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W. LONSDALE

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PLATE AIR HEATER CONSTRUCTION

Filed April 10, 1928

Fig. 1,

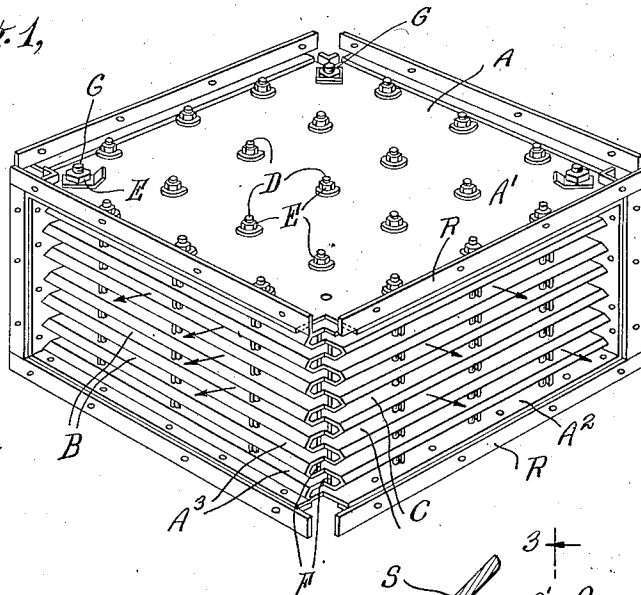


Fig. 2,

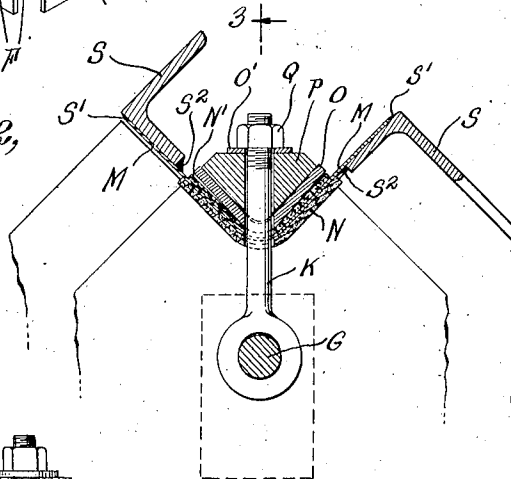
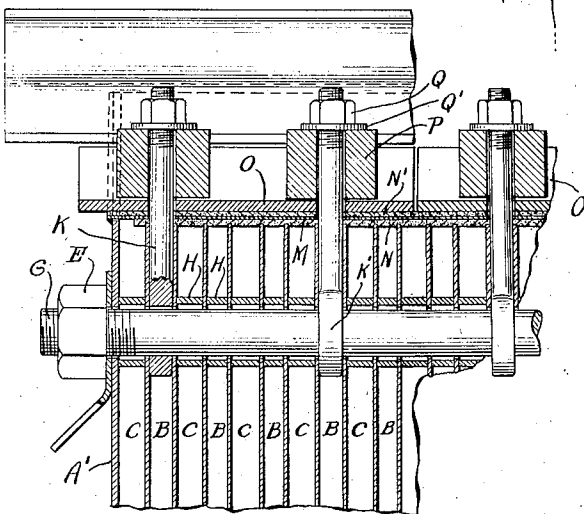


Fig. 3,



3 +

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UNITED STATES PATENT OFFICE.

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PLATE AIR-HEATER CONSTRUCTION.

Application filed April 10, 1928. Serial No. 268,845.

The present invention relates to plate air heater units in each of which a multiplicity of suitably shaped plates are arranged to form cells, which are alternately open at their sides and ends. The heater unit is thus formed with two sets of channels providing paths of flow perpendicular to each other in parallel planes, one for the heating gases and the second for the air or other gas to be heated. In forming the cell structure, each plate is cut away at the corners and corner pieces are provided for separating the air and heating gas channels. Air heater units of the above type are disclosed in U. S. Reissue Patent, 16,807 to Eugen Haber, reissued December 6, 1927.

The object of my present invention is to provide improved means for sealing the portion of the air and heating gas channels at each corner of the heater unit.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, and the advantages possessed by it reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described a preferred embodiment of the invention.

Of the drawings:

Fig. 1 is a perspective view of a heater unit with the corner piece removed from the front corner;

Fig. 2 is an enlarged plan view partly in section of the corner sealing means in position; and

Fig. 3 is a sectional elevation on the line 3—3 of Fig. 2.

In the drawings and particularly in Fig. 1 I have illustrated an air heater unit A having top and bottom plates A' and A² respectively and intermediate plates A³. Each of the plates A³ is cut away at its corners and the projecting end portions formed by that operation are bent to unite with bent portions of adjacent plates forming a plurality of cells. The end portions of the plates are so bent that channels are formed in the cells and alternately open in directions at right angles to one another. In the construction shown the channels B are used for the passage of the heating

gases and the channels C are utilized for the passage of the air to be heated. As shown in Fig. 1, portions of the channels are open to each other at each corner of the unit. It has been found extremely difficult due to the high temperature conditions present to provide effective means for sealing the corners of the heater unit so that the individual channels may be separated from one another and a gas-tight construction maintained.

In the construction shown the individual plates A³ are connected by through bolts D, each of which extends beyond the top and bottom plates A' and A² of the heater unit and is provided with a nut E threaded on each end. The individual plates forming each cell are usually separated by undulated strips of sheet metal F extending parallel to the closed sides of each channel. These strips serve to space the plates apart a uniform distance when the nuts E are tightened and also serve to divide the individual channel into separate sections.

