

G. SWARTWOOD.  
 BOILER STAY BOLT.  
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1,137,433.

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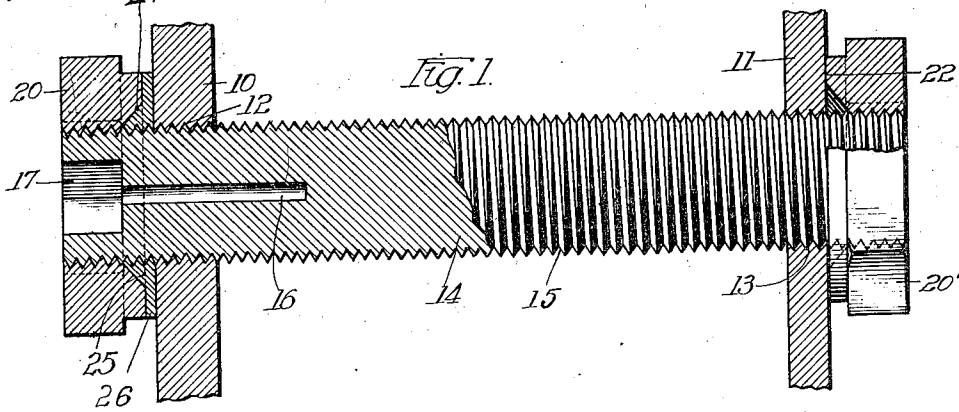


Fig. 2.

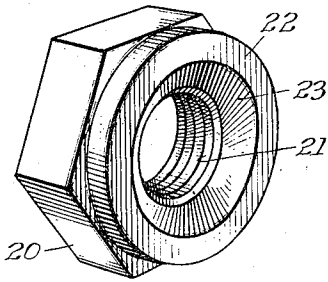


Fig. 3.

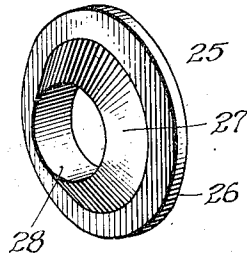


Fig. 4.

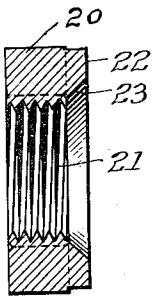


Fig. 5.

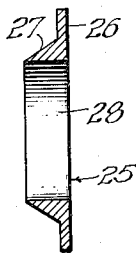
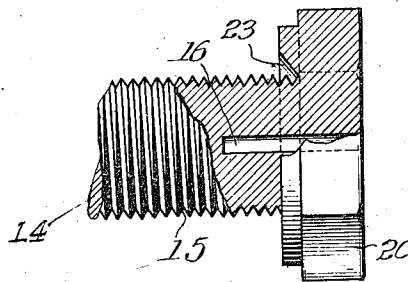


Fig. 6.



Witnesses:  
 Robert Weir  
 A. Carlson

Inventor:  
 George Swartwood  
 By Gore Dainaway  
 Atty.

# UNITED STATES PATENT OFFICE.

GEORGE SWARTWOOD, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-THIRD TO AUGUST KRUMM AND ONE-THIRD TO LUDWIG J. KOEPPEN, BOTH OF CHICAGO, ILLINOIS.

## BOILER STAY-BOLT.

1,137,433.

Specification of Letters Patent.

Patented Apr. 27, 1915.

Application filed September 22, 1913. Serial No. 791,018.

*To all whom it may concern:*

Be it known that I, GEORGE SWARTWOOD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Boiler Stay-Bolts, of which the following is a specification.

My invention relates to improvements in boiler stay bolts.

The general object is to provide an efficient stay-bolt construction which may be set up without distortion of the bolt or boiler plates, which insures tight connection with the boiler plates stayed thereby, which strengthens the plate construction, and which may be used and removed without injury to the plate, so that any broken or otherwise discarded bolts may be replaced with bolts of the same size.

Other and further objects of my invention will be apparent to those skilled in the art from the following description taken in conjunction with the accompanying drawings.

In the drawings Figure 1 shows, partly in vertical cross section and partly in elevation, stay bolt structure embodying my invention applied to two boiler plates. Fig. 2 is a perspective view of a nut. Fig. 3 is a perspective view of a packing gasket. Fig. 4 is a vertical section of the nut. Fig. 5 is a vertical section of the gasket. Fig. 6 is a detail of a modified bolt.

