Feb. 24, 1925. 1,527,689

E. C. LEWIS

STEAM PLATE

Filed Feb. 9, 1924

Fig. 1.

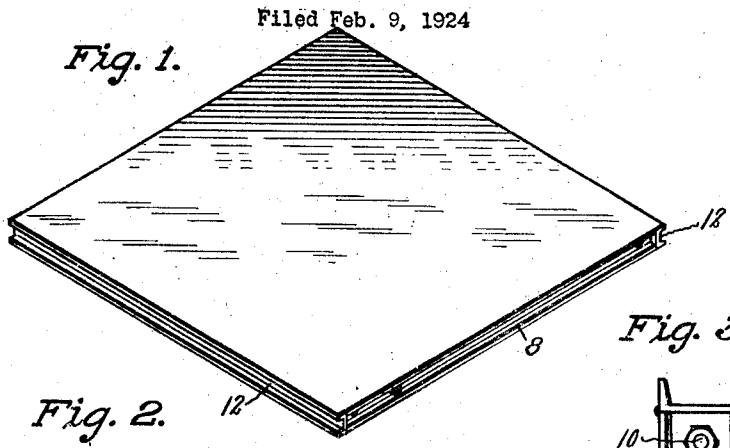


Fig. 2.

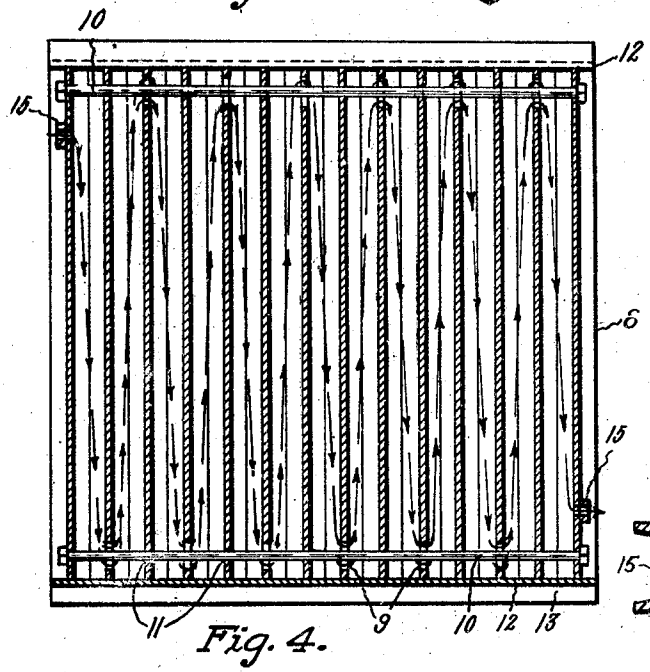


Fig. 3.

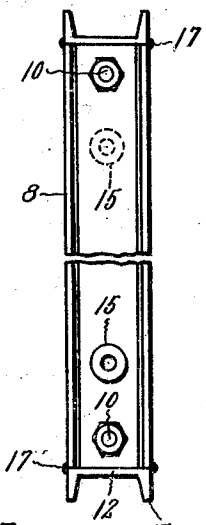


Fig. 5.

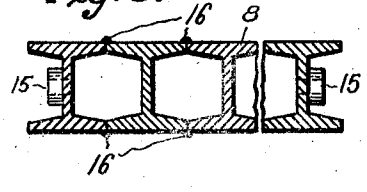


Fig. 4.

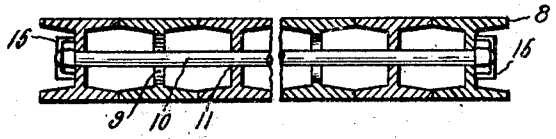


Fig. 6.

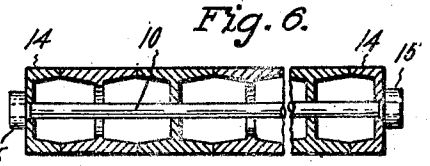
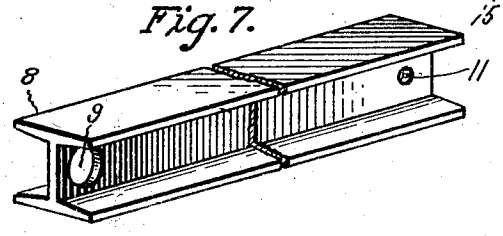


Fig. 7.



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UNITED STATES PATENT OFFICE.

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STEAM PLATE.

Application filed February 9, 1924. Serial No. 691,799.

To all whom it may concern:

Be it known that I, EARL C. LEWIS, a citizen of the United States, residing at Swampscott, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Steam Plates, of which the following is a specification.

The present invention relates to steam plates which are used for a great variety of purposes among which may be mentioned the manufacture of laminated material in which the laminae are united by a binder and the manufacture of sheet insulation. These plates are ordinarily used in connection with a hydraulic press for consolidating or compressing the material undergoing treatment. The thickness of the plates to a large degree determines the output of a given press per unit of time; and hence the desirability of making them thin is apparent. Thin plates, however, are liable to warp especially when alternately heated and cooled as they must be in ordinary practice.

