July 28, 1931. W. A. WHITE 1,816,757

HEAT TRANSFERRER

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Fig. 1

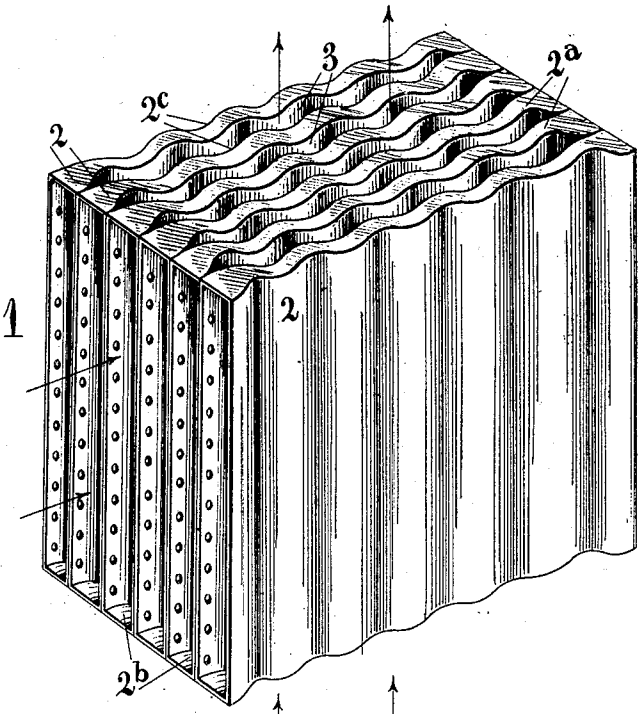
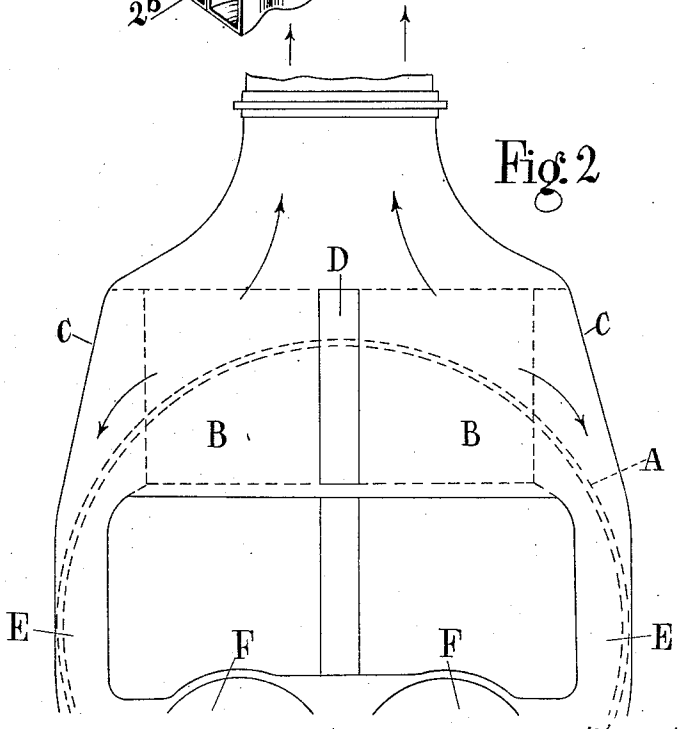


Fig. 2



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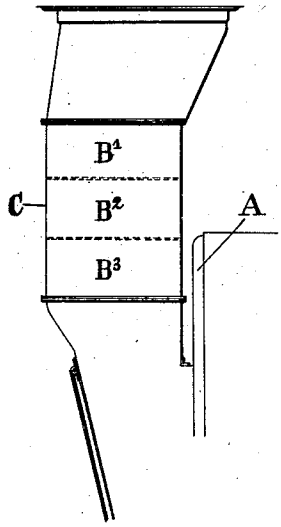


Fig. 5.

