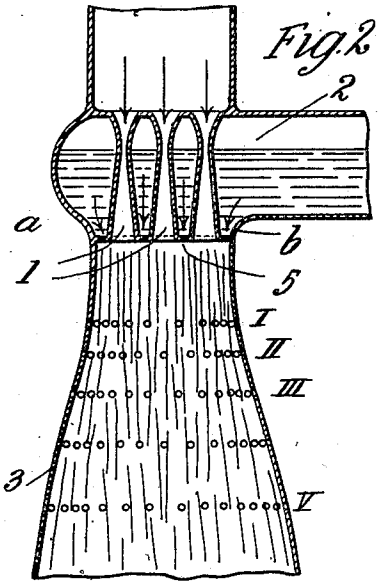


Fig. 1.

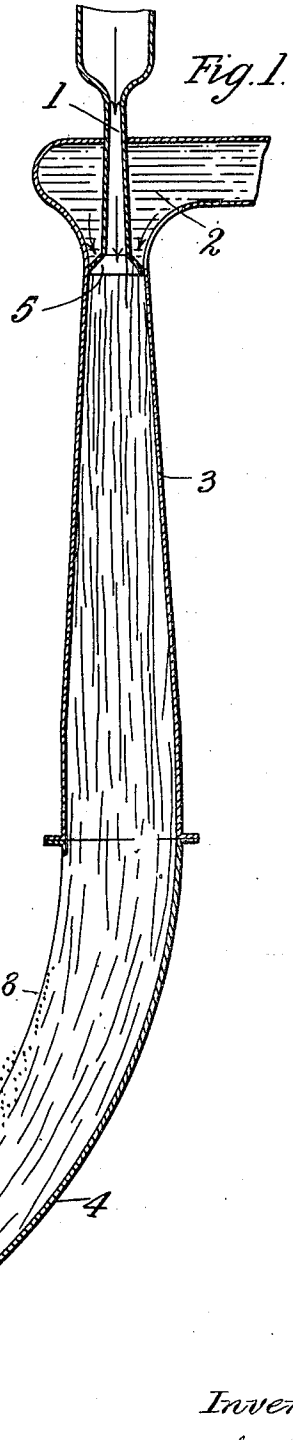
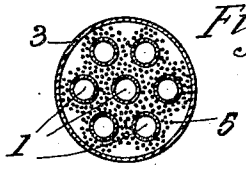


Fig. 3.



Witnesses,
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[illegible]

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UNITED STATES PATENT OFFICE.

ADOLF VOGT, OF TULSE HILL, ENGLAND.

STEAM-TURBINE.

No. 825,364. Specification of Letters Patent. Patented July 10, 1906.

Application filed March 6, 1906. Serial No. 304,512.

To all whom it may concern:

Be it known that I, ADOLF VOGT, electrician, a citizen of Austria-Hungary, residing at 149 Tulse Hill, in the county of Surrey, England, have inverted certain new and useful Improvements in Steam-Turbines, of which the following is a specification.

My invention has reference to the employment of a jet of steam or gas under pressure for driving a turbine or Pelton wheel at a low velocity by imparting the kinetic energy of such jet of small mass moving with a high velocity to a body of liquid of comparatively large mass and moving at a slow velocity, which is then made to act upon a turbine or Pelton wheel. It has already been proposed to effect such transmission of the energy of a jet of steam to a body of liquid for the above purpose by means of an ordinary injector action, in which case there is in addition to the loss of energy arising during the transmission of the steam's energy to the liquid a considerable further loss due, first, to the impact of the particles of liquid against each other owing to small vacuous spaces being formed by the condensation of globules of steam carried along thereby, and, secondly, by the conversion of the velocity of the jet of liquid into pressure in forcing it through a concentrating-nozzle for the purpose of obtaining a compact jet.

According to my present invention I avoid the greater part of such losses by doing away with the ordinary injector action in causing the jet of liquid issuing from the converting-nozzle in which it is brought in contact with the steam-jet to pass freely along a channel in such manner that the separate particles of water are not subject to any material change of velocity by impact against each other, but are allowed to flow along freely in such manner that any particles of steam or air mixed therewith can escape, so that the liquid particles in uniting closely together form a compact jet which is then made to impinge upon the blades or buckets of the turbine or Pelton wheel. For this purpose the said channel extending from the converting-nozzle to the turbine is either made open or of a large size as compared with the volume of the jet of liquid, so that room is afforded for the escape of gaseous particles, and it is also preferably made of a curved form, such that the liquid-jet passing along it will be subject to centrifugal action in a transverse direction, whereby the particles of water will be forced close together and the liberation of the gaseous particles will be facilitated, thus producing a perfectly compact jet which in issuing from a nozzle-orifice impinges upon the blades of the turbine. Any other form of conduit or channel may, however, be employed that will produce the described effect of causing the water particles to be brought close together without converting the velocity of the jet into pressure.

In the drawings, in which like parts are similarly designated, Figure 1 is a longitudinal section through one form of my device. Fig. 2 is a partial longitudinal section of a modification. Fig. 3 is a transverse section on line *a b* of Fig. 2.

