P. WAGNER.

DRAINING STEAM TURBINES.

APPLICATION FILED DEC. 7, 1914.

1,165,922.

Patented Dec. 28, 1915.

2 SHEETS—SHEET 1.

Fig. 1.

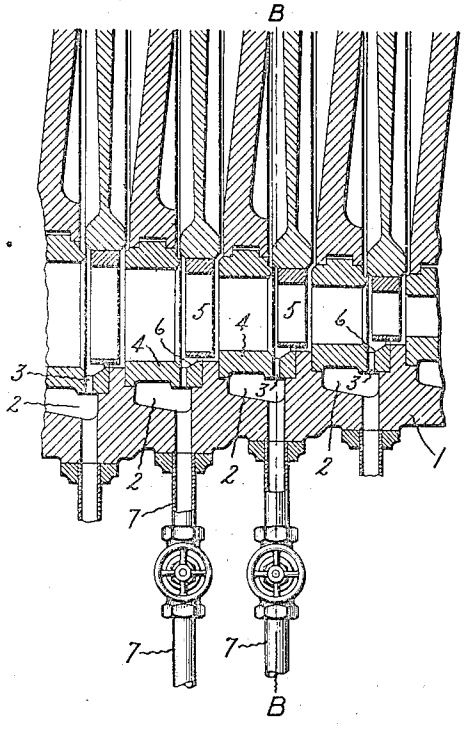


Fig. 2.

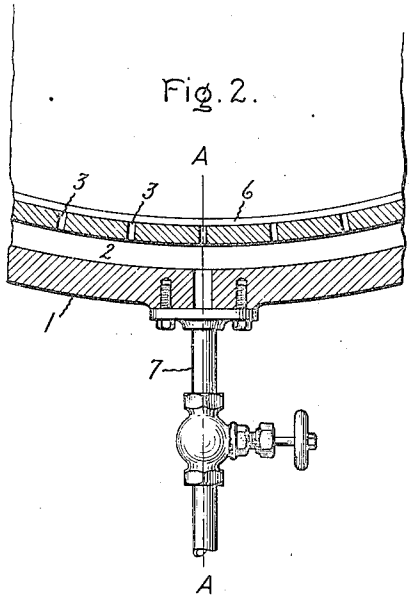
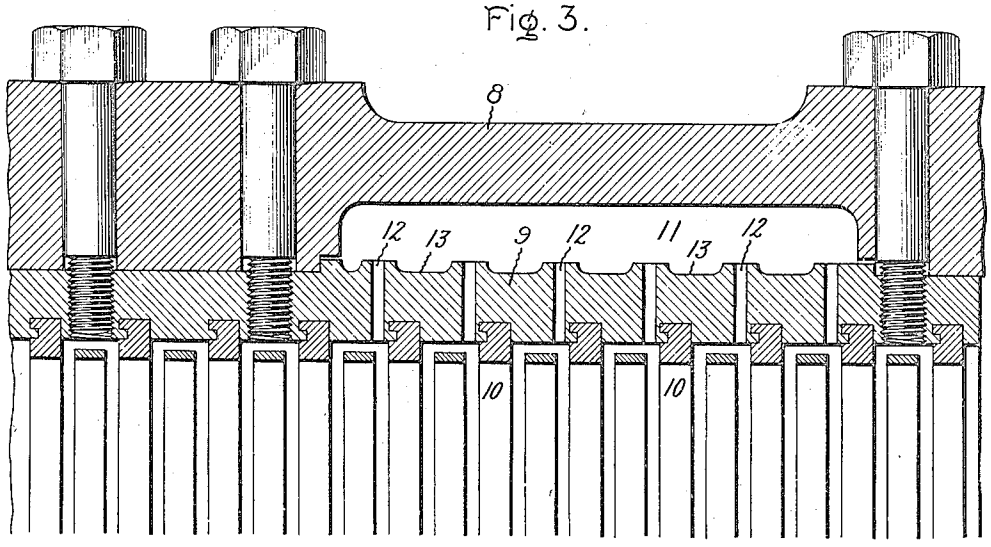


