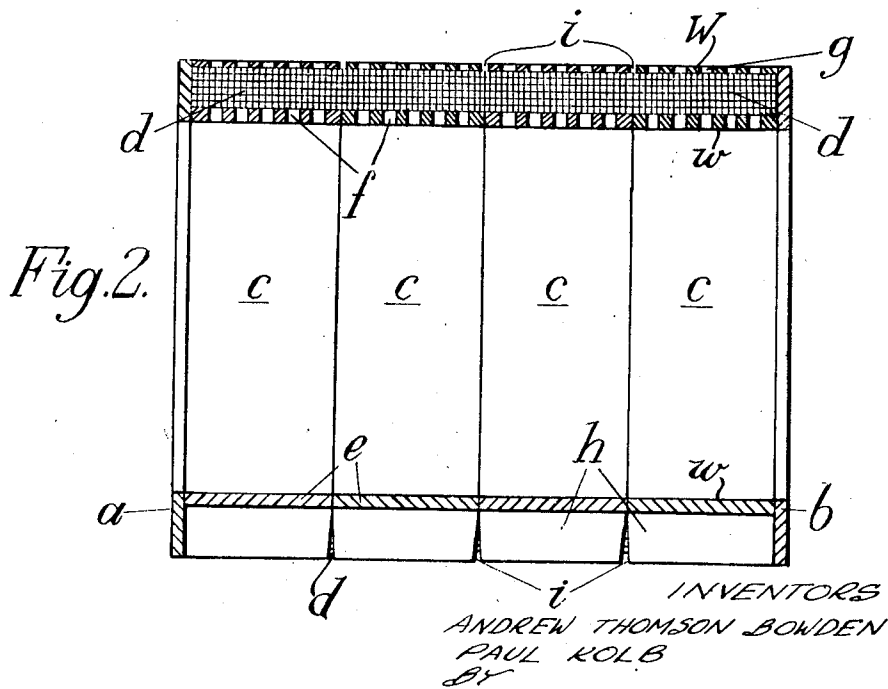
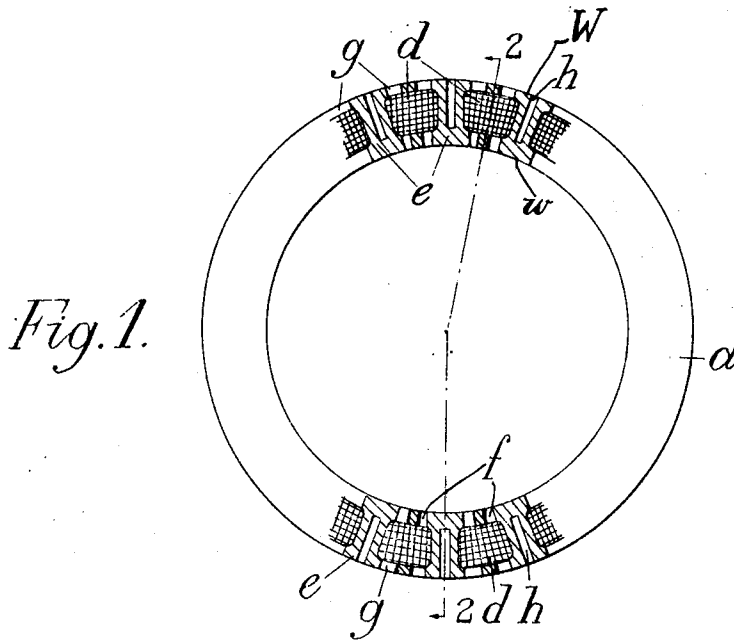


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A. T. BOWDEN ET AL
REGENERATIVE HEAT EXCHANGER

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REGENERATIVE HEAT EXCHANGER

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5 Claims. (Cl. 257-8)

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This invention relates to combustion turbines of all types embracing those in which the working fluid may be obtained from a solid, liquid, or gaseous source, for instance, gas, oil, or coal, and which may be produced either internally or externally.