My invention has for its object to improve the construction of steam plates and also to reduce the cost of manufacture, special reference being made to making them thin yet not liable to warp when in service, and to making them light for the character of the work to be performed.

For a consideration of what I believe to be novel and my invention, attention is directed to the accompanying description and the claims appended thereto.

In the accompanying drawing which is illustrative of my invention, Fig. 1 is a perspective view of a steam plate; Fig. 2 is a horizontal section of the same; Fig. 3 is an edge view of a plate; Fig. 4 is a cross-section; Fig. 5 is also a cross-section but in a different plane showing means for temporarily uniting the members of which the plate is composed. Fig. 6 is a sectional view showing side members of a modified shape, and Fig. 7 is a perspective view of one of the members.

In the best prior constructions with which I am familiar, sheet steel plates have been employed which are separated by individual spacers of various kinds, to form an internal chamber. In my improved construction the use of plates is entirely obviated and chiefly to this fact is due the advantages of my construction.

In carrying out my invention, ordinary structural steel is employed. I may use H or I beams or such beams in connection with channel beams. Beams of this character are cheaper than large plates of machine steel and furthermore, are exceedingly rigid, and are more convenient to handle, store and machine than said plates. Furthermore, I avoid the necessity of numerous small parts.

Briefly stated, my improved plate comprises a plurality of counterpart body members such as structural steel beams placed side by side and other members such as structural steel beams which form the two ends and also tie the body members together, there being cross passages through the vertical webs of the body members to connect the longitudinal chambers or passages between them. In this manner a zig-zag passage or chamber of great length is formed for the heating and cooling fluids. The various members are united by fusion, i. e. by copper brazing which is carried out in a suitable closed furnace in which an atmosphere of hydrogen is constantly maintained. By this means all of the members are united into an integral mass of great strength and rigidity. After the brazing operation the top and bottom surfaces of the plate are ground true. One of the characteristic features of the plate is that each member or element forms a part of the top surface as well as a part of the bottom surface of the finished plate and in addition forms a wall which separates one part of the heating and cooling chamber from another.

By preference H beams are employed such as is shown in Fig. 7 because the width is approximately the same as the height. This results in a lesser number of beams for a given size plate than would be the case with other shapes. When the beams are received from the mill the edges of the flanges 8 are slightly rounded. For this reason they are lightly machined to make them flat and also perpendicular to the top and bottom surfaces. The beams are sawed to the required length either before or after the machining

operation on the sides, special finish at this point being unnecessary.

Each beam after being cut to size is also drilled at one end as at 9 to form a cross passage in the web for the steam used for heating and the water used for cooling. In adjacent beams the holes are located at opposite ends so as to form a zig-zag passage for the circulating fluid. Where the beams are temporarily united by through or assembly bolts 10 as shown in Figs. 2, 4 and 6, additional holes 11 are drilled for the bolts which holes are smaller than the holes 9 and make a reasonably close fit with the bolts. These holes in adjacent beams are also located at opposite ends. It will be noted that the large holes 9 forming cross passages are utilized in part as holes for the bolts 10 and thus they serve a double purpose.

In order to unite the ends of the body beams and at the same time close the ends of the passages or chambers between the webs of adjacent beams, end members 12 are provided. For reasons of rigidity and economy of manufacture these are made of steel channel bars of the same height as the beams. These are sawed to the proper length and ordinarily no machining is necessary. The vertical flange 13 of each end beam is arranged to contact with the vertical webs of the body beams, and the top and bottom parts thereof with the flanges of the said beams. As will be seen the flanges 8 on the side body beams and flanges 13 on the end beams extend outwardly. The purpose of this is to provide means whereby the plate when finished can be conveniently handled. If the plate is small the operator can grasp the flanges on two sides and move the plate manually. On the other hand if it is large the flanges form an effective receiving means for the hooks of a lifting crane.

The webs of the two outside body beams are also drilled to form passages for the admission and discharge of the fluid which circulates through the zig-zag chamber in the plate. As the webs are relatively thin it is preferable to reinforce them around each opening by a boss 15. These bosses may be spot-welded to temporarily hold them in place until the brazing operation is completed.

Having properly made the various parts, the body beams are placed side by side on a suitable surface plate and connected temporarily by the assembling bolts 10. The bolts should exert substantial pressure on the beams so as to ensure good mechanical contact between the adjacent surfaces. After this the body beams may be united at a suitable number of places by arc or other welds 16. The end beams are then placed in position and while securely clamped by suitable means are united to some (or all if desired) of the body beams by arc or other welds 17, Fig. 3.

Having assembled the parts in the manner described the plate, together with the necessary amount of good grade copper to fill the joints between the parts, is placed in a closed furnace in which a supply of hydrogen is maintained. The copper may be distributed in a variety of ways and preferably some of it is placed in the channels between the webs during the assembling operation. On raising the temperature of the furnace and its contents to a point slightly above the melting point of the copper, the latter will melt and freely run into and fill all of the cracks or joints between the various parts, and when the temperature is lowered will solidify and unite the parts into an integral structure. Experience has demonstrated that joints made in this manner are stronger than the metal of which the parts are composed. To attain the best results the joints between the various parts should be of such character that the molten copper flows into them by capillary attraction.