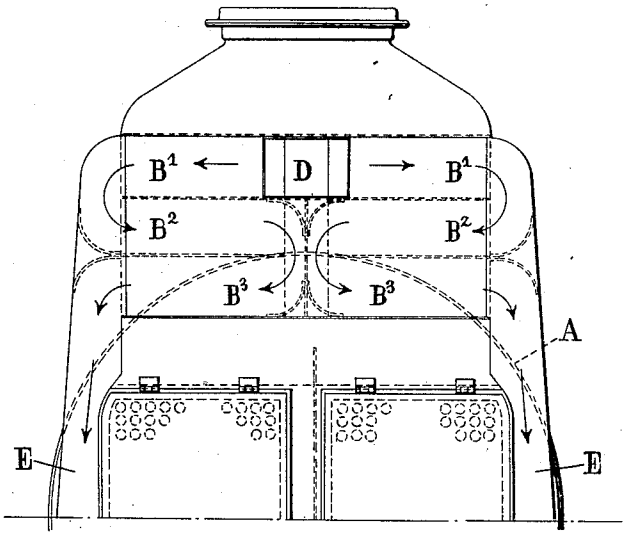


Fig. 3.

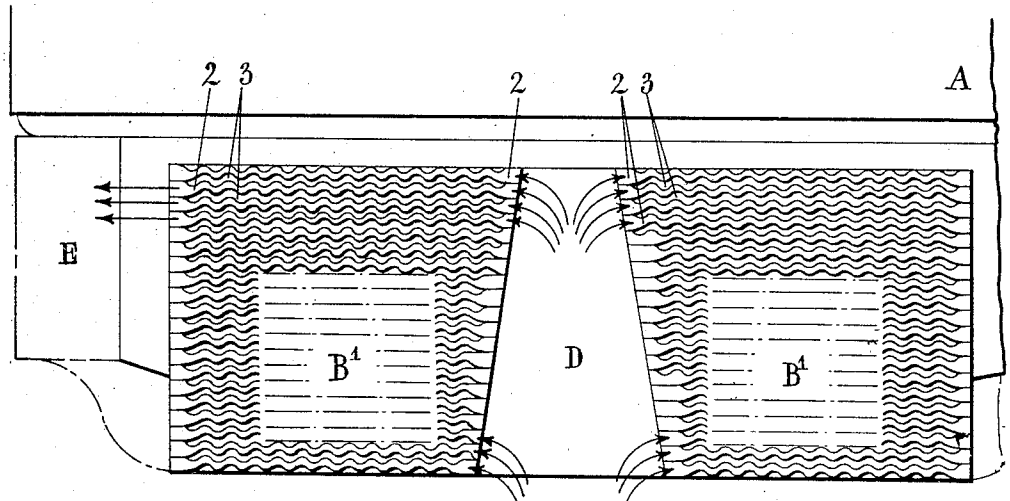


Fig. 4

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HEAT TRANSFERRER

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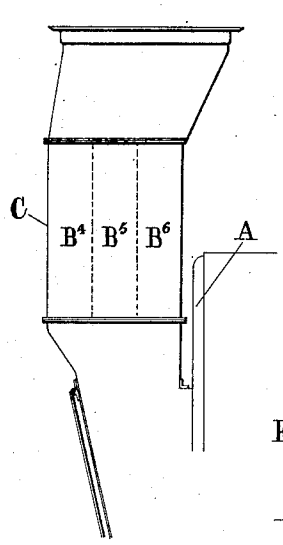


Fig. 8.

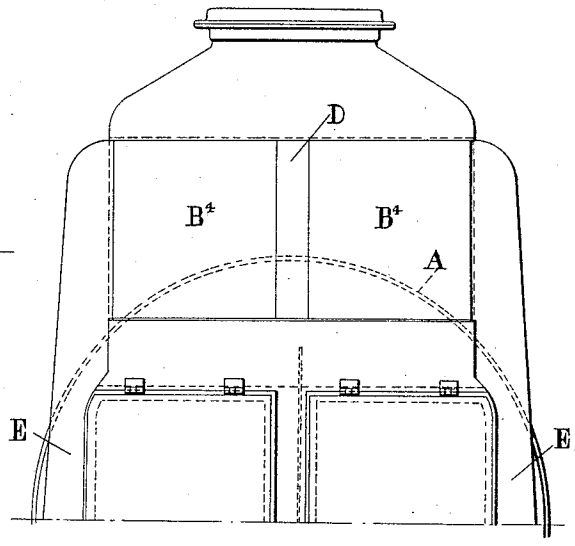


Fig. 6.

