P. F. GALLAGHER.

FLEXIBLE STAY BOLT CONNECTION.

APPLICATION FILED OCT. 27, 1917.

1,300,832.

Patented Apr. 15, 1919.

2 SHEETS—SHEET 1.

Fig. 1.

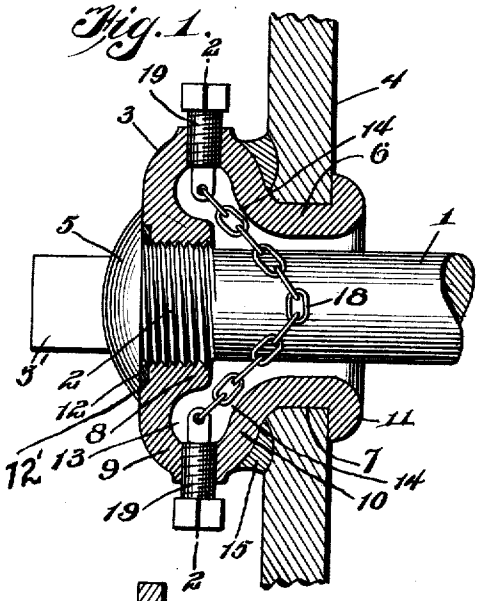


Fig. 2.

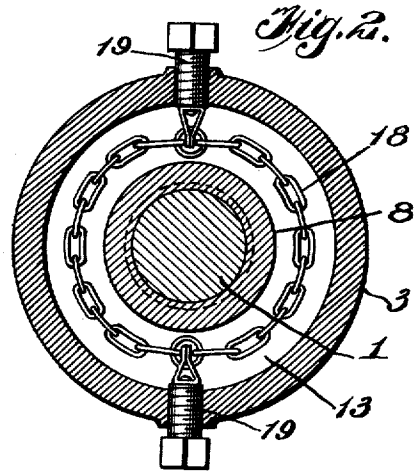


Fig. 3.

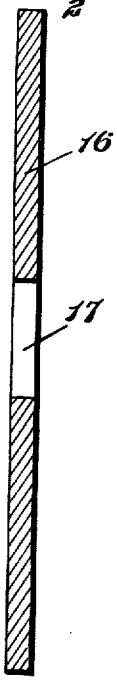


Fig. 4.

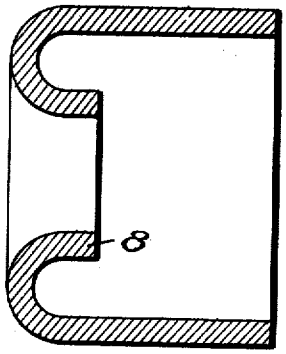
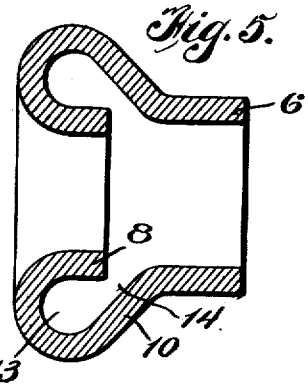


Fig. 5.



Witness

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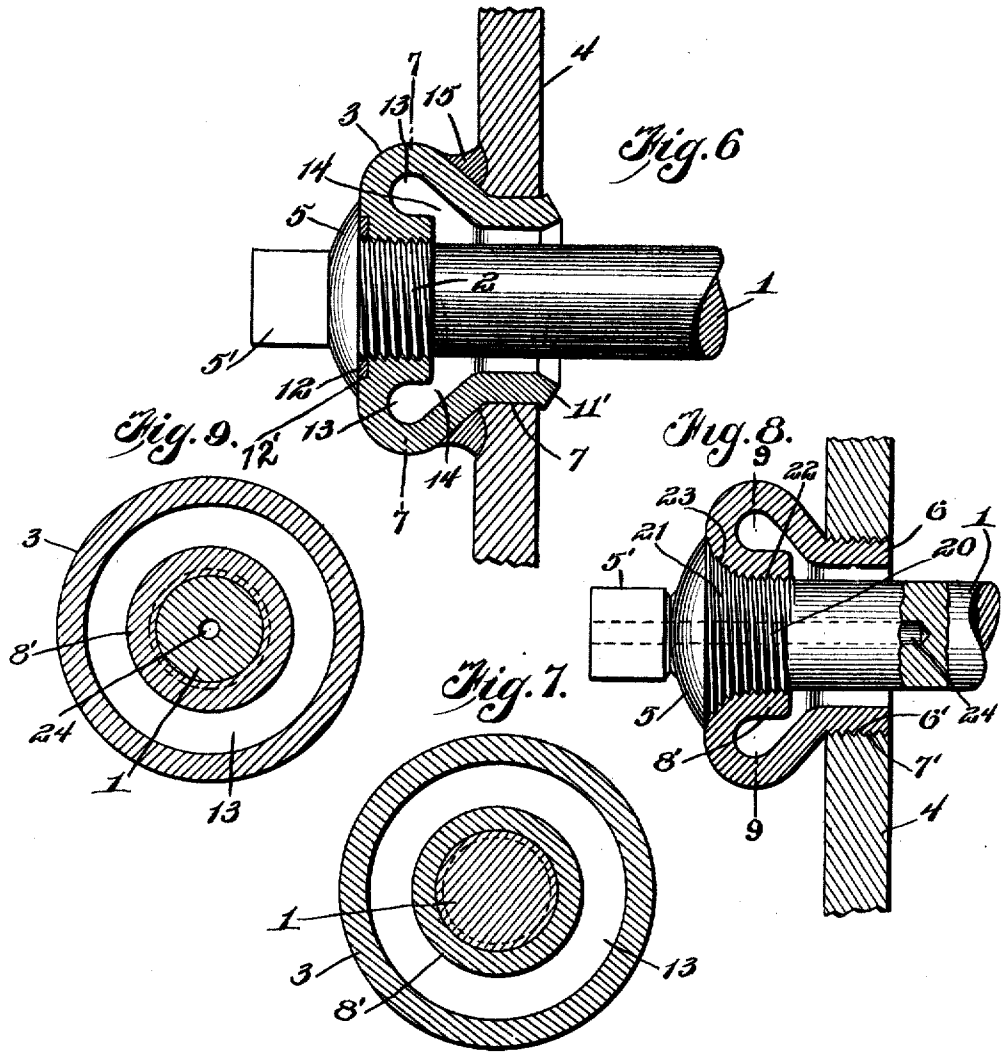
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2 SHEETS—SHEET 2.



