K. BAUMANN.

SEMIDOUBLE FLOW STEAM TURBINE.

APPLICATION FILED AUG. 24, 1917.

1,405,090. Patented Jan. 31, 1922.

3 SHEETS—SHEET 1.

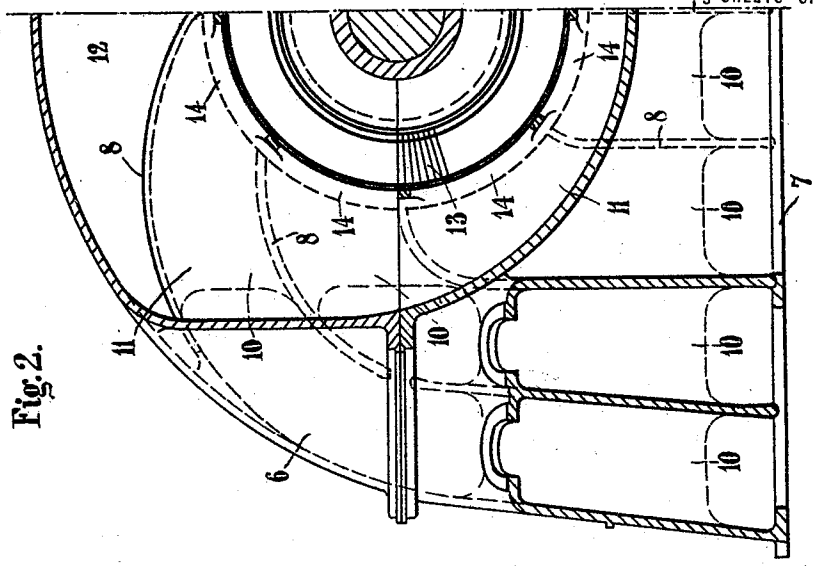


Fig. 2.

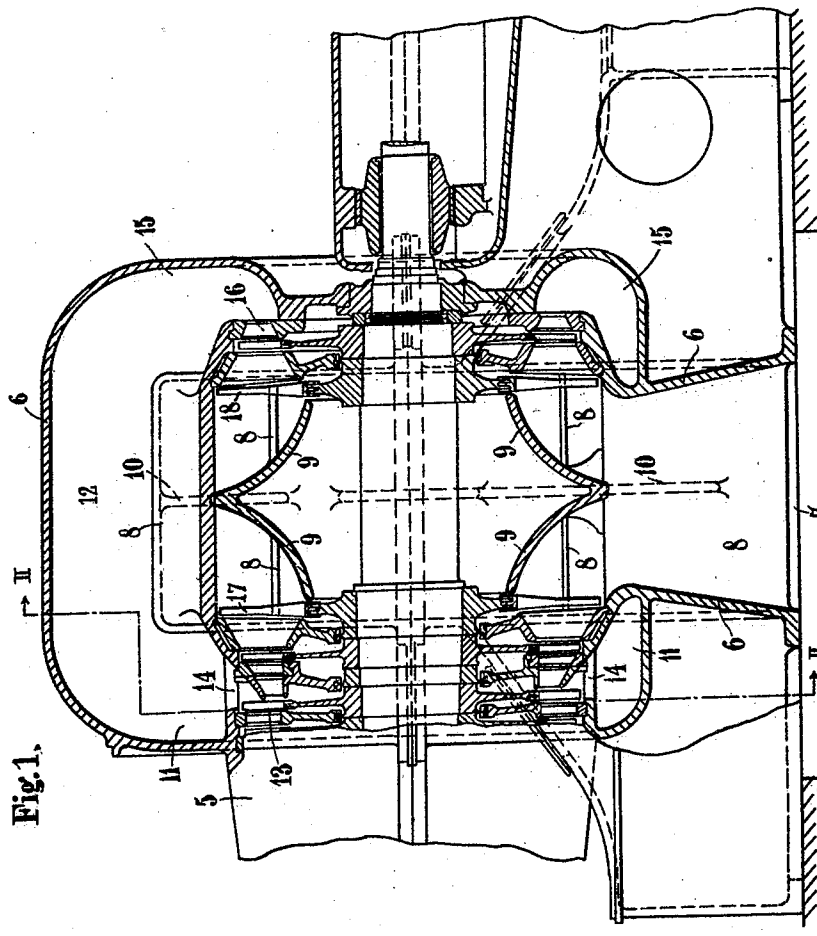


Fig. 1.

