Jan. 19, 1937. H. J. PETERS 2,068,432

METHOD OF FORMING STAYBOLT CONNECTIONS

Filed June 10, 1935

FIG. I.

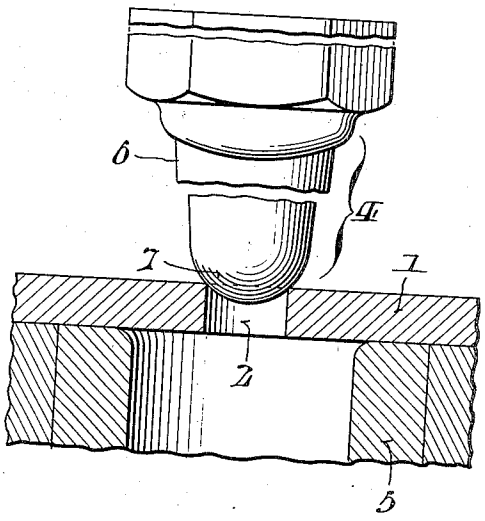


FIG. II.

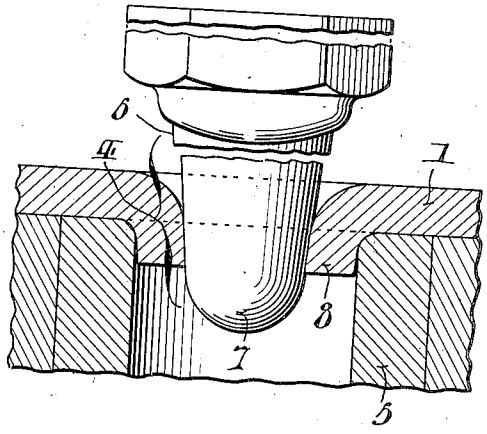
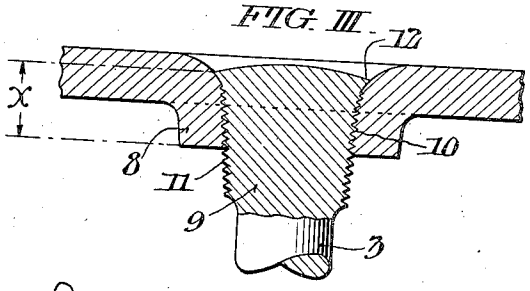


FIG. III.



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METHOD OF FORMING STAYBOLT CONNECTIONS

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1 Claim. (Cl. 29—157.4)

This invention relates to methods of forming staybolt connections, and, though applicable generally to the art of joining a staybolt to a relatively thin metal sheet, it is particularly useful as a method of connecting the staybolts of a locomotive boiler to the side sheets thereof.

One object of the method of the present invention is to increase the area of contact between the head of the staybolt and the sheet to which it is applied, and thus to establish a more steam-tight and firm connection between these elements. Another object of the invention, in its application to a locomotive boiler, is to provide a minimum exposure of the parts of such a joint to the fire side of the boiler sheet, and thus to increase the life of the joint. Still another object of the invention is to provide an annular flange surrounding the hole in the sheet in which the staybolt is inserted and serving to reinforce and materially strengthen the sheet, at the same time creating no interference with necessary expansion and contraction.

The staybolt connection formed according to this invention avoids many of the difficulties formerly experienced with older methods of connecting staybolts to side sheets. It eliminates cracking of the sheet at the holes, and makes possible an increase in the number of threads at the region of contact between the staybolt and sheet. The connection formed according to the method of my invention is further characterized by a tapered cavity at the hole in the sheet adapted for the application of a similarly formed head of a staybolt, which provides a particularly firm steam-tight connection.

Other objects and advantages characterizing my present invention will become more fully apparent from the description hereinafter set forth of one example of the method as applied to a locomotive boiler, having reference to the accompanying drawing. Of the drawing:

Fig. I represents a portion of a boiler side sheet, showing a die and plunger in association therewith preparatory to the formation of an annular flange at a hole in the sheet.

Fig. II is a view similar to Fig. I, showing the position of the parts when the plunger has entered the die to complete the formation of the annular flange; and

Fig. III represents in cross section the assembled side sheet and staybolt when the joint has been completed.

In the drawing, there is represented an example of the invention as applied to the art of joining staybolts to the side sheets of a locomotive boiler. The side sheet is represented at 1, and the first step of the process consists in drilling holes 2 corresponding in number and location to the staybolts 3 to be used, such holes being made of a diameter considerably smaller than the outside diameter of the heads 9 of the staybolts to be inserted therein.

When the side sheet 1 has been thus perforated, it is placed in a power press having a plunger 4 and bottom die 5 as represented in Figs. I and II. In accordance with the preferred practice, the plunger 4 is formed with a conical or tapered shank 6 and a hemispherical head 7, the size of the plunger corresponding closely to the size of the head 9 of the staybolt 3. The complementary die 5 is of annular formation with an inside diameter larger than the diameter of the plunger head 7.

In Fig. I, the parts are represented in the positions occupied preparatory to forcing the plunger 4 through the hole in the side sheet 1. Downward movement of the plunger 4 causes the hemispherical head 7 to be forced through the hole 2 with incidental pressing out of an annular flange 8 as shown in Fig. II. The annular flange 8 defines a cavity tapering towards the end of the flange. After the flange 8 has thus been formed, the inner wall thereof is threaded as indicated at 10. The staybolt head 9, correspondingly threaded as indicated at 11, is then inserted in the cavity and screwed to tight fitting engagement. The final step of the process consists in riveting the head 9, as indicated at 12, to close fitting contact with the sheet 1 and within the confines of the mouth of the cavity, thus presenting a minimum of exposed metal at that side of the sheet.

It will be particularly observed that the flange 8 is so formed that a substantially large bearing area is provided between the inner wall of the flange 8 and the head 9 of the staybolt. As shown in Fig. III, the staybolt head 9 is in contact with the flange 8 over a distance measured longitudinally of the staybolt, as represented at X, which is greater than the thickness of the side sheet. Furthermore, it will be noted that the flange 8 is formed at the water side, rather than at the fire side, of the side sheet 1, thus reducing to a minimum the exposure of the parts of the staybolt connection to the extreme heat of the fire.

With a joint of the character described, the presence of the flange around the hole in the sheet acts as a reinforcement which materially strengthens the sheet, while at the same time creating no interference with expansion and con-

traction. Accordingly, the difficulties formerly experienced with joints of this character, and caused by inadequate bearing surface between the sheet and staybolt, are eliminated. Particularly, the tendency of the side sheet to crack at the joint is avoided, and the formation of a conical cavity establishes a firm connection between the parts.

While I have described one example of my invention, as applied to boiler practice, it will be apparent that various changes may be made in the steps and instrumentalities employed in forming a joint of the character described, all without departing from the spirit of my invention as defined in the annexed claim.

Having thus described my invention, I claim:

The method of joining a staybolt having a preformed flaring head to a sheet which consists in drilling a preliminary circular hole in the sheet of smaller diameter than the staybolt to ease a subsequent punching operation, punching a rounded plunger through said hole, the size of said plunger corresponding closely to the size of said tapered head, thereby producing an annular flange on said sheet, said flange defining a substantially conical cavity narrowing towards the end of the flange, taperingly threading said flange interiorly, inserting therein a staybolt having a correspondingly shaped and similiarly taperingly threaded head fitting the cavity aforesaid, and riveting the head in place.

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