After the plate has been cooled, and this should be done at least in part in a hydrogen atmosphere to prevent oxidation, the top and bottom surfaces are ground to free them of any imperfections including the welds 16 and 17, and ensure parallelism of he top and bottom surfaces. The inlet and outlet bosses are also drilled and tapped to receive the necessary pipe connections. The plate when finished is shown in Fig. 1. When properly made the fused copper joints between the beams are so small as to be hardly perceptible even when the surfaces are freshly ground.

In Fig. 5 is shown a type of plate in which the assembly bolts 10 are omitted and welds such as 16 are relied upon to hold the beams in place for the brazing operation. This type of plate is obviously somewhat cheaper to manufacture than the other.

If for any reason it be desired not to have the overhanging flanges 8 at the sides of the plate, as for example where the material being acted upon by the plate is to extend to the very edge thereof, I may use steel channel beams or bars 14 for the sides of the plate, as shown in Fig. 6, in which case the flanges will be turned inward and not outward as in the case of the end beams.

In Fig. 2 the arrows indicate the passage of the circulating fluid through the tortuous chamber or passage in the plate. As will be evident from inspection the fluid flows through the chambers in series. The flanges of the beams are relatively thin, although of a shape designed to withstand great pressure, as are also the webs. Special attention is directed to the fact that the chamber in the plate is very large compared to the size of the plate and this together with the

fact that the flanges of the beams are relatively thin means that the plate can be very quickly heated by passing steam through the chamber and also quickly cooled by shutting off the steam and admitting water. This results in real economy in press operations because it permits of a greater output from the press. Further economy of press operation is due to the fact that the plates may be very thin for their surface area.

The type of construction shown is inherently very strong and the tendency to warp either during the brazing operation or afterward is reduced to a minimum. The channel beams arranged as they are with their webs vertical and at right angles to the webs of the body beams resist any tendency of the plate to warp or twist. The plate is cheap to manufacture because the machining operations are few and simple and of such a character that there is practically no waste stock. Because the operations are simple the labor costs are very low. Owing to a better distribution of material in the plate the weight is less for a given surface area than any other on the market.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. In a plate of the character described, the combination of a plurality of metallic body members arranged side by side, the top and bottom portions of which are fused together to form the working surfaces of the plate, there being longitudinally extending fluid conveying passages between the members, and metallic means for uniting the members at their ends which also form walls for said passages, said means being fused to the body members.

2. In a plate of the character described, the combination of a plurality of metallic body members arranged side by side, each member comprising a vertical web having flanges which extend perpendicularly thereto at the top and bottom, the flanges of one member being fused to another member and forming the working surfaces of the plate, the said webs forming walls of a fluid-conveying passage, and end members which are fused to the flanges of the body members for connecting and supporting them and which also form the end walls of the fluid passages.

3. A plate of the character described which comprises a plurality of structural beams arranged side by side with their adjacent flanges fused together to form the top and bottom surfaces of the plate, and other structural beams which form the end members of the plate and are fused to the first-named beams.

4. A plate of the character described which comprises a plurality of structural beams arranged side by side with their adjacent flanges fused together to form the top and bottom surfaces of the plate, there being chambers between the beams and cross passages in the beams for connecting the chambers, and other structural beams which are fused to the flanges of the first-named beams and which also form the end walls of the chambers.

5. A plate of the character described which comprises a plurality of body members arranged side by side, each member having a vertical web and laterally extending top and bottom flanges, the flanges of one member being fused to corresponding flanges of adjacent members, passages which cross-connect the chambers between the webs, and members each having a web and flanges which are located at the ends of the body members and are fused to the webs and flanges thereof, the webs of the end members forming walls for the ends of the chambers between the body members.

6. A plate of the character described which comprises a plurality of H-shaped structural beams arranged side by side, the adjacent flanges thereof being fused together, the webs of the beams having openings therein which form cross-passages and which are arranged to connect the chambers between the various webs in series, and channel beams which form the end members for the plate and are fused to the H-shaped beams.

7. A plate of the character described which comprises a plurality of structural beams arranged side by side, the flanges of which form the top and bottom surfaces of the plate and the webs the spacing means which also define walls of the fluid-circulating chambers, said flanges being fused together, means extending through the webs to clamp the beams in place, and structural beams which form the ends of the plate, are fused to the first named beams and have out-turned flanges by means of which the plate can be lifted.

8. In a plate of the character described, the combination of a plurality of counterpart body members each having a vertically-disposed support to sustain the pressure on the plate and top and bottom laterally extending elements, the elements on one member being fused to an adjacent member, and end members, each having a vertical portion which is fused to the supports and elements of the body members.

9. In a plate of the character described, of a plurality of structural body beams arranged side by side and other structural beams connecting the ends of the body beams, the body and end beams being fused together at their meeting surfaces, the body beams forming sides of the plate and the end beams all having outwardly extending top and bottom flanges to facilitate handling of the plate.

In witness whereof, I have hereunto set my hand this seventh day of February, 1924.

EARL C. LEWIS.