N° 19,493 A.D. 1913

(*Under International Convention.*)

Date claimed for Patent under Patents and Designs Act, 1907, being date of first Foreign Application (in Germany), 18th Sept., 1912

Date of Application (in the United Kingdom), 28th Aug., 1913

At the expiration of twelve months from the date of the first Foreign Application, the provision of Section 91 (3) (a) of the Patents and Designs Act, 1907, as to inspection of Specification, became operative

Accepted, 15th Jan., 1914

COMPLETE SPECIFICATION.

Improvements in Heat Exchangers.

I, WILHELM MAYBACH, of 9, Freiligrath Strasse, Cannstatt, in the Kingdom of Württemberg, German Empire, Engineer, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to heat exchangers for heat radiators, cooling apparatus and the like and has for its object to increase the efficiency of such apparatus.

Hitherto, the air has usually been caused to traverse the heat-radiating surfaces in a direction parallel thereto. This has the drawback that the heat is absorbed only by the air nearest the heat-radiating surfaces. Moreover, the air being superheated is thus rendered dangerous to the health, when employed for heating buildings, whilst furthermore it gradually absorbs less heat as it rises until it at last ceases to absorb any heat. The heating surface is thus very inefficiently utilized, which is especially noticeable in gas-stoves in which the upper part is moreover not so warm.

According to the present invention, alternate adjacent air inlet and outlet conduits are provided, which are open at their longer sides, these conduits being arranged short distances apart and directed at their open sides towards the heat-radiating surfaces so that the air entering the inlet conduits under either natural or artificial draught traverses the heating surfaces over the whole length of the conduits, passing transversely around their inner edges, and is thus heated and passes away through the outlet conduits, so that the whole of the air supplied is uniformly heated, without being superheated to a degree dangerous to health, whilst, moreover, the greatest possible absorption of heat is attained. The conduits and heating surfaces are enclosed in a draught-inducing casing. Furthermore, the entry and exit openings of the conduits are inclined, so that the cross-sectional area of the air passage through the draught-inducing casing is in no way or inappreciably diminished by the conduits, thereby also resulting in a saving in material for the conduits, which also results from arranging the conduits adjacent to each other with a common partition.

In order that the invention may be more clearly understood, reference is made

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to the accompanying drawings which show various embodiments of my invention by way of example.

Fig. 1 is a vertical sectional view through a heat radiator constructed according to the present invention, the left-hand side of the figure showing one construction and the right-hand side showing a modification thereof.

Fig. 2 is a side view with the outer casing in section, the left-hand part showing the heat radiator illustrated in the left-hand half of Fig. 1 and the right-hand part of Fig. 2 showing a heat radiator constructed as illustrated in the right-hand half of Fig. 1.

Fig. 3 is a horizontal sectional view substantially on the line A—B of Fig. 1 but the lower right-hand half showing two further modifications.

Fig. 4 is a vertical sectional view illustrating a water cooler constructed according to the present invention.

On the drawings, Figs. 1 to 3, *a* designates the heat radiating surfaces, *b* the air inlet conduits, *c* the air outlet conduits, and *d* the inwardly turned flanges of the conduits *c*. In the left-hand half of Figs. 1, 2 and 3 the heating surface is shown provided with transverse ribs *e* whilst in the right-hand half of Figs. 1, 2 and 3, the heating surface is shown provided with longitudinal ribs *f* one for each air inlet and outlet conduit. The whole is enclosed in a draught inducing casing *g* open below for the entry of air and continued upwardly above the heat-radiating surfaces *a* so as to increase the natural draught.

