

Dec. 22, 1936.

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2,064,928

PACKING JOINT FOR HEAT EXCHANGERS

Filed Nov. 22, 1935

3 Sheets-Sheet 1

Fig. 1.

Fig. 2.

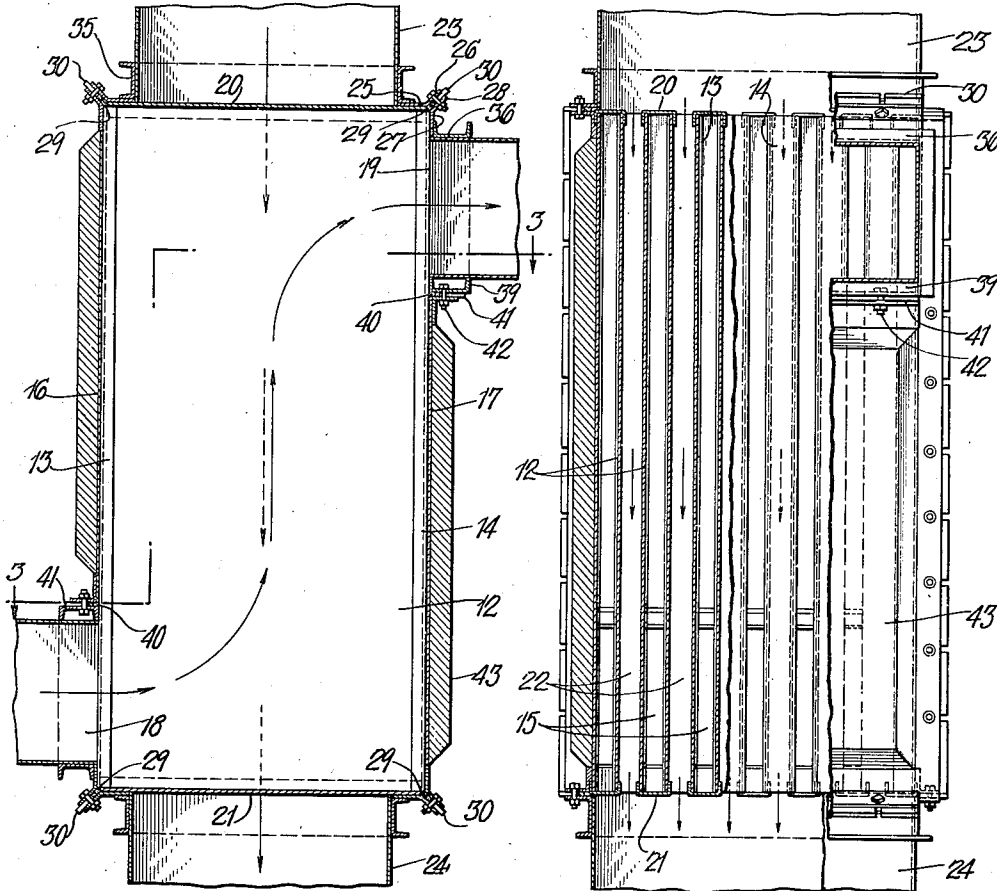
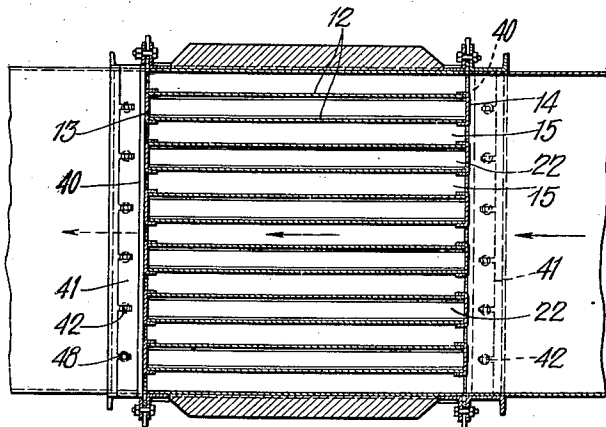


Fig. 3.