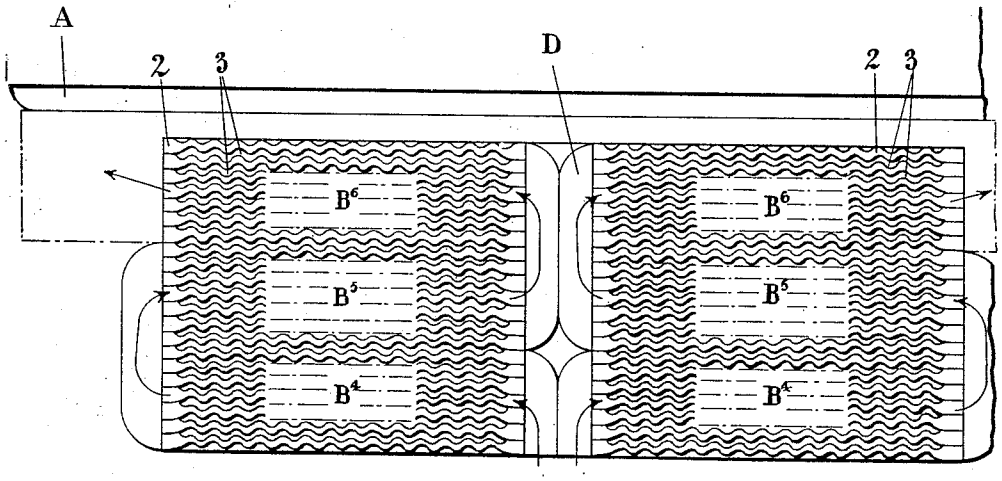


Fig. 7.

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Patented July 28, 1931 1,816,757

UNITED STATES PATENT OFFICE

WILLIAM ALBERT WHITE, OF HEBBURN, ENGLAND

HEAT TRANSFERRER

Application filed March 18, 1929, Serial No. 348,000, and in Great Britain March 21, 1928.

The invention relates to heat-transferring devices of the kind in which heat is transferred from one fluid to another, and though applicable generally, is particularly designed for the air preheaters of steam generators.

The main objects of the invention are to provide a heat-transferring device of cheap and simple construction which in addition can be readily repaired or overhauled.

With such objects, the present invention consists in the improved heat-transferrer cells, the improved heat-transferrers built up of such cells and the improved arrangements of such built-up heat-transferrers all as hereinafter described and particularly pointed out in the claims.

Referring to the accompanying drawings:—

Figure 1 shows a perspective view of one form of heat-transferrer according to the present invention;

Figure 2 shows a front elevation of the heat-transferrer according to Figure 1 applied as an air preheater to a Scotch marine boiler;

Figures 3, 4 and 5 show elevation, plan and side elevation of a modified form of heat transferrer, similarly applied as an air preheater, in which the air to be heated makes a plurality of horizontal passes through the transferrer at different levels; while finally

Figures 6, 7 and 8 show similar views respectively of another form of heat transferrer, applied as an air preheater, in which the air to be heated makes a plurality of horizontal passes through the transferrer at the same level.

The same reference symbols are used in the different figures to denote corresponding parts.

In carrying the invention into effect according to one form suitable for transferring the heat of waste gases to air for combustion or otherwise, the heat-transferring device (see Figure 1) is built up of a series of open-ended unit sections or cells of like design, 2, 2, 2, bolted, riveted or otherwise secured together side by side as shown. Each cell is of flat box-like form open at the ends but closed top and bottom as at 2*a* and 2*b*, and having corrugated sides of large superficial area arranged with the undulations, 2*c*, 2*c*, in approximate correspondence, the effect of such corrugations being on the one hand to increase the effective heating surface as compared with flat sides and on the other hand to increase the efficiency of heat transfer on account of the more turbulent air flow.

The top and bottom members, 2*a* and 2*b*, of sinusoidal contour to correspond with the corrugations may take the form of plates welded in place or they may be detachable, in which case they are preferably provided with checks or shoulders to limit the amount by which they enter as plugs into the sections, where they can be held in poistion by light bolts connecting the top and bottom members.

The top and bottom members, 2*a* and 2*b*, are transversely splayed or enlarged at their ends, as shown, so that when the individual cells are juxtaposed for attachment to one another, the adjacent corrugated walls are a certain distance apart, thereby leaving passages, 3, 3, from top to bottom.

