June 19, 1934. C. D. ST. CLAIR 1,963,337

METHOD OF FORMING BOILER HEADERS

Filed Aug. 21, 1929 3 Sheets-Sheet 1

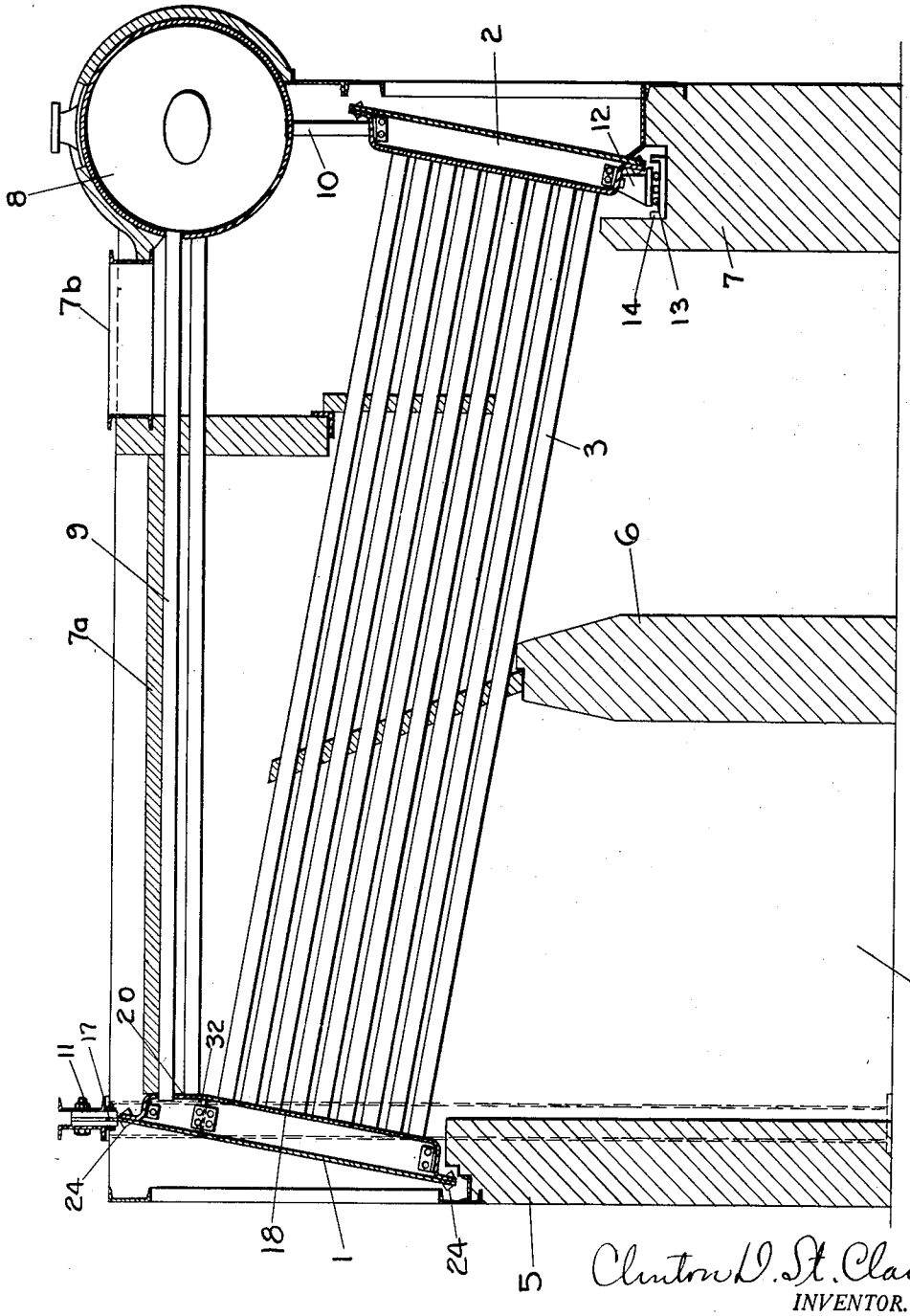


Fig 1

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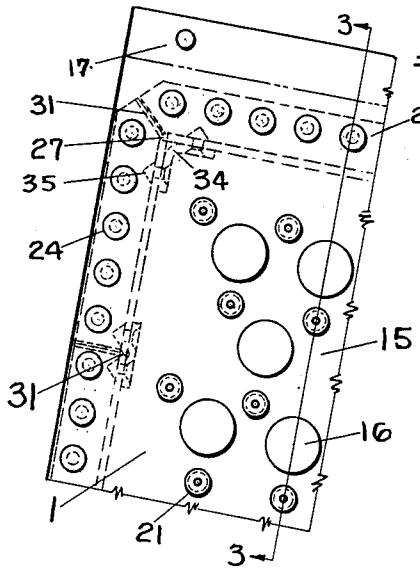


Fig. 2

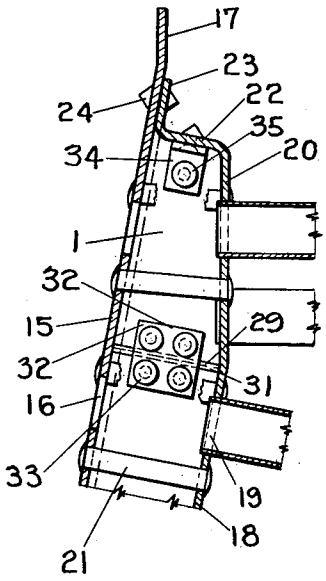


Fig. 3

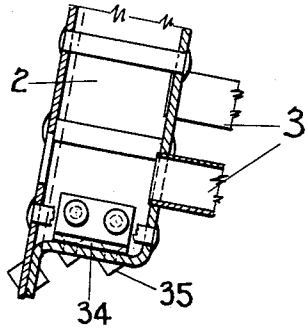


Fig. 4