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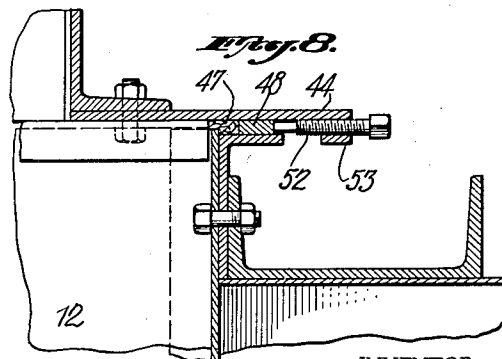
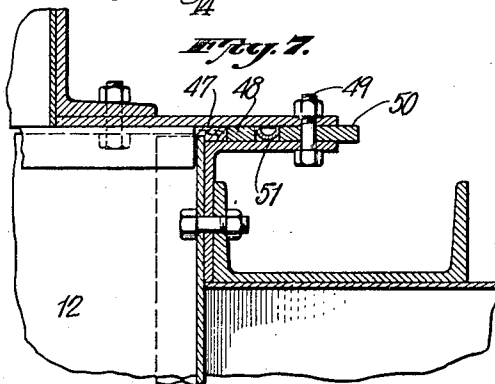
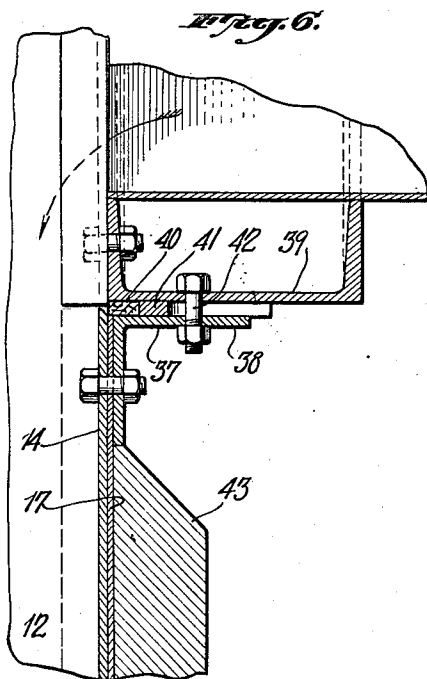
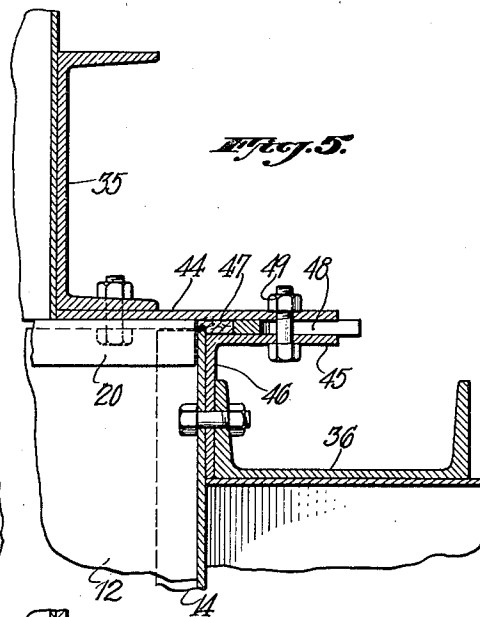
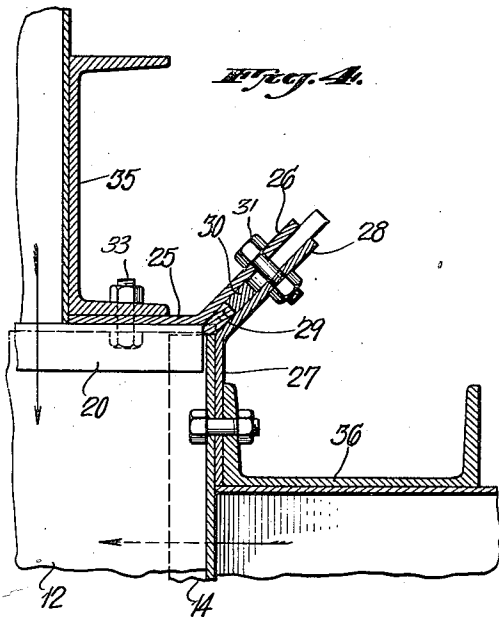
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3 Sheets-Sheet 2



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PACKING JOINT FOR HEAT EXCHANGERS