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

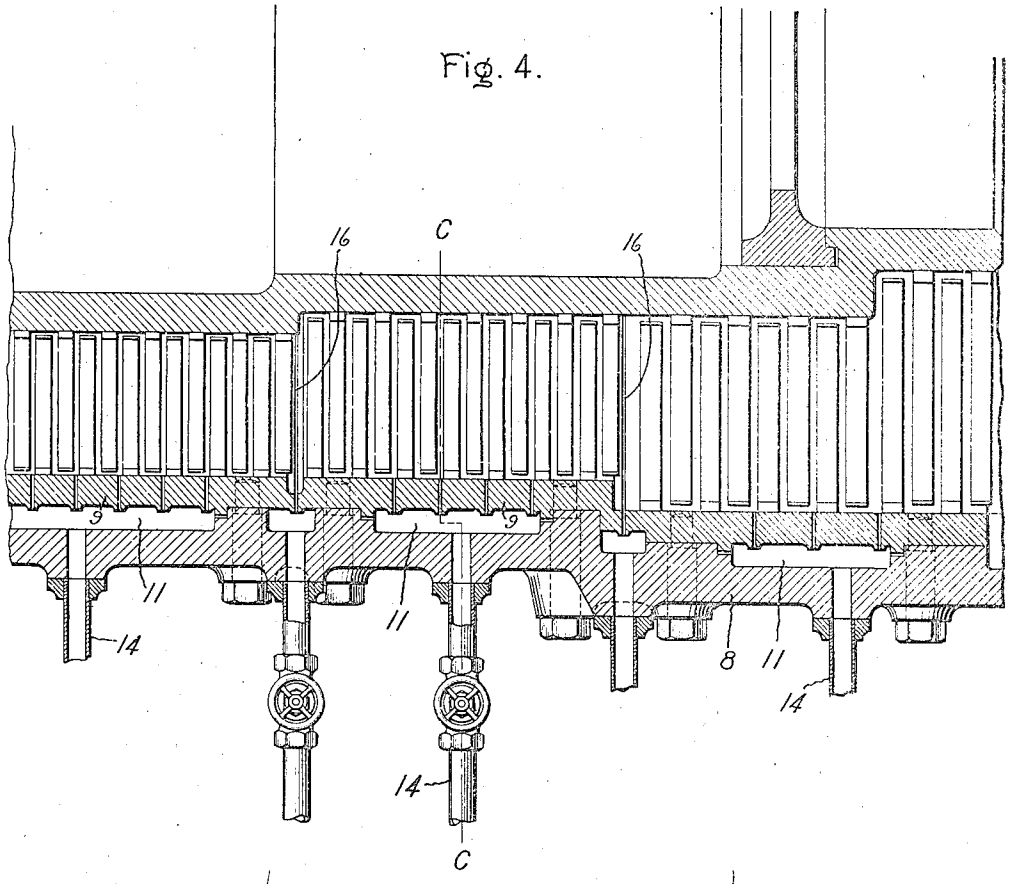
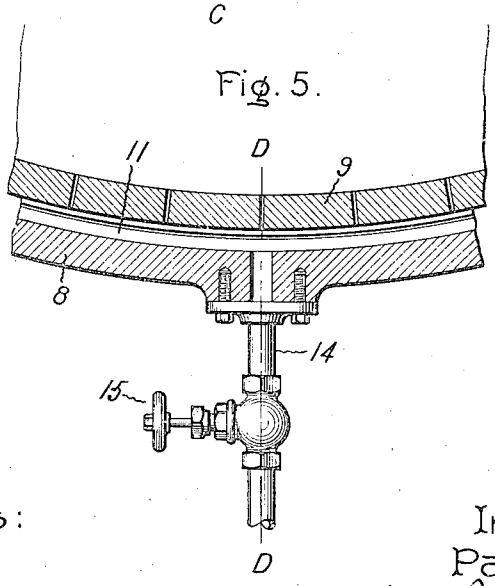


Fig. 5.



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UNITED STATES PATENT OFFICE.

PAUL WAGNER, OF CHARLOTTENBURG, GERMANY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

DRAINING STEAM-TURBINES.