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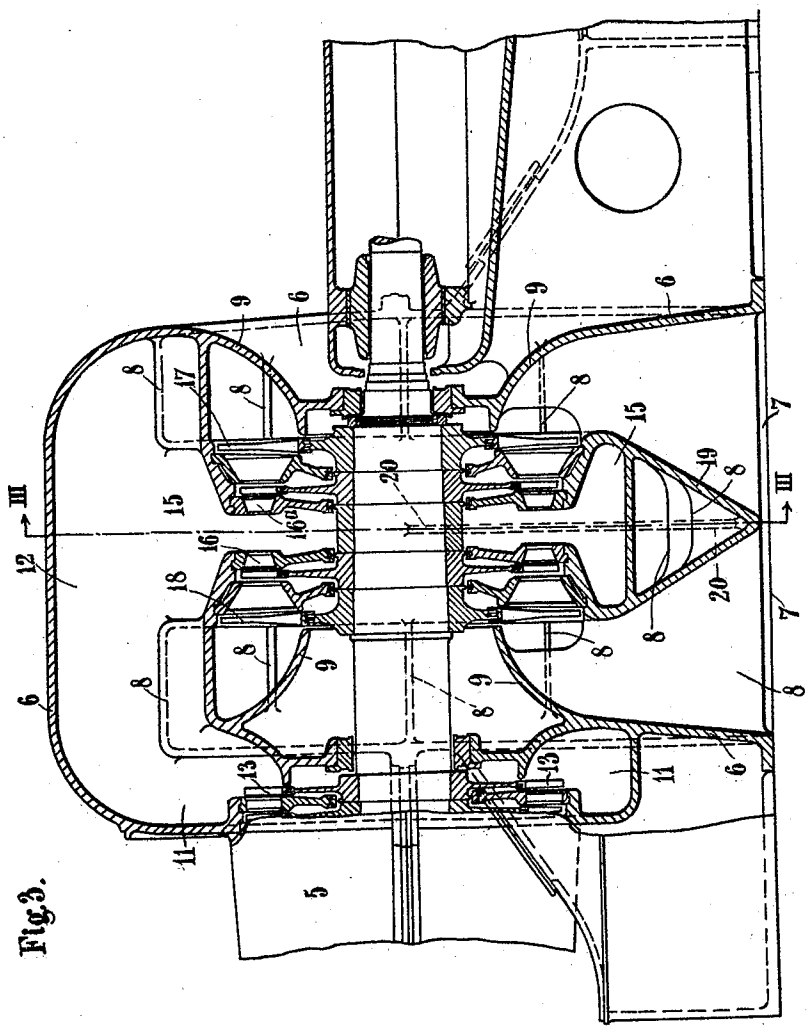


Fig. 3.