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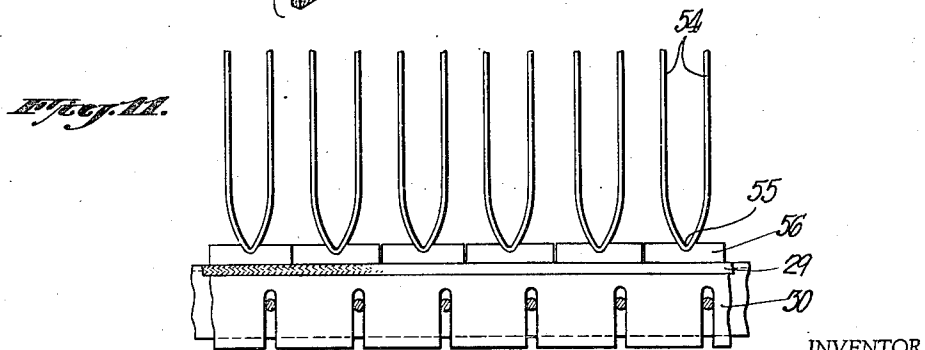
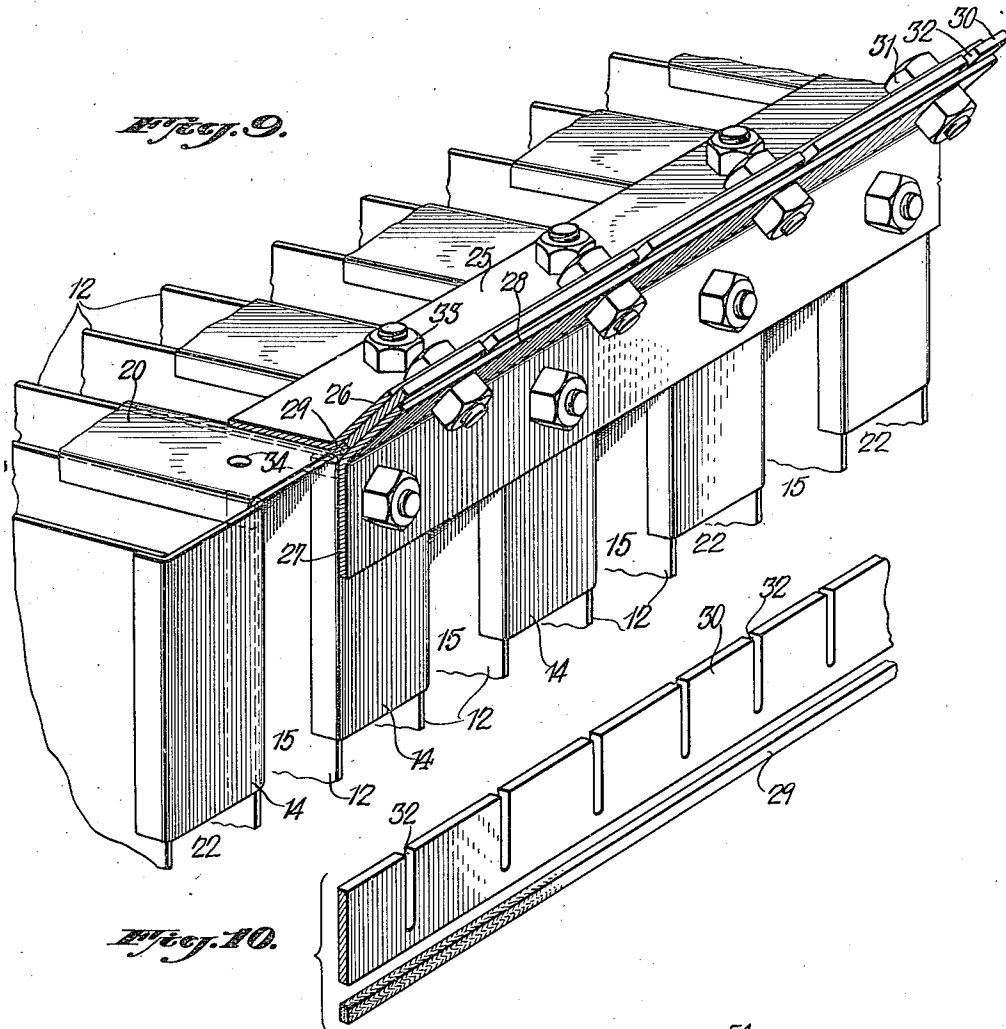
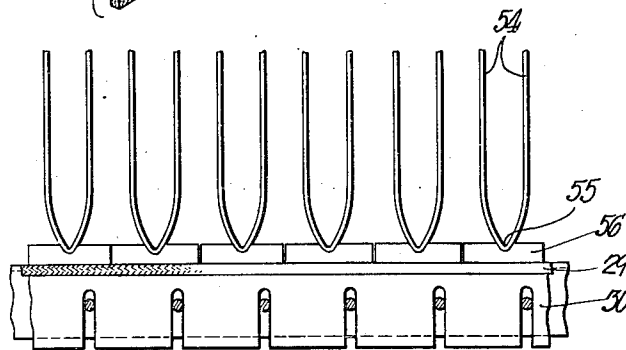


