Oct. 9, 1928. 1,687,236

J. R. BUFFINGTON

HEAT REGENERATOR

Filed July 28, 1926

Fig. 1.

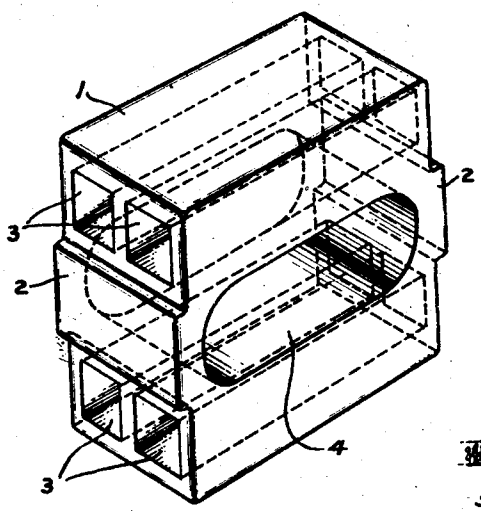


Fig. 2.

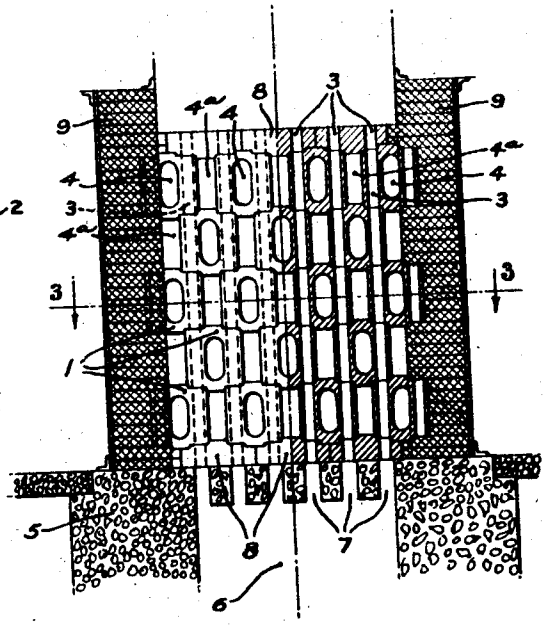
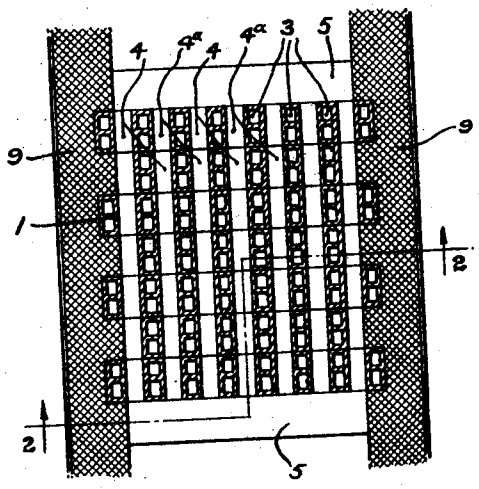


Fig. 3.



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HEAT REGENERATOR.

Application filed July 28, 1926. Serial No. 125,563.

This invention relates to heat recuperators or regenerators, and has particular reference to those formed of firebrick or other refractory material.

Heretofore, regenerative furnaces have been formed of a plurality of variously shaped elements which were expensive and difficult to make and required specially skilled workmen to erect because of the intricate combinations required. Moreover, the entire weight of the mass was borne by a few base bricks or elements.

It is the principal object of this invention to provide an efficient heat or cold recuperator or regenerator whereby an exchange of temperature takes place between two gaseous or fluid currents, or between a gaseous and a fluid current.

Another object of this invention is to provide a complete regenerator construction consisting of a plurality of identical interlocking elements that can be readily set up by any one skilled in the laying of brick or masonry, and in such a manner that weight is distributed among the elements instead of being borne by a few elements.

A further object of this invention is to provide a regenerator construction such that the joints of the special elements forming the circuits for the currents of gas or liquid shall be impervious to the same, each element coacting with the adjoining interlocking elements to form collinear tubular passageways having only transverse joints, the several passage-ways for one substance being at right angles to the passage-ways of the other substance so as to form a cross-current heat interchanger.

Other objects and advantages of this invention will become apparent from a description of a preferred embodiment thereof such as is illustrated in the accompanying drawings in which like reference characters designate like parts in the several views.

In the drawings:

Figure 1 is a perspective view of the special element of which the regenerator is constructed.

Fig. 2 is an elevation of the regenerator thus constructed, being shown partly in section as seen along line 2—2 of Fig. 3.

Fig. 3, which is a sectional plan view of the regenerator as seen along the line 3—3 of Fig. 2.

Referring to Fig. 1, numeral 1 designates the symmetrical regenerator element which is substantially rectangular in form and is provided at two opposite sides with transverse tenons 2, parallel to the common plane of which are passage-ways 3 disposed at each side of passage-way 4, which is formed in the common plane of tenons 2 and at right angles to the direction of passage-ways 3.