The air inlet conduits *b* and outlet conduits *c* are separated by a common triangular partition 1, 2, 3 (see Fig. 1), bent as shown in section in Fig. 3 so that the outlet conduits *c* are closed at 1, 2 whilst the inlet conduits *b* are closed at 2, 3. To permit the free passage of the air through the casing *g*, the total area of the air inlet openings 1, 2 as well as the total area of the air outlet openings 2, 3, and also the total free passage between the flanges *d* and the heat-radiating surface must each be about as large as the cross-sectional area 1, 4 of the casing *g*, and for this purpose the inlet openings 1, 2 and outlet openings 2, 3 are arranged at an inclination. Instead of making the opening 1, 2 long and the opening 2, 3 short, the size of the openings may be reversed or the apex 2 may be taken at any desired point and, if desired, arranged midway between the points 1 and 2 so that in this case the air inlet and outlet conduits may be made of equal dimensions throughout.

As indicated at f^1 in Fig. 3 the vertical ribs may be of sufficient width to divide the air outlet conduits *c* into two separate compartments. Or as indicated at f^2 in Fig. 3 the vertical rib may be made integral with the casing of the conduit *c* and form one side of the conduit *b*.

In Fig. 4, *h* designates the cooling lamellar plates of a water cooler between which are arranged air inlet conduits *b* and outlet conduits *c*, two such conduits being arranged between each pair of cooling plates *h* through which the cooling air may pass either under natural or artificial draught.

The operation of the device is as follows:—

Cold air enters the lower part of the casing *g* (Fig. 1) and rises owing to the heat of the heating surfaces in the direction of the arrows through the air inlet conduits *b* and, striking the heating surfaces *a* is deflected around the flanges *d*, as indicated by the arrows in Fig. 3, thereby traversing close to the heating surfaces *a* for a short distance and thereupon, in its then heated condition, it enters the outlet conduits *c* where it is conducted away for heating purposes. The exchange of heat thus takes place as the air passes from the inlet conduits *b* to the outlet conduits *c* uniformly over the whole heating surface. The transverse ribs *e* and longitudinal ribs *f*, f^1 or f^2 serve, in the usual manner, to increase the heat-radiating surface.

If desired, the casing *g* below the point 2 may be wholly dispensed with so that the air enters the side 1—2 of the air inlet conduits directly, whilst the side 1—2 of the air outlet conduits may be of any other suitable shape and serve as a casing.

The conduits may also be adapted to irregular or uneven heating surfaces or to radiators of circular or oval cross-section by suitable modification thereof.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. In a heat exchanger, alternate adjacent air inlet and outlet conduits open at their longer sides and directed at their open sides towards the heat radiating surfaces so that the air entering the inlet conduits traverses the heating surfaces over the whole length of the conduits, passing transversely around their inner edges, substantially as described.

2. A heat exchanger as claimed in Claim 1 in which the inlet and outlet openings of the conduits are inclined substantially as and for the purpose set forth.

3. A heat exchanger as claimed in Claims 1 or 2 in which the conduits are constructed substantially as described with reference to the accompanying drawings.

4. In a heat exchanger as claimed in Claims 1, 2 or 3, a series of vertical ribs on the heat-radiating surfaces, one for each air inlet and outlet conduit, substantially as described.

Dated this 28th day of August, 1913.

JENSEN & SON,
77, Chancery Lane, London, W.C.,
Chartered Patent Agents.

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MAYBACH'S Complete Specification.

(1 SHEET.)

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

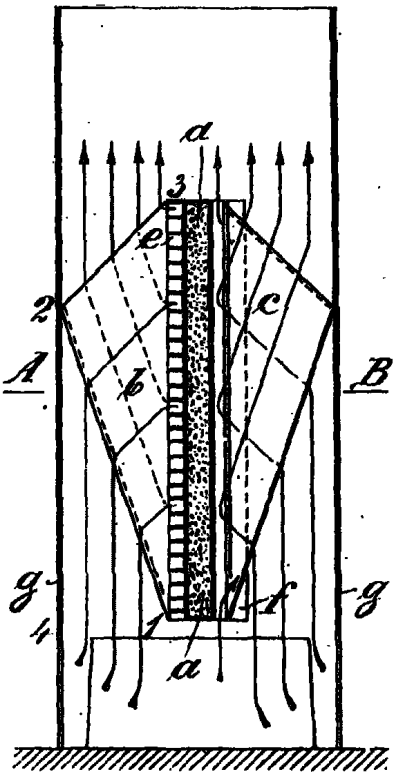


Fig. 2.