Fig. 11.



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UNITED STATES PATENT OFFICE

2,064,928

PACKING JOINTS FOR HEAT EXCHANGERS

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9 Claims. (Cl. 257-224)

My invention relates to a packing joint for heat exchangers, and more particularly to a heat exchanger having a multiplicity of parallel spaced plates to form alternate passages, one for the heating fluid and the other for the heat receiving fluid. An example of this type of heat exchanger is shown in the Watson and Lewis Patent 1,833,666. As will be apparent from Fig. 1 of this patent, one of the fluids, either the heating or heat receiving fluid, passes straight through the heat exchanger from the top to the bottom through spaced passages, and the other fluid passes through the passages between those of the first fluid by means of entrances and exits at the sides of the plates.

In heat exchangers of the above and other similar types, it is important or desirable that the two fluids remain separated. Due to the fact that a multiplicity of plates cannot, in practice, all be made of precisely the same length and width, the joints between the flanges connecting the heat exchanger passages with the ducts leading thereto or therefrom have heretofore been packed with asbestos or some similar substance to fill crevices of corners caused by irregularities in the metal surfaces of the various elements. Asbestos and other similar packing elements undergo changes during the course of time that cause them to shrink or otherwise lose their effectiveness as packing elements. Asbestos, for example, when heated above about 700° to 800° F., begins to dehydrate rapidly and lose its elasticity. Even when heated to lower temperatures for a long period of time as, for example, a year, it tends to lose its elasticity. Since there is no convenient method of tightening the gasket or packing, it must be replaced or leaks will occur at the joints.

The exteriors of heat exchangers of the above type are generally heavily insulated against loss of heat, and the removal of portions of the metal work to replace the packing requires the removal or destruction of a valuable part of the insulation, and also increases the time required for replacing such packing.

The above difficulties and disadvantages are obviated in my present invention in which a packing is provided in which the packing material may be molded or pressed into the joint without removing or replacing any parts, and may thereby readily be tightened from time to time.

The various features of the invention are illustrated in the accompanying drawings, in which—

Fig. 1 is a vertical sectional view of a heat exchanger having joints embodying a preferred form of the invention, the section being taken on a plane parallel to the walls or plates separating the fluid passages.

Fig. 2 is a vertical sectional view taken on a plane at right angles to that of Fig. 1.

Fig. 3 is a horizontal sectional view of the heat exchanger shown in Figs. 1 and 2.

Fig. 4 is a detail section on a larger scale of the joint and packing.

Figs. 5, 6, 7, and 8 are similar sections of different modifications of the joint.

Fig. 9 is a perspective view of the joint shown in Fig. 4.

Fig. 10 is a packing element of the joint shown in Fig. 4.

Fig. 11 is a diagrammatic view of a portion of a different type or construction of heat exchanger embodying the invention.

The invention is illustrated in Figs. 1, 2, 3, and 9 as applied, by way of example, to the type of heat exchanger shown in the above referred to Patent 1,833,666, but it will be understood that it is applicable to other constructions of heat exchangers.