There are thus two sets of passages at right angles through which the heated and the heating gases pass respectively, namely the passages through the individual cells, 2, 2, from end to end thereof and also the passages, 3, 3, between the walls of adjacent cells.

The individual cells may be of any size and number to give the capacity required.

In view of the fact that the sections are interchangeable, and in view also of the transversely splayed ends, damaged sections can readily be replaced without dismantling the entire apparatus.

As applied to a Scotch marine boiler, A, an air heater as described above may conveniently be arranged in two halves, B, B, in the uptake, (see Figure 3) the flue gases passing upwards through the passages, 3, 3, between adjacent cells to the funnel while the air from a fan enters at the centre, D, and passes horizontally in parallel through the cells of the two halves of the air heater, and by way of suitable ducts, E, E, to the Howden or other furnace fronts, F, F.

In Figures 3, 4 and 5 a modified arrangement is shown according to which the air pre-

heater, applied to a Scotch marine boiler, is in two halves, each half being divided into three tiers, B^1, B^2, B^3, placed one above the other. According to this arrangement, the cold air enters by way of the inlet, D, between the upper tiers, B^1, B^1, and passes at different levels successively through the tiers, B^1, B^2, B^3, in opposite directions as shown by the arrows in Figure 3, to the ducts, E, E, leading to the furnace fronts. The flue gases as before flow in an upward direction through the passages, 3, 3, between adjacent cells, 2, 2, of the preheater.

In Figures 6, 7, 8, yet another arrangement is shown, according to which the preheater is in halves as before, each half in effect being divided into three sections, B^4, B^5, B^6, of the full depth available, the cold air entering at the centre, D, as before and flowing at the same level successively through the sections, as shown in Figure 7, by the arrows, to the ducts, E, E.

Although a specific application has been described above, the invention is nevertheless applicable generally to the transfer of heat from one fluid to another, and especially to the transfer of heat from one gaseous medium to another.

Variations may be made in the details of construction of the apparatus without exceeding the scope of the invention.

Having now described my invention, what I claim as new and desire to secure by Letters Patents is:—

1. As an article of manufacture, a self-contained open-ended heat-transferrer cell having corrugated sides, and a top and a bottom member of sinusoidal contour secured thereto, to define the position of said corrugated sides.

2. As an article of manufacture, a self-contained open-ended heat-transferrer cell having corrugated sides, and a top and a bottom member of sinusoidal contour secured thereto to define the position of said corrugated sides, said top and bottom members diverging at the ends to splay out laterally the open ends of said cell.

3. A heat-transferrer comprising a plurality of like cells as claimed in claim 1, assembled side by side with their open ends juxtaposed; together with means for attaching said juxtaposed ends together.

4. A heat-transferrer comprising a plurality of like cells as claimed in claim 2, assembled side by side with their splayed open ends juxtaposed together with means for attaching said splayed open ends together.

5. An air-preheater for a steam generator comprising in combination an uptake for the furnace gases and disposed in said uptake two groups of cells as claimed in claim 1, said cells being assembled side by side and said groups being spaced apart to provide a central combustion-air inlet to the open ends of the cells of the two groups disposed adjacent to said central inlet; together with combustion-air ducts leading to the furnaces from the open ends of the cells of the two groups disposed remote from said central inlet.

6. An air-preheater for a steam generator, comprising in combination an uptake for the furnace gases and disposed in said uptake a plurality of groups of cells as claimed in claim 1, said cells being assembled side by side; means connecting the outlet of one group of cells to the inlet of the next group to cause combustion air to flow through said groups in series; together with combustion-air ducts leading to the furnaces from the outlet and of the last of said groups.

7. An air-preheater for a steam generator, comprising in combination an uptake for the furnace gases and disposed in said uptake at different levels a plurality of groups of cells as claimed in claim 1, said cells being assembled side by side; means connecting the outlet of one group of cells to the inlet of the next group to cause combustion air to flow through said groups in series from above downwards; together with combustion-air ducts leading to the furnaces from the outlet end of the lowest of said groups.

In testimony whereof I have signed my name to this specification.

WILLIAM ALBERT WHITE.