1,165,922. Specification of Letters Patent. Patented Dec. 28, 1915.

Application filed December 7, 1914. Serial No. 875,838.

To all whom it may concern:

Be it known that I, PAUL WAGNER, a subject of the King of Prussia, residing at Charlottenburg, Germany, have invented certain new and useful Improvements in Draining Steam-Turbines, of which the following is a specification.

This invention relates to steam turbines and its object is to effect a thorough removal from the casing of the water of condensation.

It comprises a casing having chambers in its walls communicating with the bucket wheel chamber or chambers and extending partly or wholly around the circumference of the casing. Each stage to be drained has one or more ports leading to the adjacent draining chamber, and each draining chamber receives the drainage from one or more stages. A controlled drain pipe leads from each chamber.

In the accompanying drawings, Figure 1 is a longitudinal section of a portion of a multi-stage turbine embodying my invention taken on the line A—A, Fig. 2; Fig. 2 is a cross-section on the line B—B, Fig. 1; Fig. 3 is a longitudinal section through the upper part of the casing of a drum turbine; Fig. 4 is a longitudinal section of the lower part of such a turbine on line D—D, Fig. 5; and Fig. 5 is a cross-section on the line C—C, Fig. 4.

Referring first to Figs. 1 and 2, the casing 1 has a plurality of annular drainage chambers or channels 2. Escape ports 3 are arranged between the stages and the drainage chambers, being preferably located in the nozzle rings 4 beyond the vanes or buckets 5. The inner ends of the ports 3 terminate preferably in circumferentially extending grooves 6 formed in the nozzle rings. The drainage is carried off from every chamber 2 by a valved drain pipe 7 which is located at the lowest point in the casing. The drain of each stage can, therefore, be accomplished in the best manner.

In Fig. 3 the upper part 8 of the casing is provided with a special lining or bushing 9 in which the intermediate buckets 10 are inserted. Between the casing and the lining a drainage chamber 11 is formed, into which the escape ports 12 of the several stages open through the lining 9. To prevent the water expelled through the ports of higher pressure stages from flowing back into the ports communicating with the lower pressure stages, circumferential grooves 13 are turned in the periphery of the bushing between the escape ports.

Figs. 4 and 5 show the lower part of a drum turbine. Three drainage chambers 11 are shown, with suitable drain pipes 14, which can be controlled by valves 15. By these valves the quantity of water drained off, and thereby the pressure existing in the annular chambers, can be regulated. When one of these chambers is connected with a plurality of pressure stages, a particularly effective drainage, without appreciable steam loss, is obtainable. If approximately the average pressure in a plurality of stages is established in the drainage chamber by adjusting the valve 15, then there is a pressure drop between some of the stages and the chamber, and a pressure drop from the chamber to other stages. The drainage from the higher pressure stages will be accelerated by the steam which follows the water. This, however, is not wasted, but, after the water has separated out by gravity, the steam flows back to the turbine through some of the ports of the lower stages and performs work there again. If any water is unable to drain off from these lower stages on account of the inflow of steam, it will pass on through the turbine to the next drainage chamber. Instead of separate escape ports between the stages and the drainage chambers, there may be a narrow slit 16 extending around the entire periphery of the casing at the joint between two neighboring bushings 9.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative, and that the invention can be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. The combination with a turbine casing, of a lining forming with said casing annular drainage chambers each covering a plurality of stages, ports through said linings for each stage, and controlled drain pipes leading from said chambers.

2. The combination with a turbine casing, a lining located therein, there being a drainage chamber between the two, stationary

buckets carried by the lining, rotor buckets coöperating with the stationary buckets, ports for discharging water located in the lining and communicating with the rotor chamber and drainage chamber, and means for discharging fluid from the drainage chamber.

3. The combination with a casing, means arranged to form drainage chambers between the rotor and the casing, means connected to the chamber for draining them individually, a rotor, and stationary fluid discharging devices carried by the said means for directing fluid against the rotor.

In witness whereof, I have hereunto set my hand this 31st day of October, 1914.

PAUL WAGNER.

Witnesses:
ERICH ÜBERLÉE,
GUSTAV HÜLBROCK.