In this type of heat exchanger successive pairs of vertical plates 12 are joined, as shown in Fig. 3, at their opposite side edges by connecting channels 13 and 14 to form flat tubes or passages 22 spaced apart by interpositioned passages 15 open at opposite sides. These passages 15 are partially closed by plates 16 and 17, as shown in Fig. 1, leaving the inlet and outlet openings 18 and 19 and are closed at their upper and lower ends by closing plates 20 and 21. The passages 22 are open at the top and bottom so that fluid may pass directly downwardly or upwardly therethrough. A suitable inlet 23 and an outlet 24 are provided for the passages 22.

The assembly of passages thus formed is closed at the various corners by the joint and packing of this invention.

In the embodiment of this joint shown in Figs. 1 to 4 inclusive, and Fig. 9, the joint comprises a plate 25 on one wall having an extension 26 at an angle of about 135° from the outer edge of said plate 25, and a plate 27 on the adjoining wall having an extension 28 slightly spaced from and substantially parallel to the extension 26 so as to define a narrow space between. Into this space is inserted a mass of packing material 29, such as asbestos or other suitable packing material. This packing material may be in loose fibrous form, or braided or molded in accordance with the

practices and conditions of use. It is forced inwardly against the edges of the plates 12, 14, and 20 by means of a plate 30 extending longitudinally in the space between the extensions 26 and 28 so as to pack the packing material 29 and mold it into the crevices or spaces between the plates. The plate 30 is then gripped into position by bolts 31 which extend through the spaced slots 32 in the plate 30 and are tightened to cause the plate extensions 26 and 28 to grip the plate 30. If at any time the packing 29 shrinks or loses its elasticity, or leaks otherwise occur, it may be remolded in the joint by driving inwardly the plate 30 as, for example, with a sledge hammer. It may not be necessary to loosen the bolts 31 which will not prevent movement of the plate 30 under a heavy blow or impact, but may hold it securely against the expansive action of the packing.

The plates 25 and 27 are shown as secured to the closing plates 20 and 14 by means of bolts 33 passing through openings, such as 34, in the plates, but it will be understood that any suitable means may be used to provide the spaced plate extensions 26 and 28.

As shown in Fig. 4, the channel irons 35 and 36 forming the frame for the outlets and inlets may be bolted to the plates 25 and 27, respectively. As shown in Fig. 6, my invention provides a packing between similar channel irons and the plates 16 and 17. In this joint an angle member 37 is bolted to the plate 17 and channels 14 and has a flange 38 parallel to and slightly spaced from a flat surface 39 of the channel structure. A packing 40 and a driving plate 41 are inserted in this space between the flanges 38 and 39 so that by driving the packing plate 41 inwardly, the packing 40 is compressed against the outer surface of the plate 17 and forms a tight joint between the channel member 39 and the plate. The plate 41 is maintained in position by the tightening bolt 42.

In all of the above constructions the exterior insulation 43 covering the outer surface of the heat exchanger may remain in place while the plates 30 and 41 are tightened or driven into position inasmuch, as the insulation does not cover these plates and access is only required to the striking edge thereof.

In the form shown in Fig. 5, the construction is modified by having the extension of one of the plates, for example, the plate 44, corresponding to the plate 25 of Fig. 1, extend flatly or beyond the vertical edges of the plates 12, and the extension 45 of a plate 46, corresponding to the plate 27 of Fig. 1, at an angle of 90° and slightly spaced from the extension of the plate 44. A packing 47 and a forcing or packing plate 48 and tightening bolt 49 in this construction may be tightened and function similarly to the corresponding elements in the modification shown in Figs. 1 to 4, inclusive, and Fig. 9.

A modified form of forcing plate arrangement is shown in Fig. 7 illustrated, by way of example, as applied to the type of construction shown in Fig. 5. In this case the packing or forcing plate 48 is not grooved to extend outwardly beyond the tightening bolts 49, but the bolts 49 secure and hold the plate 50 to confine a spring 51 so that it will at all times exert an inward pressure towards the packing 47 and thus compensate for any loss of resiliency in the packing material.

Connector means for forcing and retaining the packing plate 48 is shown in Fig. 8, also illustrated by way of example as applied to the construction shown in Fig. 5. In this embodiment,

the plate 48 is forced inwardly by a screw 52 which passes through a side extension 53 of the wall 44 so that by merely turning the screw 53, the plate 48 will be forced inwardly.