Fig. 2 illustrates the manner in which elements 1 are arranged to form continuous passage-ways 3 in a vertical direction, and continuous passage-ways 4 and 4^a in a horizontal direction, passage-ways 4^a being equivalents of and parts of the horizontal duct system formed by passage-ways 4 and constitute the space between the tenons of aligned elements and the sides of adjoining elements.

As illustrated in Fig. 2, the regenerator is adapted to be used with a furnace of some kind, the hot gaseous products of combustion thereof passing through horizontal passage-ways 4 and 4^a on their way to the smoke-stack, and the cold air blast passing vertically downward through passage-ways 3, whereby the air is heated by contact with the hot elements and passes out below as a hot blast to the furnace combustion chamber or utilized to other purposes. Simultaneously with the heating of the air blast, the flue gases are cooled before passing into the stack. Fig. 3 illustrates the arrangement of the elements as seen in plan section, the flue gases passing through horizontal passage-ways 4 and 4^a and the air blast passing through vertical passage-ways 3.

In constructing the regenerator, the foundation 5 is preferably provided with a not blast duct 6 having openings 7 which are adapted to register with vertical passage-ways 3 formed by interlocking elements 1, as shown in Fig. 2. Finishing slabs 8 may be utilized at the top and base, and which are also provided with openings adapted to register with passageways 3. The elements of each row are spaced apart by distances equal to the width of tenons 2, plus the negligible space for mortar, and the elements of the second row are likewise spaced apart by the width of tenons 2 which are fitted into the spaces between the elements of the next lower row, etc. Thus each successive row of elements is displaced laterally relative to the next adjoining rows, so that each element centers with the space between the elements of the next adjoining rows. The projecting

portions of the end elements of alternate rows are set in side walls 9 as shown in Figs. 2 and 3.

It will be evident from the above description that a simple and efficient regenerator for exchanging heat or cold between gases, liquids, or gases and liquids, may be readily constructed by utilizing a plurality of the specially-shaped interlocking elements or bricks illustrated in Fig. 1.

While the regenerator of this invention has been described as a flue gas heat exchanger or interchanger, it is to be understood that it may be used for other purposes, that the heating or cooling medium may be alternatively passed through the vertical or horizontal tubes and in either direction, and that changes may be freely made in form and detail without departing from the spirit of this invention within the scope of the appended claims.

What is claimed is:

1. A substantially cubical regenerator element symmetrical about each central plane, tenons disposed upon two opposite surfaces in a central plane, passage-ways through said element in the central plane of said tenons, and other passage-ways disposed in planes parallel to the central plane of said tenons.

2. An element for regenerator construction having tenons formed upon two of its opposite faces, passage-ways formed through said element in the common plane of said tenons, and other passage-ways formed through said element in planes parallel to the common plane of said tenons and at an angle to the first-named passage-ways.

3. A regenerator element having substantially rectangular surfaces, transverse tenons disposed centrally across two of its opposite surfaces, a passage-way formed through said element in the common plane of said tenons, and other passage-ways formed through said element in planes parallel to the common plane of said tenons and disposed at each side of and passing at right angles to the first-named passage-way.

4. A regenerator element having substantially rectangular surfaces, rectangular tenons projecting transversely from two opposite surfaces, a passage-way formed through said element in the common plane of and having a rectangular cross-section substantially equal to the surface of said tenons, and other passage-ways formed through said element in planes parallel to the common plane of said tenons and disposed at each side of and at right angles to said first-named passage-way.

5. A regenerator comprising a plurality of interlocking like elements forming two groups of relatively rectangular passage-ways through the composite structure, each element having transverse tenons upon two opposite faces, one of the edges of two adjacent elements being disposed at each side of one of said tenons whereby said two adjacent elements are spaced apart by the width of said tenons to form passage-ways between said elements parallel to one of said first-named groups of passage-ways, each passage-way in said elements registering with a corresponding passage-way in the next adjoining element, and each of said passage-ways formed between said elements registering with the corresponding passage-way formed between the next adjoining elements.

6. A regenerator comprising a plurality of interlocking like elements to form two groups of continuous passage-ways at right angles, said elements being spaced apart in rows, alternate rows of said elements being displaced laterally so that each element is centered with the spaces between elements of the next adjoining rows to form a passage-way, each of said elements being provided with a tenon to project into said spaces, one of said groups of passage-ways registering in vertical rows, and the other of said groups of passage-ways registering in horizontal rows, the passage-ways formed between said elements being parallel to said horizontal rows or passage-ways.

7. A regenerator comprising a plurality of interlocking like elements, each element being symmetrical about each central plane thereof, two groups of passage-ways through each element at right angles, tenons upon two opposite sides of and in a central plane of each element, said elements being spaced apart in superimposed rows, alternate rows being displaced so that the tenons thereof project into the spaces of the next adjoining rows, whereby each passage-way in each of said elements registers with a corresponding passage-way in the next adjoining elements to form two groups of continuous passage-ways at right angles through the composite structure.

In testimony whereof I affix my signature.

JOHN R. BUFFINGTON.