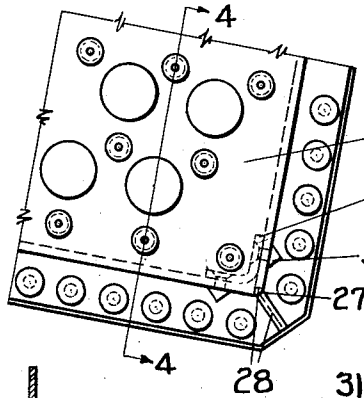


Fig. 5

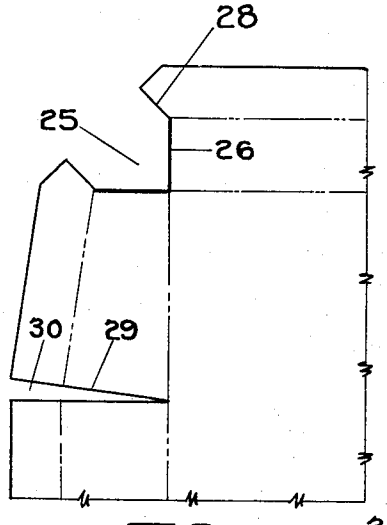


Fig. 6

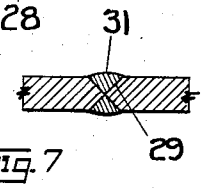


Fig. 7

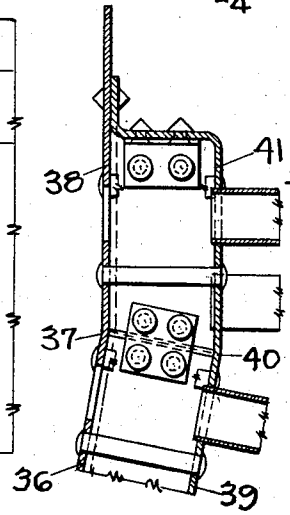


Fig. 8

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METHOD OF FORMING BOILER HEADERS

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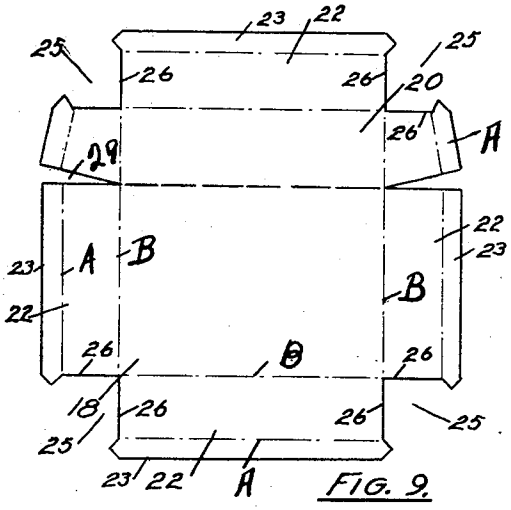


FIG. 9.