This invention relates more particularly to heat exchangers of the regenerative drum type, in which the rotor, consisting of a cylindrical matrix of metal or ceramic, rotates within a casing through which both the exhaust gases and the compressed cold air pass. The paths of the exhaust gases and of the compressed air respectively are separated by sealings running along the length and around the ends of the drum, thereby dividing the drum into a hot gas and cold air side respectively, in which the gas can flow in counter directions through the matrix. The hot exhaust gases, in passing through the hot gas side of the drum, give up their heat to the matrix in that part of the drum, so that as the drum rotates, the hot matrix passes into the cold air side, where the heat is transferred from the matrix to the cold compressed air.

With this type of regenerator, the length of the gas or air path through the matrix, can be very small, but the temperature difference between, say, the inside diameter and outside diameter of the drum, is the full temperature difference between the hot gas and cold air temperatures, so that the various parts of the drum are subjected to vary large differences of temperature. In order to maintain an effective seal along the length of the drum, it is important to keep the drum as nearly cylindrical in shape as possible.

The object of the present invention is to provide a drum overcoming or minimising the tendency to distortion, caused by the stresses set up by the temperature differences in the metal of the drum.

Referring to the accompanying diagrammatic drawings, illustrating one form of the present invention:

Figure 1 is a transverse section of a split drum, and

Figure 2 is a section on the line 2-2 of Figure 1 looking in the direction of the arrows.

In carrying the invention into effect in the form illustrated, a drum is split into four sections *c* along its length, the sections being held together by bolting or similar means between two end plates *a* and *b*. Each section *c* of the drum consists of a number of separate chambers *d* formed by a series of radial ribs *e* which connect the inside and outside walls of the drum con-

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centrically. The separate sections *c* of the full drum are joined together in such a manner that the ribs *e* are all in line so that the chamber *d* runs the full length of the drum. Into this chamber a matrix of metal gauze or ceramic is fitted in such a manner that air or gas can flow from the inside to the outside of the drum, or vice versa. The inside wall *w* and outside wall *w* of the drum are pierced with holes or slots *f* and *g*, through which the gas or air can flow.

If it be assumed that in one half of the drum the cold air flows from the inside to the outside, while in the other half of the drum the hot gas flows from the outside to the inside, then the outside wall *w* of the drum will be at a suitably higher temperature than the inside wall *w*. Thus there is a tendency for the outside wall to expand relative to the inside wall in the circumferential direction. This expansion of the outside wall relative to the inside wall is allowed for by having slots *h* in the ribs *e* in a longitudinal direction. Since the outside wall of the drum is constrained by the ribs *e*, any excessive expansion of the outside wall will tend to close up the gap of the slits *h*.

In carrying this invention into effect in one way, it has been desired, from the point of view of simplicity in manufacture, to build up the drum in a longitudinal direction by the combining of a number of similar sections *c*. With this arrangement, it is necessary to secure the drum sections between the end plates *a* and *b*. The sections are, therefore, secured by a series of longitudinal bolts joining the end plates and passing through the coldest wall—in the case under consideration, the inside wall—of the drum, since the bolts should be subjected to the least distortion induced by any temperature changes to which the drum may be subjected.

In operation, the outside wall will tend to expand in a longitudinal direction relative to the inside wall, and in order that no or little distortion of the end plates *a* and *b* should occur, the sections *c* of the drum are manufactured in such a way as to leave a gap *i* which becomes closed as the temperature of the outside wall of the drum reaches the operating temperature of the unit.

We claim:

1. A rotor for a drum-type regenerative heat exchanger comprising concentric inner and outer walls and a plurality of radial ribs spaced uniformly around the circumference, connecting the inner and outer walls and dividing the space between the inner and outer walls into a plurality

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of chambers for holding a heat exchanging matrix.

2. A rotor according to claim 1, in which the inner and outer walls have holes through which gas and air can flow.

3. A rotor according to claim 2, in which the ribs are gas tight.

4. A rotor according to claim 2, in which the rotor comprises an aligned plurality of annular sections fastened together with the inner walls abutting and in which their outer walls are spaced apart providing axial clearance to accommodate for expansion when the sections are heated.

5. A rotor according to claim 2, in which the outer wall has radial slits continuing part way through the ribs toward the inner wall for permitting expansion of the rotor wall between the ribs.

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