It will of course be understood that the means shown in Figs. 7 and 8 for forcing or maintaining the plate 48 tightly against the packing 47 may be used on any embodiment of this invention, being illustrated in the construction shown merely by way of example and not requiring repetition on other specific forms to show its applicability thereto.

In the modification shown in Fig. 11, the joint is shown as applied to heat exchangers in which pairs of walls 54 converge to a closure 55. These plates are maintained in proper positions by spacers 56 against the closed ends 55. The corners may be provided with spaced plate extensions between which is fitted packing material 29 and a packing bar 30 similar to that shown in Fig. 10 and Figs. 1 to 4 inclusive, and Fig. 9.

Through the above invention a packing means is provided which is readily accessible at all times from the exterior, even though the apparatus may be covered throughout with insulation except for the exposed edges of the packing bar or plate.

The invention is applicable to any type of packing, whether metallic such as copper, or lead, wool or asbestos or composition. It enables the material to be promptly and easily forced into the joint to maintain a fluid tight condition. The forcing bar is sufficiently flexible by reason of the slots 32, or otherwise to permit it to adjust itself to slight variations in the thickness of the packing material, or to other requirements.

What I claim is—

1. A packing for a joint between two wall plates disposed at an angle to each other, which comprises spaced plates extending in parallel spaced relation, one from the outer surface of one of said wall plates and the other from the outer surface of said other of said wall plates, packing material between said extending plates, and means movable inwardly towards said joint to compact said packing into said joint.

2. A packing for a corner joint between two wall plates meeting at an angle, which comprises spaced plate extensions, one from the outer surface of one of said wall plates and the other from the outer surface of the other of said wall plates, packing material between said plates, and means movable inwardly towards said joint to compact said packing into said joint.

3. A packing for a corner joint between two wall plates meeting at a right angle which comprises plate extensions, one extending at an angle of 135° from the outer surface of one of said wall plates and the other extending at an angle of 135° from the outer surface of the other of said wall plates and slightly spaced from said first extension, packing material between said plates, and means movable inwardly towards said joint between said extensions to compact said packing into said joint.

4. A packing for a corner joint between two wall plates meeting at an angle which comprises spaced plate extensions, one from the outer surface of one of said wall plates and in substantially the same plane therewith, and the other from the outer surface of the other of said wall plates and at an angle to space it substantially uniformly from said first extension, packing material between said plates, and means movable

between said plates inwardly towards said joint to compact said packing into said joint.

5 5. A packing for a corner joint between two wall plates meeting at an angle which comprises spaced plate extensions, one from the outer surface of one of said plates, and the other from the outer surface of the other of said plates, packing material between said plates, a packing bar having an edge abutting said packing material and having slots extending outwardly towards the outer edges of said extensions, and clamping bolts through said extensions and said slots.

10 6. A packing for a corner joint between two wall plates meeting at an angle which comprises spaced plate extensions, one from the outer surface of one of said wall plates, and the other from the outer surface of the other of said wall plates, packing material between said plates, means movable inwardly towards said joint to compact said packing into said joint, and resilient means for forcing said movable means towards said packing.

20 7. A packing for a corner joint between two wall plates meeting at an angle which comprises spaced plate extensions, one from the outer surface of one of said wall plates, and the other from the outer surface of the other of said wall plates, packing material between said plates, means movable inwardly towards said joint to compact

said packing into said joint, and screws for forcing said plate inwardly towards said packing material.

8. A heat exchanger comprising a series of spaced plates, a series of closing means to connect successive pairs of said plates at their opposite sides to form a passage between the plates of each of said pairs, means to space said pairs of plates apart and to close the ends of the spaces between the said pairs to provide passages between the said pairs, corner plates secured to said plate assembly at the corners thereof and having extensions outwardly from said corners, packing material between said extensions, and means to force said packing inwardly towards the corners of said plates.

9. A heat exchanger comprising a series of spaced substantially parallel plates, end closure plates for successive pairs of said plates, side closure means to close the side edges of said plates in pairs staggered with relation to the end closures, a pair of corner plates for each corner of said assembly, covering the outer edges of said plates near the respective corners, and having spaced outward extensions therefrom, packing material in said extensions, and means for forcing said packing inwardly towards the corners of said plates to form an air tight joint.

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