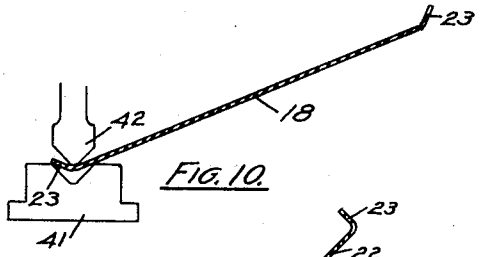


FIG. 10.

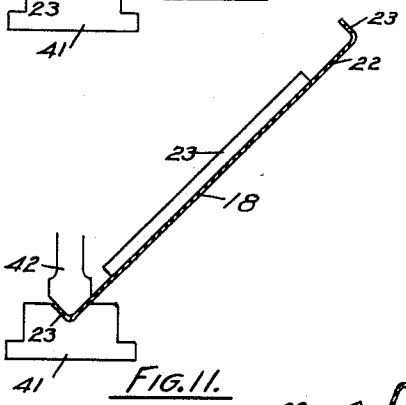


FIG. 11.

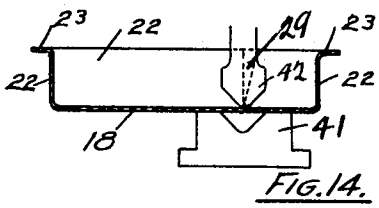


FIG. 14.

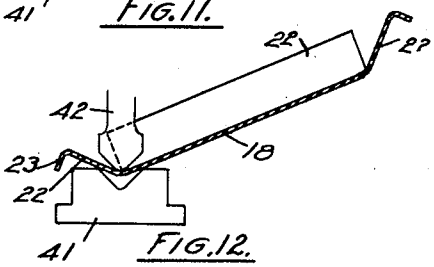


FIG. 12.

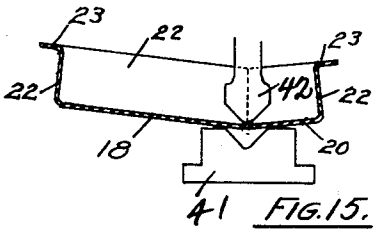


FIG. 15.

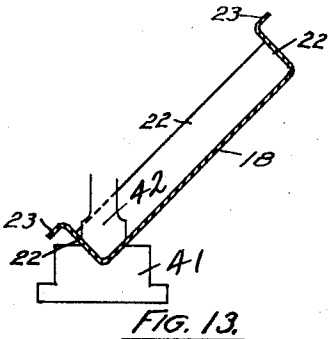


FIG. 13.

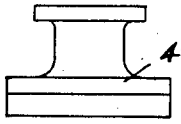


FIG. 16.

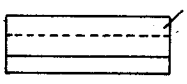


FIG. 17.

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UNITED STATES PATENT OFFICE

1,963,337

METHOD OF FORMING BOILER HEADERS

Clinton D. St. Clair, Erie, Pa., assignor to Erie City Iron Works, Erie, Pa., a corporation of Pennsylvania

Application August 21, 1929, Serial No. 387,333

6 Claims. (Cl. 29—157.4)

The present invention is designed to improve the method of making boiler headers, particularly for boilers supplied with flat box-type headers and involves as one of its features the arrangement of such a boiler header with opposing surfaces, such as to permit of the use of straight-ended tubes. The invention also contemplates making a preferable form of header, one that may be readily fabricated from plate, readily stayed and with unsupported surfaces reduced to a minimum and so fashioned that the rivets joining the parts will be at the outer part of the header, or away from the direct action of the fire. Features and details of the invention will appear from the specification and claims.