Although many special forms of stay bolt structures for boilers have been designed and experimented with, the standard practice in connecting two steam-boiler plates with stay bolts consists in the use of a solid threaded bolt, extending through apertures in the plates initially placed in the plates so that the ends of the bolts project beyond the opposite surfaces of the plates, and then peened or "bulldozed", to offset the protruding end and fashion it into a head which rigidly anchors the bolt in place. Such bolt structures are difficult to apply, hard to remove, are irregular in their strength, security, and tightness of joint with their respective plates, and almost inevitably enlarge the plate holes in which they are seated, owing to the expansion of the bolt under peening or pounding, thereby distorting the metal of the plate, tending to make the plate sag into pockets between stays and also making it impossible

to substitute for a stay bolt originally employed another of the same size.

In conjunction with the boiler plates 10 and 11 to be stayed by bolts taking through the appropriate alining apertures 12 and 13, formed and tapped or screw threaded in the plates, I provide a solid integral stay-bolt-stem 14 screw threaded as at 15 from end to end, unidirectionally, said bolt being of suitable length to span the space between the plates 10 and 11 and to project at both ends beyond the opposite surfaces of the plates. The bolt may have at each end a tell tale bore 16 extending axially thereof from its end to a point between the plates, for giving egress to steam in case the bolt ruptures, and for easy insertion of the bolt in the plates a squared socket 17 may be provided in its end, although other means for affording tool engagement with the bolt are well known and may be substituted therefor.

20—20' are heads upon the extremities of the bolt-stem, at least one of which is, and preferably both of which are, removable nuts of special construction, although one of said heads may, if desired, be made integral with the bolt-stem for some of the purposes of my invention, as shown in Fig. 6.

The nut 20, is a plinth of any suitable polygonal shape for tool engagement. It has a threaded aperture 21 for engagement with the bolt and has upon one face, within the confines of the plinth, a projecting crown 22, to provide a flat bearing surface, preferably of annular form and uniform width throughout the circle, said bearing being spaced apart somewhat radially from the bolt hole 21. From the inner edge of the bearing ring 22 to the bolt hole I prefer that there extend a tapering recess 23 preferably of approximately the same depth as the crown 22. Thus the plinth or body portion of the nut may be of unimpaired strength affording adequate thread receiving surface and pressing with unimpaired axial rigidity on the crown-surface, and may be flat on its outer face so that when in place it substantially aligns with the end of the bolt.

A nut of this character may be employed upon the bolt in direct face to face contact with the boiler plate and in such use as shown at the right of Fig. 1 it affords an efficient locking structure for positioning

the bolt and nut with respect to the boiler shell.

The annular crown, 22, bearing uniformly and smoothly against the plate when the nut is screwed in place, makes an effective butt joint with the plate at right angles to the general line of the thread joint between the plates and bolts. It strengthens and reinforces the plate for a material area around the bolt hole. The nut acts to draw the bolt axially with respect to the threads in the plate so as to force the proximate outer surfaces of the thread ridges on the bolts and inner surfaces of the thread valleys in the plate into intimate contact, to insure the adequate provision of a steam-tight joint; and at the same time the nut of course acts as a lock nut to prevent rotary motion of the bolt under strains and vibrations. Further the provision of the recess in the bearing face of the nut surrounding the bolt hole leaves a small ring of the boiler plate free from direct support, so that there is no possibility of defeating the action of the nut by the presence of metal particles or "burs" around the bolt holes of either the plate or nut, and a slight but effective capacity of the plate surface to yield somewhat upon the bolt threads is preserved.

I prefer, for absolute insurance of joint tightness, that a relatively soft and malleable metallic packing washer or gasket be applied between the plate and the nut, and preferably said gasket is preliminarily formed for approximate conformity to the surfaces with which it coacts. Such a washer or gasket, indicated generally at 25, is preferably made of soft iron or copper and consists of a flat plate 26 of suitable size to extend from the bolt hole to the edge of the bearing surface 22 of the nut, said plate having on one surface a beveled boss or projection 27 surrounding the bolt receiving hole 28 and shaped somewhat like the recess 23 in the nut. I prefer, however, that the taper of the projection 27 be somewhat more gradual than the taper of the walls of the recess 23 so that the depth of the projection 27 is slightly greater than the depth of the recess, this being one way of providing slightly more metal in the projection than could normally be accommodated in the recess. As shown at the left of Fig. 1, such gasket is applied with its flat face against the contiguous face of the plate 10 and the nut is screwed on the bolt so that its recess rides over the projection 27, the action of the nut compressing and condensing the boss 27 of the gasket causing the metal thereof to flow into the screw threads and to make airtight connection at the joints between the bolt, nut and plate.

