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CASING FOR GAS TURBINES
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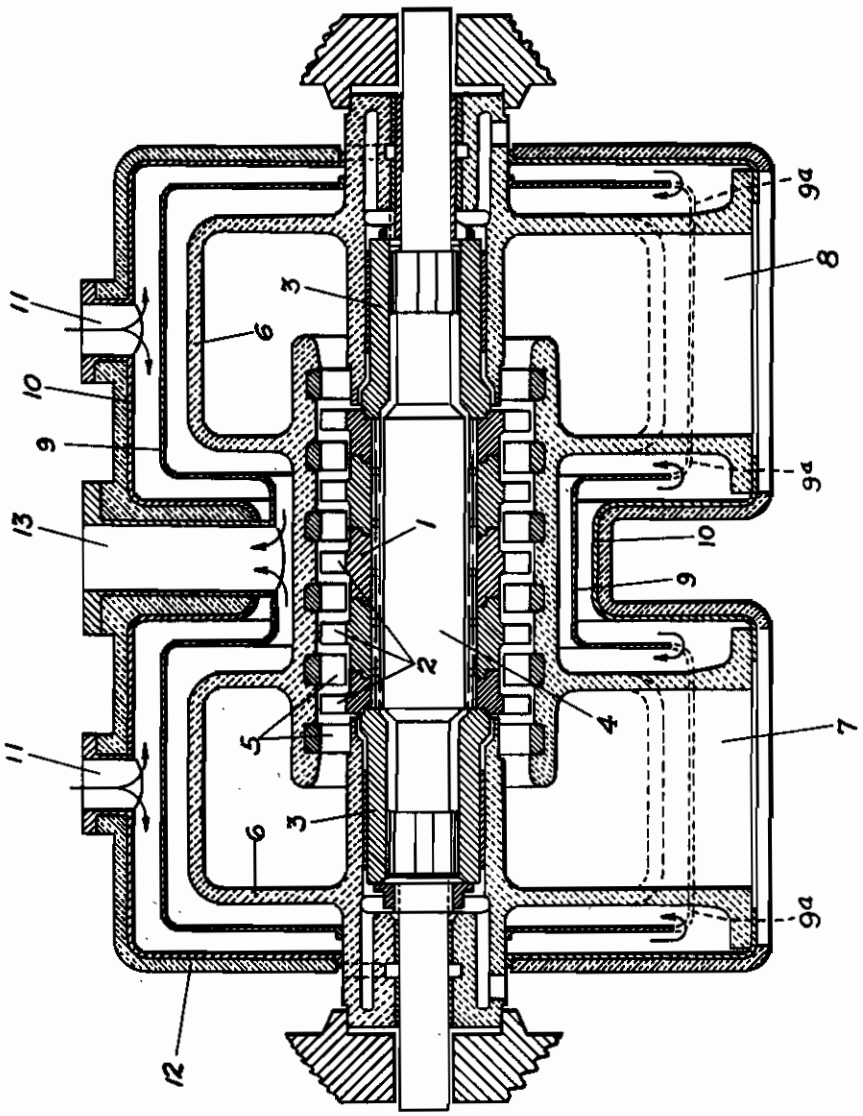

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CASING FOR GAS TURBINES

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This invention relates to a casing for gas turbines.

In order to operate a turbine of this class at maximum economy the actuating fluid must have a very high temperature. The part of a gas turbine subjected to greatest stresses is of course the rotor with the blades, but at high gas temperatures the casing, too, is exposed to considerable straining forces.

It is the object of the invention to provide a casing meeting all requirements by producing it from ceramic materials which possess remarkable strength even at high temperatures. The economic initial pressures of a gas turbine are as a rule quite low. They differ according to gas temperatures and partial efficiencies, but usually amount to approximately 3 to 4 atmospheres, so that in view of the resulting low stresses the casing may be made of ceramic materials without any reinforcement.

Such an arrangement is, however, open to other objections. As ceramic materials are sensitive to impact, turbine casings made therefrom can be easily damaged by action from without. Furthermore, the outside of the turbine casing, due to the high gas temperatures prevailing inside, will acquire a relatively high temperature, and the radiation of heat will therefore be considerable, unless the casing is carefully insulated.

In further accordance with the invention the ceramic turbine casing is therefore surrounded by two or more steel jackets, and the hollow spaces formed between the jackets and the casing are flown through, in particular order, by a portion of the air supplied by the compresser to the combustion chamber. A casing of this type is fully suited for economically operating turbines with gases of high temperature.

One form of the invention is illustrated by way of example in the accompanying drawing which shows a longitudinal section of a casing according to the invention.

A drum rotor 1 provided with moving blades 2 is supported by a shaft 4 by means of interposed tubes 3. Vanes or guide blades 5 are disposed in a casing 6 made of ceramic material. The actuating gas enters the turbine through a connection 7 and passes out through a connection 8. The casing 6 is surounded at a certain distance by a protective jacket 9 of heat resistant steel which is enclosed by a second jacket 10 of structural steel. Between the casing 6 and the first jacket 9 as well as between the jackets 9 and 10 ribs, not shown, may be arranged so that contact is made only at a few points to interfere with heat conduction from the casing to the outside, whilst, on the other hand, the casing and its protective jackets are reinforced.

The portion of compressed air intended for cooling the casing 6 is guided through connections 11 into the hollow space formed between the jacket 10 and jacket 9 and then enters the space between the jacket 9 and the casing 6. In this way, the coldest air will be found at the outer circumference of the turbine, heat radiation kept down, and only preheated air will flow past the casing 6. This arrangement prevents, moreover, excessive cooling of the casing 6 and the development of dangerous thermal stresses resulting therefrom. The outer steel jacket 10 acquires only a low external temperature, and a relatively slight and low-priced insulating layer 12 will therefore suffice for reducing heat losses to a minimum. The cooling air heated in the turbine passes out through a connection 13 and between the compresser and the combustion chamber of the turbine plant is returned to the air curent for combustion at a point where equality of pressure prevails between this partial air current coming from the enclosure of the turbine casing and the main air current flowing from the compresser through an air preheater to the combustion chamber. This is possible without trouble, because both the main and the partial air current suffer a loss in pressure, the first one in the preheater and the other one in the jackets of the casing. The partial air current is therefore admitted at a point where the drop in pressure from the condenser to this point is equal to the drop in pressure occurring in the jackets of the casing, the cross sections and quantity of the partial air current being so dimensioned that, as much as possible, equal temperatures prevail also at the admission point.

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