A preferred embodiment of the invention is illustrated in the accompanying drawings as follows:

Fig. 1 shows a longitudinal section through the boiler.

Fig. 2 an outer face view of the front header.

Fig. 3 a section on the line 3—3 in Fig. 2.

Fig. 4 a section on the line 4—4 in Fig. 5.

Fig. 5 a view of the inner plate of the headers.

Fig. 6 a view of the plate form from which the header is made.

Fig. 7 indicates the form of weld used in the abutting surfaces. Fig. 8 shows an alternative construction.

Fig. 9 is a plan view of a complete blank forming the inner plate of the header.

Fig. 10 a view showing the manner of forming the preliminary bend on the exterior flange.

Fig. 11 a view showing the manner of completing this flange.

Fig. 12 a view showing the preliminary bend on the corner of the rear plate.

Fig. 13 a view showing the completion of this corner.

Fig. 14 a view showing the header having its sides bent up in position to form the bend in the inner wall of the header.

Fig. 15 shows the completion of this bend.

Fig. 16 a side elevation of the bending die.

Fig. 17 a side elevation of the block.

1 marks a front header, 2 a rear header, the front header being at a slightly higher level than the rear header and the headers being connected by tubes 3. The furnace has side walls 4, front wall 5, rear wall 7, top wall 7*a*, and bridge wall 6, these performing their customary functions and the stack being arranged at 7*b*. The boiler is preferably baffled in any desired manner to get the proper traverse of gases, one scheme of baffling being clearly shown in the drawings. A cross drum 8 is arranged above the rear header and connected by tubes 9 with the front header and tubes 10 with the rear header. The front header is carried by beams 11 forming a gallows frame for the front end of the boiler. A bracket 12 is secured below the rear header and rests on rollers 13 carried by a roller plate 14 mounted in the wall 7.

The outer plate 15 of the front header is provided with hand-hole openings 16 and with an extension 17 by which the header is hung on the gallows frame. This is usually a substantially flat plate.

An inner plate 18 has tube openings 19. The plate has a part 20 in a different plane from the main body of the plate, the part 20 being directly faced toward the rear drum and receiving the tubes 9. In consequence the tubes 9 make a direct and right angle connection with this plate, thus permitting of the use of straight-ended tubes. The body of the plate 18 is parallel with the inner plate of the rear header so that the tubes 3 extend from the inner plate at right angles to that plate and are consequently straight-ended tubes. The two plates are stayed by stay bolts 21 in the usual manner.

The rear plate is formed by flanging and bending operations with a marginal flange 23 extending from sides 22 and with the parts 18 and 20 inclined to each other. These flanges are secured by rivets 24 to the front plate. It will be noted that these rivets may be protected by the wall and are thus out of the fire. The blank for making the rear plate is shown in Fig. 6. The corners are cut out at 25 so that when the sides are bent up the edges of the corners at 26 abut and the prism-shaped gap at the outer face of the abutting edges is filled with a welding material of the weld 27, this gap affording ample metal for sealing the corners and producing a satisfactory weld. The flanges have abutting edges 28 at the corners, these edges being brought together as the sides are bent up and the flanges bent out and these abutting edges are welded together. In order to accommodate the bending of the plate at the point of connection between the planes forming the rear plate the plate is initially separated at 29 and the abutting edges of this separation are brought together as the sides are brought up into abutting relation and similarly the initial opening 30 in the flange at this point is brought together into abutting relation and this separation as a whole is closed by a weld 31, clearly shown in Fig. 7.

A strap 32 bridges the weld 31 in the sides and

rivets 33 extend through the strap in the sides of each side of the weld. Corner plates 34 arranged at the corners re-enforce the welds 27 and these are secured to the adjacent side walls by rivets 35 at each side of the corner welds.

The rear box is formed in a manner exactly similar to that of the front box with the exception that the inner plate is all in one plane and the upper wall of the box is formed at an inclination to the inner plate to form the same at right angles to the tubes 10 so that the tubes 10 may be straight-ended tubes. With this structure of header the space between the front and rear plates which is at the sides of the box is as short as can well be made and the tendency to crown here is reduced particularly by reason of the flange construction at the open edge and the arrangement of the rivets through this flange. The flange not only braces the edge of these walls but it makes possible bringing the riveted connection really within the dimensions of the wall itself.