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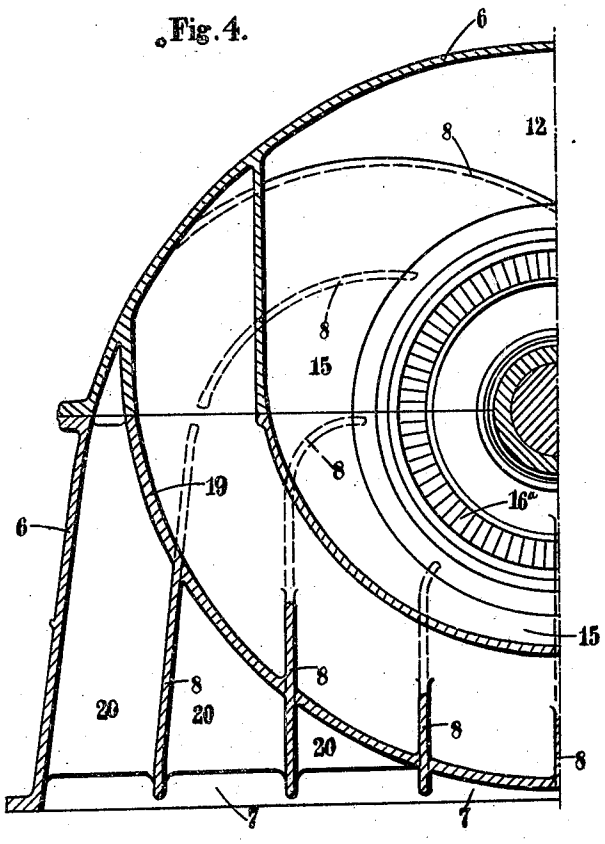
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3 SHEETS—SHEET 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

KARL BAUMANN, OF URMSTON, ENGLAND, ASSIGNOR TO THE BRITISH WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY LIMITED, A COMPANY ORGANIZED UNDER THE LAWS OF GREAT BRITAIN.

SEMIDOUBLE-FLOW STEAM TURBINE.

1,405,090. Specification of Letters Patent. Patented Jan. 31, 1922.

Application filed August 24, 1917. Serial No. 187,961.

To all whom it may concern:

Be it known that I, KARL BAUMANN, a citizen of the Confederation of Switzerland, and a resident of Urmston, in the county of Lancaster, England, have invented a new and useful Improvement in Semidouble-Flow Steam Turbines, of which the following is a specification.

This invention relates to steam turbines of the axial flow type in which the low pressure stage or stages of the turbine are so arranged that the steam flows through them in opposite directions to the exhaust. Turbines of this kind are commonly called semi-double-flow turbines.

In my application Serial No. 187,963, filed August 24, 1917, there is described an improved construction of turbine exhaust casing and the present invention consists in a modified construction of the turbine exhaust casing set forth in said application, for use with semi-double-flow turbines.

As is well known in one form of turbine of this type one or more pipes or conduits have to be provided for conducting a portion of the steam from an intermediate stage to that part of the divided low pressure stage or stages in which the steam flows in the opposite direction to that in which the steam flows through the high pressure stages of the turbine. In another form of semi-double-flow turbine the whole of the steam from an intermediate stage of the turbine is conducted through one or more pipes or conduits to the low pressure stage or stages through which the steam flows in opposite directions to the exhaust.

According to the present invention the space enclosed by the two uppermost internal guide walls and the top of the exhaust casing (hereinafter called the "duct") of the improved construction described in said application is utilized as a conduit for conducting the whole or a portion of the steam from an intermediate stage of the turbine to the low pressure stage or stages through which the steam flows in the opposite direction or in both directions to the exhaust.

In the accompanying drawings Fig. 1 is a central, vertical longitudinal section and Fig. 2 a half section taken on the line II—II of Fig. 1 of an exhaust casing of the kind described in said application adapted for use with a semi-double-flow turbine in accordance with the present invention. Figs. 3 and 4 are views similar to Figs. 1 and 2 showing a modified construction for use with a semi-double-flow turbine of a different type to that illustrated in Fig. 1.

Referring now to Figs. 1 and 2 the turbine therein illustrated is of the type in which a portion only of the steam is conducted from an intermediate stage to one half of the divided low pressure stage through which it flows in the opposite direction to the exhaust. The turbine cylinder is indicated at 5, the exhaust casing at 6, and the exhaust outlet at 7. The internal guide walls are indicated by the numeral 8 and the curved guides for deflecting the steam leaving the last rows of moving blades from an axial into an approximately radial direction of flow by the reference number 9. A central transverse web 10 is preferably also provided between the guide walls 8 for a purpose hereinafter described.

