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ELEMENT SET FOR HEAT EXCHANGERS

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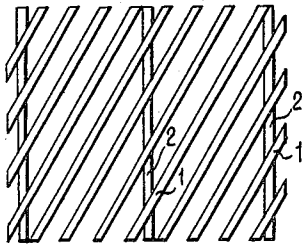


Fig. 1.

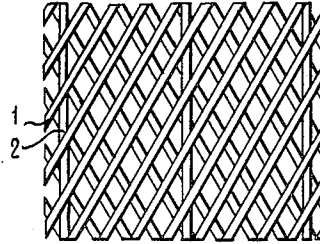


Fig. 3.



Fig. 2.

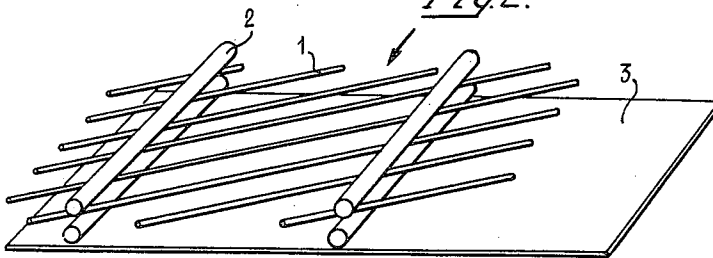


Fig. 4.

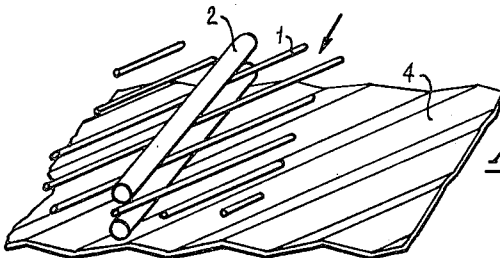


Fig. 5.

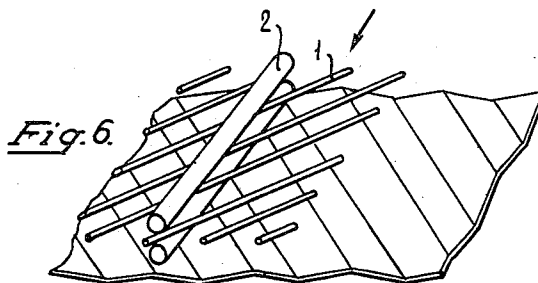


Fig. 6.

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ELEMENT SET FOR HEAT EXCHANGERS

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8 Claims. (Cl. 257—256)

The present invention relates to heat transfer elements in heat exchangers for air or other gaseous mediums and has particular reference to regenerative air-preheaters.

The heat exchanging mass of such heat exchangers is ordinarily built up of plate packs composed of smooth and/or undulated plates, spaced by notches pressed up in the plates or by means of other distance elements, said plates forming walls of flow channels for the heat exchanging gases. It is found that favourable effects can be obtained if these gases are given a helical path of flow through the channels. In doing so the creation of a heat insulating boundary layer nearest to the heat exchanging surfaces is reduced. A flow of this character also prevents soot and other impurities in the gases from depositing in the preheater reducing the heat transmission coefficient. Heat exchangers built according to the above principles have a relatively good ratio between the heat transmission coefficient and the pressure drop of the through-flow.

This ratio, however, has further been improved by means of heat transfer elements according to the present invention.

The favourable result has substantially been attained by using heat transfer elements in the form of substantially parallel and spaced wires forming an acute angle (preferably less than 45°) to the main direction of flow of the gases. These wires are preferably arranged to form gratings spaced by thicker wires, bent metal strips or similar distance elements.

These and other characteristics of the invention will be hereinafter described more in detail with reference to the accompanying drawings, showing some preferred embodiments by way of example.

Fig. 1 is a plan view of gratings according to the invention.

Fig. 2 is an end view of these gratings.

Fig. 3 is a plan view of gratings having wires arranged cross-wise.

Fig. 4 shows a grating and a smooth plate in combination.

Fig. 5 shows an undulated plate in combination with a grating, of the type shown in Fig. 1.

Fig. 6 shows a modification of the embodiment shown in Fig. 5.

Figs. 1 and 2 show two gratings placed parallel to each other, each of them consisting of wires 1 disposed in parallel and at an acute angle to the main direction of flow of the gases. In each grating the wires 1 are interconnected by distance wires 2 holding the two gratings apart. The cross section of the distance wires may have any suitable form. In air preheaters the distance elements 2 are substantially parallel to the main direction of flow of the gases. Preferably, the value of the angle between the wires 1 and the distance elements 2 as above is of the order of 30°. It is suitable to secure the wires 1 to the distance elements 2 by welding, riveting or the like. Due to the parallel arrangement of the wires 1 in the two gratings, the gas column therebetween is divided into two currents having helical paths of opposite sense. This results in a favourable increase of the heat trans-

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mission coefficient. As to the cross-section of the wires 1, it may be round or oval. Other suitable cross-sections as polygonal, for example, may also be used.

Fig. 3 shows a second embodiment of the invention characterized by parallel wires 1 in one grating which wires have a direction crossing that of corresponding wires in an adjacent grating, which in some cases may be appropriate to produce a single-directed rotation of the gas flow between two gratings.

Instead of making all of the heat exchanging mass of gratings as described above it is also possible to combine these gratings by plane or corrugated plates alternately provided between said gratings.

In Fig. 4 is a grating of the above described type provided with distance members 2, which bear against intermediate heat exchanging plates 3, which in this case are smooth.

Fig. 5 shows another plate 4 having undulations running parallel to the direction of the wires 1, and Fig. 6 is a modification of the embodiment in Fig. 5, having said directions provided cross-wise.

What is claimed is:

1. Regenerative heat exchange mass comprising a multiplicity of spaced and generally parallel heat exchange elements forming a pack and including between each two adjacent elements parallel spaced elongated and substantially straight spacing means for providing between each two adjacent elements a plurality of contiguous and substantially straight and unobstructed channels open at their ends for flow of columns of the same gaseous fluid from end to end of the several channels of the pack, each of said channels being defined by two adjacent elements and two adjacent spacing means between the said two adjacent elements and each of said channels being of generally rectangular cross-section having a width at least several times the distance between said adjacent elements, at least one of the elements defining a side of each of said channels being in the form of a grating consisting of a multiplicity of substantially parallel spaced wires obliquely disposed in the same sense with respect to the lengths of the channels and certain other of said elements consisting of plates.

2. Structure as defined in claim 1 in which said spacing means comprises distance pieces connecting the wires of each of said gratings.

3. Structure as defined in claim 1 in which the grating elements and plate elements alternate so that the opposite sides of each channel are defined respectively by solid and perforate elements.

4. Structure as defined in claim 3 in which the plate elements are plane.

5. Structure as defined in claim 3 in which the plate elements are undulated.

6. Structure as defined in claim 5 in which the undulations are oblique with respect to the direction of the length of the channels.

7. Structure as defined in claim 6 in which the undulations are oblique in the same direction as the wires of the grating elements.

8. Structure as defined in claim 6 in which the undulations of the plate elements and the wires of the grating elements are oppositely oblique.

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