I prefer that a separable nut and a gasket be used at each end of the bolt, for by this arrangement a perfectly tight joint at each

end may be secured and the tightening of the nut at either end does not disturb the rotary position of the bolt nor affect the joint at the opposite end, and while the gasket may upon occasion be dispensed with, it is an inexpensive and advantageous auxiliary to the attainment of perfect results.

While I have herein described in some detail a particular embodiment of my invention it will be apparent to those skilled in the art that changes in the details of construction might be made without departure from the spirit of my invention and within the scope of the appended claims.

What I claim is:—

1. A stayed-plate boiler structure, comprising, in combination the parallel plates having alining threaded openings therein, a bolt-stem having threaded engagement with both of said plates, a head upon one extremity of said bolt-stem, a nut comprising a polygonal plinth threaded directly on the threads of said bolt stem beyond the other plate, said nut having in its surface confronting the plate a recess contiguous to the bolt hole in the nut, and a flat bearing surface surrounding said recess and within the periphery of the plinth.

2. In a structure of the character described, the combination with the plates of a stay bolt passing therethrough in threaded engagement with both of said plates and projecting beyond one of said plates, a nut upon the projecting end of said bolt comprising a polygonal plinth and a crown projecting from the surface of said plinth which confronts the contiguous plate, said crown having an annular surface 22 for contact with the plates and a beveled surface 23 extending from the bearing surface to the bolt hole.

3. In a structure of the character described the combination with the boiler plates, of a stay bolt passing therethrough and effecting screw threaded engagement with both of said plates, one end of said stay bolt projecting beyond its plate, a nut upon the projecting end of said stay bolt, and a gasket interposed between said stay bolt and plate, said nut having a recess therein and said gasket having a projection thereon to enter said recess.

4. In a structure of the character described, the combination with the boiler plates, having threaded apertures therein, of an integral rigid stay bolt extending through said plates in screw threaded engagement therewith and having a head on each end thereof, one of said heads comprising a nut engaging the threaded stem of the bolt and having a recess on its inner surface surrounding the bolt hole and a gasket interposed between said nut and said plate and having a projection thereon to interfit in said recess in the nut.

5 In a structure of the character described, the combination with the boiler plates, having threaded apertures therein, of an integral rigid stay bolt extending through  
 5 said plates in screw threaded engagement therewith and having a head on each end thereof, one of said heads comprising a nut engaging the threaded stem of the bolt and  
 10 having a recess on its inner surface surrounding the bolt hole and a gasket interposed between said nut and said plate, the  
 10 gasket having a projection, larger than the recess in the nut, to enter said nut-recess.

6. A stay bolt structure comprising a bolt-stem threaded from end to end, a nut thereon  
 15 having a conical recess in its inner face surrounding the bolt hole, and a metal gasket surrounding said bolt having a conical projection to enter said conical recess in the  
 20 nut, said projection and recess being differently shaped, whereby the nut becomes adapted to swage said projection inward.

7. In a structure of the character de-

scribed, the combination with the boiler plate, having threaded apertures therein, of  
 25 an integral rigid stay-bolt extending through said plate in screw threaded engagement therewith and having a head on each end thereof, one of said heads comprising a nut  
 30 engaging the threaded stem of the bolt and having a recess on its inner surface surrounding the bolt hole and a soft malleable metallic gasket bored out to a diameter substantially equal to that of the bolt inter-  
 35 posed between said nut and said plate, the gasket having an annular projection, larger than the recess in the nut, to enter said nut recess whereby the nut becomes adapted to  
 40 swage said gasket into the threads of the stay-bolt.

In testimony whereof I hereunto set my hand in the presence of two witnesses.

GEORGE SWARTWOOD.

In the presence of—

AUGUST KRUMM,

GEO. T. MAX, JR.