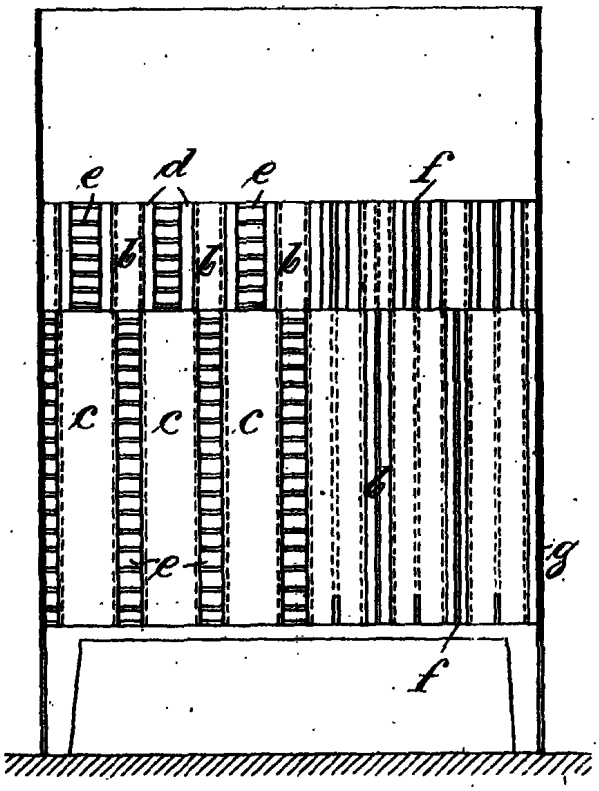


Fig. 3.

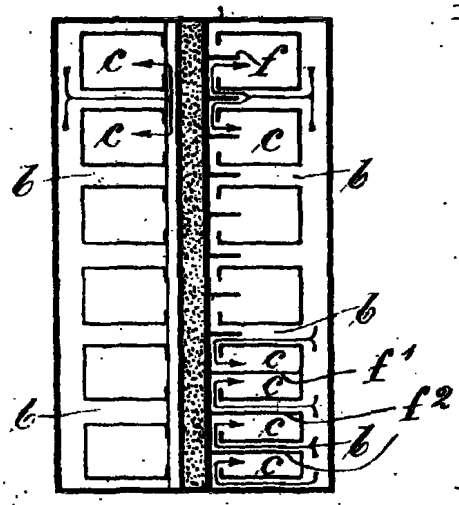
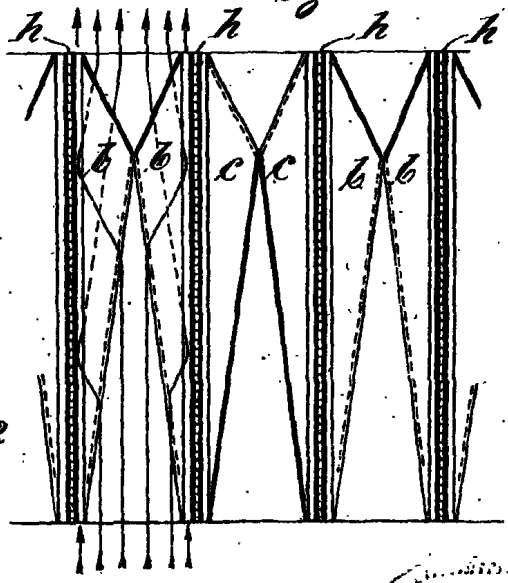


Fig. 4.



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