1 is an expansion-nozzle through which steam or gas under pressure issues and which is surrounded by the water-supply conduit 2, both supplies being regulatable by means of valves or the like. From the concentric orifices a tube 3 of gradual increasing diameter extends downward, in which the jet of steam or gas mixes with the water, the tube being made of such a length that when arriving at the lower end the velocities of the two particles of fluid will have become practically equal. To the lower end of the tube 3 is attached a curved tube 4, which is either open, as shown at 8, or is formed with perforations on its concave side. As the mixed fluids pass along this tube the centrifugal action causes the particles of water to flow closely against the curved outer surface thereof, thus separating them from the particles of air or gas, which consequently escape through the openings or perforations, while the water forms into a compact body. By this means there is obtained at the lower end of the curved tube or trough 4, which may be formed as an exit-nozzle 7, a compact jet of water which may be made to impinge directly upon the buckets of a Pelton wheel or turbine or be otherwise utilized, so as to convert its *vis viva* into work.

In order to facilitate the mixture of the gas or steam jet with the water, there may be fitted round the issue-orifice of the former a perforated plate 5, through the perforations of which the water issues in fine jets directed toward the center.

Fig. 2 shows a part vertical section, and Fig. 3 a cross-section at *a b*, of an arrangement with several steam or gas nozzles 1 which facilitates the action of the apparatus. The seven nozzles 1 pass through a plate 5,

having a series of perforations surrounding each of the nozzles, through which perforations the water passes from the conduit 2. The action will be as follows: Assuming I II III, &c., to represent successive layers of water particles descending from the plate 5, the layer I will be struck by the steam or gas jets, which will impart a certain velocity thereto. A great portion of the jets will, however, pass by the layer I and will impinge successively upon the layers II III, &c., which were all previously in the position I, and consequently had the said velocity imparted to them, so that the successive layers of particles will successively have a continuously increasing speed imparted to them and will have their distances from each other correspondingly increased. The tapering tube 3 is, as before, made sufficiently long to enable the speeds of the water and the steam to become equalized by the time they reach the lower end. By the above-described arrangement the successive layers of water particles can never impinge upon each other, so that loss of useful effect caused by impact is avoided. The lower end of the tube 3 is, as before, attached to a curved tube with openings or of an open-trough shape in which the separate water particles unite together, and as they have all approximately the same speed there is also no loss of effect by concussive action in uniting.

The above-described construction with any desired number of steam or gas nozzles is preferably employed when dealing with large masses of water.

When applying the invention to Pelton wheels, a shield 6 is preferably provided at the discharge-nozzle tube 4 in order to prevent the jet from being disturbed by water-spray.

I claim—

1. The combination with a jet-nozzle for vapor or gas, of a combining-tube expanding from the jet-nozzle wherein the gas or vapor is combined with the water and means in the path of flow to compact the combined jet and free gaseous components, substantially as described.

2. The combination with a jet-expanding nozzle for vapor or gases, of a combining-tube and means to free the combined jet of confined gases by centrifugal action, substantially as described.

3. The combination with an expanding-nozzle for vapor or gases; of a source of water-supply external of the nozzle and a combining-tube permitting expansion therein and ending where the velocities of the combined fluids are equal, substantially as and for the purpose set forth.

4. The combination with a jet-nozzle for vapor or gases, of a combining-tube having a curved lower end to compact the combined jet by centrifugal action.

5. The combination with a jet-nozzle for vapor or gases under pressure, of a combining-tube ending substantially where the velocities of the combined fluids are equal and a curved guide for the combined fluids leaving said tube, substantially as described.

6. The combination with a jet-nozzle for vapor or gases under pressure, of a combining-tube supplied with water, and means to compact the combined jet by centrifugal action before reaching the exit-nozzle.

7. The combination with a jet-nozzle for vapor or gases under pressure, of a combining-tube terminating in exit-nozzle and having a curved portion before the exit-nozzle open at its concave side, and a shield at the exit-nozzle.

8. The combination with a jet-expanding nozzle for vapor or gases under pressure, of an expanding combining-tube terminating in a curved way, said curved way adapted to vent gases at its concave side, an exit-nozzle at the end of the curved way and an upwardly and rearwardly projecting shield at the nozzle.

9. The combination with a jet-expanding nozzle for vapor or gases, of an expanding combining-tube from the end of the jet-nozzle and ending substantially where the velocities of the combined fluids are equal, a curved guide open at its concave side at the end of the tube and terminating in an exit-nozzle, and a shield to protect the open concave side from spray.

10. The combination with a plurality of jet-nozzles for vapor or gases under pressure, of a perforated plate surrounding the issue-orifices of said nozzles through which water is supplied, a combining-tube expanding downward, means to compact the combined fluids by centrifugal action and an exit-nozzle.

11. The combination with a plurality of jet-expanding nozzles for vapor or gases under pressure, of a perforated plate surrounding the issue-orifices of said nozzles, means to supply water around the nozzles, a combining-tube into which the nozzles discharge expanding toward its end, a curved way at the end of the tube, a nozzle at the end of the way and a shield at the nozzle to protect the way from spray.

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Witnesses:
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