The improved provisions of my present invention for sealing each corner of the heating unit comprise a stay bolt G located adjacent each corner and within the heater unit. As illustrated in Fig. 3 the plates A³ are separated at the points surrounding the openings in the plates through which the stay bolts G pass by metal bushings H. At spaced points along each stay bolt G and preferably within a heating gas channel B eye bolts K are provided in lieu of the bushings H. Each eye bolt is arranged with its enlarged end K surrounding the corresponding bolt G and with its outer threaded end extending out through the corner of the unit. A vertical strip of sheet metal M is positioned in each corner of the unit and separated from the edge portions of the individual plates by a strip of asbestos packing. The strip is bent transversely to conform to the shape of the cut out corner portions. On the outer side of the metal strip is placed a second strip of packing N'. Each strip is perforated at spaced points along its length for the passage therethrough of the eye bolts K.

Means are provided for maintaining a uniform pressure on the metallic strip M throughout its length and comprise thick steel plate sections O suitably bent transversely and mounted on the eye bolts, the

ends of each plate section being approximately in contact with the ends of adjacent sections. Each plate section is provided with openings along its length for two eye bolts. Each plate section O is forced against the packing strip N' by a cast iron block or keep P mounted on the outer end of each eye bolt. Each block P is substantially triangular in cross section as shown in Fig. 2 and contacts with the outer side of the corresponding plate section O. The various parts are pressed into position in the corner by tightening the nuts Q threaded on the outer end of the stay bolts G and separated from the base of the corresponding block P by a washer Q'.

Each heater unit is adapted to be assembled with similar units to obtain the required amount of heating surface for each installation. The edge portions of each heater unit are therefore provided with flanges R to which corresponding flanges on the units to be assembled therewith are connected. The corner flanges are formed by welding an angle beam S to each projecting end of the metallic strip M at the points S' and S².

My invention is characterized by the simplicity and effectiveness of the sealing provisions and the ease in which they can be incorporated into the heater unit. The arrangement of the plates and blocks provides a uniform pressure on all parts of the packing and metallic strip and has been found effective in maintaining a gas-tight joint under high temperature conditions. The corner pieces can be easily removed for renewing the packing strips or other parts without removing the stay bolt or the eye bolts thereon.

While in accordance with the provisions of the statutes, I have illustrated and described the best form of embodiment of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit of my invention as set forth in the appended claims and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

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

1. A heating unit comprising in combination a plurality of superposed plates having angle portions cut away at the corners, the edges of said plates being bent so that a plurality of channels are formed, alternate channels being arranged to open at different sides, and means inserted in a cut away corner of said plates for separating said channels, said means comprising a stay bolt extending through said plates, a metallic strip

extending substantially parallel to said stay bolt and means connected to said stay bolt for holding said strip in position in said corner.

2. A heating unit comprising in combination a plurality of superposed plates having angle portions cut away at the corners, the edges of said plates being bent so that a plurality of channels are formed, alternate channels being arranged to open at different sides, and means inserted in a cut away corner of said plates for separating said channels, said means comprising a stay bolt extending through said plates, a bent metallic strip extending substantially parallel to said stay bolt, a plurality of heavy plate sections in end to end relation on the outer side of said metallic strip, packing interposed between said strip and angle portions and between said strip and said plate sections, and means connected to said stay bolt for holding said strip, packing, and plate sections in position in said corner.

3. A heating unit comprising in combination a plurality of superposed plates having angle portions cut away at the corners, the edges of said plates being bent so that a plurality of channels are formed, alternate channels being arranged to open at different sides, and means inserted in a cut away corner of said plates for separating said channels, said means comprising a stay bolt extending through said plates, a bent metallic strip extending substantially parallel to said stay bolt, a plurality of heavy plate sections in end to end relation on the outer side of said metallic strip, a plurality of eye bolts connected to said stay bolt and extending through said strip and plate sections, and means on said bolts for holding said strip and plate sections in position in said corner.

4. A heating unit comprising in combination a plurality of superposed plates having angle portions cut away at the corners, the edges of said plates being bent so that a plurality of channels are formed, alternate channels being arranged to open at different sides, and means inserted in a cut away corner of said plates for separating said channels, said means comprising a stay bolt extending through said plates, a bent metallic strip extending substantially parallel to said stay bolt, a plurality of heavy plate sections in end to end relation on the outer side of said metallic strip, a plurality of eye bolts connected to said stay bolt and extending through said strip and plate sections, a block mounted on each of said eye bolts arranged to contact with one of said plate sections, and means on said eye bolts for holding said strip, plate sections, and blocks in position in said corner.

5. A heating unit comprising in combination a plurality of superposed plates having angle portions cut away at the corners, the

edges of said plates being bent so that a plurality of channels are formed, alternate channels being arranged to open at different sides, and means inserted in a cut away corner of said plates for separating said channels, said means comprising a stay bolt extending through said plates, a bent metallic strip extending substantially parallel to said stay bolt, a pair of longitudinally extending flanges mounted on opposite edges of said metallic strip, a plurality of heavy plate sections in end to end relation on the outer side of said metallic strip, and means connected to said stay bolt for holding said strip, and plate sections in position in said corner.

6. A sealing means for apparatus having cut away corner portions comprising a vertical stay bolt mounted in said apparatus, a metallic strip extending parallel to said bolt, a plurality of plate sections in end to end relation on one side of said strip, a plurality of eye bolts mounted on said stay bolt and projecting through said strip and plate sections, and means on said eye bolts for holding said strip and plate sections in position in said corner.

Signed at New York city, in the county of New York and State of New York, this 7th day of April, A. D. 1928.

WILLIAM LONSDALE.