While I have referred to my invention as a method of forming a boiler header, it will be understood that the header formed may be used for boilers and similar purposes.

In the alternative construction, Fig. 8, a front plate 36 is bent at 37 forming the upper part of a plate 38 in a plane at an angle to the lower part of the plate. A rear plate 39 has a bend at 40 making the upper part 31 of the plate at an angle to the lower part, the upper part 41 being parallel to the part 38 and the lower part 39 parallel to the part 36. Otherwise the structure is similar to that shown in the other figures of the drawings and retains the feature of having the tubes leave the rear plate at right angles to the plate.

There are shown in Figs. 9 to 17 the manner of forming the bend in the rear plate. The blank is first given a preliminary bend along the line A in forming the peripheral flange 23 in Fig. 10. Here there is a block 41 arranged on the bed of a press and a die 42 operating in the block, the block having a groove and the die having an angular face, the groove and face having their walls at an angle of 90° so as to complete a 90° bend. This bend is completed as shown in Fig. 11. The plate is then given a preliminary bend in Fig. 12 along the line B forming the corner between the sides and inner face of the header. Fig. 13 shows the manner of completing this bend. After the side walls and flanges are formed, the inner plate of the header is placed on the form 41, as shown in Fig. 14 with the apex of the slots 29 at the apex of the die 42. The inner plate is then bent, as shown in Fig. 15, bringing the edges of the slot 19 together. As shown the die and block 42 and 41 are much shorter than the width of the header and the bends are made by a step by step operation along the lines A and B to complete the bend. It will be understood, however, that these dies may be made of the length of the completed article, if desired, and consequently the bends made with a single operation. It will also be understood that the bends illustrated in Figs. 10 to 13 are extended around the lines A and B on the four sides of the plate.

What I claim as new is:—

1. The method of forming a boiler header which consists in forming a blank plate, flanging the edges of the plate a depth to form marginal flanges, flanging the sides and ends forming side and end wall flanges, bending the plate along a line between the side wall flanges, and securing an outer plate to the marginal flanges in facing engagement with the marginal flanges.

2. The method of forming a boiler header which consists in forming a blank plate, flanging the edges of the plate a depth to form marginal flanges, flanging the sides and ends forming side and end wall flanges, bending the plate along a line between the side wall flanges, and riveting an outer plate to the marginal flanges in facing engagement with said flanges.

3. The method of forming a boiler header which consists in forming a blank plate and oppositely notching the blank plate with notches extending inwardly from the sides, flanging the edges of the plate a depth forming marginal flanges, flanging the sides and ends forming side and end wall flanges, the side wall flanges terminating adjacent to the bottom of the notches in the sides, bending the plate along a line between the notches closing the notches, and securing an outer plate to the marginal flanges in facing engagement with the marginal flanges.

4. The method of forming a boiler header which consists in forming a blank plate and oppositely notching the blank plate with notches extending inwardly from the sides, flanging the edges of the plate a depth forming marginal flanges, flanging the sides and ends forming side and end wall flanges, the side wall flanges terminating adjacent to the bottom of the notches in the sides, bending the plate along a line between the notches closing the notches, joining the edges of the notches, placing bridge plates across the notches, and securing the same to the side flanges at each side of each notch, and securing an outer plate to the marginal flanges in facing engagement with the marginal flanges.

5. The method of forming a boiler header which consists in notching a blank plate at its corners, flanging the sides and ends of the plate a depth forming marginal flanges, flanging the side and end walls closing the corner notches, welding the edges of the closed notches together, bridging the corners by corner pieces secured to the flanges at each side of each corner, and securing an outer plate to the marginal flanges in facing engagement with the marginal flanges.

6. The method of forming a boiler header which consists in forming a blank plate, flanging the edges of the plate a depth to form marginal flanges, flanging the sides and ends forming side and end wall flanges, bending the plate along a line between the side wall flanges, and securing an outer plate to the marginal flanges in facing engagement with the marginal flanges with the outer plate extending beyond the marginal flange at the top of the header.

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