Surrounding the intermediate stage of the turbine from which a portion of the steam is abstracted is a steam collecting chamber 11 which communicates with the duct 12 formed between the uppermost internal guide walls 8 and the upper portion of the exhaust casing 6. The steam abstracted from this intermediate stage passes from the outer portions of the row of moving blades 13 through openings 14 in the turbine cylinder into the collecting chamber 11.

A steam distributing chamber 15 communicates with the other end of the duct 12 and distributes the steam passing through said duct to the guide blades or nozzles 16 of that half of the divided low pressure stage of the turbine through which the steam flows in the opposite direction to the exhaust. The distributing chamber 15 is similar in shape to that of the collecting chamber 11 shown in section in Figure 2, both of said chambers gradually increasing in cross-sectional area as they approach the duct 12. The steam leaving the final rows of moving blades 17, 18 of the divided low pressure stage of the turbine will be deflected by the guides 9 into an approximately radial direction of flow, and is divided into segmental portions by the internal guide walls 8 and conducted away to the exhaust in the manner described in said application. The central division wall 10 between said guide walls prevents the

steam which flows from the moving blades 17 and 18 in opposite directions from intermingling and setting up whirls and eddies which are objectionable as resulting in a loss of efficiency. The division wall 10 is, however, not essential especially if the curved guides 9 are properly designed so as to deflect the steam into an approximately radial direction, to ensure which additional intermediate curved guides or baffles may advantageously be provided.

The turbine illustrated in Figure 3 is of the kind in which the whole of the steam leaving a row of moving blades of an intermediate stage is led to a divided low pressure stage through which the steam flows in opposite directions to the exhaust. In the turbine of this type the whole of the steam leaving the moving blades 13 passes into the collecting chamber 11 and flows through the duct 12 to the guide blades or nozzles 16, 16^a of the divided low pressure stage. The distributing chamber 15 is, in this construction, located centrally within the exhaust casing 6 having on the outer periphery of its lower half a portion 19 which is somewhat triangular in section as seen in Fig. 3. The lower portions of some of the internal guide walls 8 are carried through the triangular portion 19 of the distributing chamber 15 for the purpose of maintaining said chamber in position within the exhaust casing 6. That portion of the exhaust casing 6 which is not occupied by the distributing chamber 15 or duct 12 is preferably provided with a division wall 20 which extends as shown in Figure 4 from the outer periphery of the triangular portion 19 to the side of the exhaust casing, being carried down to near the exhaust outlet 7. This division wall 20 performs the same function as the central division wall 10 shown in the construction illustrated in Figure 1.

I claim as my invention:

1. In an axial flow steam turbine having a divided low pressure stage through which the steam flows in opposite axial directions, a casing provided with partitions forming separate inlet and exhaust chambers for each division of said stage.

2. In a steam turbine, a divided-flow, low-pressure stage comprising energy-abstracting portions through which steam flows in opposite directions, steam inlet means for the portions, deflecting means cooperating with the outlets of the portions to change the flow from an axial to a radial direction, and segmental guide walls for segmentally dividing the flow of steam from each portion.

3. In a steam turbine, a divided-flow, low-pressure stage comprising energy-abstracting portions through which steam flows in opposite axial directions, means for deflecting steam discharged from the portions from an axial to substantially a radial direction, and walls for segmentally dividing the steam discharged from each portion.

4. In a steam turbine, a divided-flow, low-pressure stage comprising energy-abstracting portions through which steam flows in opposite directions, curved walls for segmentally dividing the steam discharged from each portion and for conducting it in the same general direction, and means co-operating with the walls to prevent intermixture of steam discharged from the portions, thereby avoiding eddying and whirling.

In testimony whereof I have hereunto subscribed my name this tenth day of July, 1917.

KARL BAUMANN.

Witnesses:
FREDERICK NIXON,
WILFRED MORRIS.