Witness

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UNITED STATES PATENT OFFICE.

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FLEXIBLE STAY-BOLT CONNECTION.

1,300,832. Specification of Letters Patent. Patented Apr. 15, 1919.

Application filed October 27, 1917. Serial No. 198,883.

To all whom it may concern:

Be it known that I, PETER F. GALLAGHER, a citizen of the United States, residing at New Dorp, in the county of Richmond and State of New York, have invented new and useful Improvements in Flexible Stay-Bolt Connections, of which the following is a specification.

This invention relates to a flexible stay bolt connection for yieldingly connecting a rigid stay bolt with a boiler sheet in such a manner as to permit the bolt to yield uniformly in all directions without subjecting the bolt or boiler sheets to undue strains as a result of variable movements of the parts due to expansion and contraction.

An object of the invention is to provide a flexible connection of the spring sleeve type which obviates the use of closure caps, which allows the bolt to have a maximum degree of yielding motion, which insures a higher degree of uniformity in the expansion and contraction of the bolt, and which combines maximum efficiency of operation with simplicity and cheapness of construction and general economy and durability in use.

Another object of the invention is to provide a spring sleeve connection which may be produced in a simple manner and with very little skilled or costly machine work, which embodies improved means for strongly and durably connecting the same with the boiler sheet and permitting circulation of the water about the bolt to an increased extent to secure greater uniformity of contraction and expansion thereof, and which further embodies improved means for preventing the accumulation of mud, scale and other similar obstructions within the sleeve.

The invention consists of the features of construction, combination and arrangement of parts, hereinafter fully described and claimed, reference being had to the accompanying drawing, in which:—

Figure 1 is a view showing the end of a stay bolt in side elevation and the boiler sheet and sleeve in section, the plane of section being longitudinally of or parallel with the axis of the bolt.

Fig. 2 is a vertical transverse section on line 2—2 of Fig. 1.

Figs. 3, 4 and 5 are views illustrating certain consecutive steps of manufacture in producing a form of spring sleeve embodying my invention.

Fig. 6 is a view similar to Fig. 1, showing a modified form of spring sleeve.

Fig. 7 is a transverse section on line 7—7 of Fig. 6.

Fig 8 is a view similar to Figs. 1 and 6, showing another modified form of sleeve and a modified form of bolt.

Fig. 9 is a vertical transverse section on line 9—9 of Fig. 8.

Referring to the drawings, 1 designates a rigid stay bolt, one end of which is threaded for engagement with a threaded opening in the inner boiler sheet, such threaded construction not being shown, and the other end of which is threaded at 2 for engagement with a bushing or sleeve 3 fitted in the outer boiler sheet 4. The threaded end 2 of the bolt is provided with an abutment head 5 and an angular stud or projection 5′, such stud being adapted for engagement with a wrench or similar tool employed for threading it into or out of engagement with the inner boiler sheet and bushing.

The bushing or sleeve 3 is made of spring metal and is preferably drop-forged or otherwise struck up from a single piece of sheet metal. It comprises a tubular inner end 6 fitted within an opening 7 in the sheet 4, an instruck tubular outer end 8, internally threaded to receive and engage the threaded end 2 of the bolt, an arcuately curved, bowed or scroll-shaped body portion 9 connected at its outer portion with said instruck tubular end 8, and an angularly disposed neck portion 10 connecting the said body portion 9 with the tubular inner end portion 6.

The tubular inner end portion 6 is made initially of slightly smaller diameter than the opening 7 in the sheet 4 and, after being fitted in said opening, is expanded into engagement with the wall thereof to form a tight connection. In addition the inner extremity of said end portion 6 is preferably flared and spread to form a bead 11 engaging the inner or water side of the sheet, thus increasing the security of the mechanical connection and additionally sealing the joint against leakage. The internal threads of the outer end portion 8 are suitably formed after the bushing or sleeve is made and prior to its application to the sheet 4, and after said bushing is applied the bolt 1 is inserted therethrough from the exterior of said sheet, and screwed at its inner and outer ends into

the threaded opening in the inner sheet and into the end portion 8. The head 5 of the bolt is initially formed thereon and by means of the angular stud or projection 5' the bolt may be readily and conveniently screwed into and out of place. When the bolt is applied the flat face of the head 5 bears against the outer face of the end portion 8 and preferably against a soft metal gasket or packing ring 12 fitted in a recess 12' in the end portion 8, thus preventing leakage of water and steam through the threaded joint. By the mode of connection described the use of caps is avoided, and the practice of upsetting or forming the head 5 after application of the bolt obviated. As a result the bolt may be removed by simply unscrewing it when it is necessary to replace it with a new bolt, and without the necessity of drilling out the bolt as when applied in the customary way.

In accordance with my invention the body portion 9 of the bushing or sleeve is made scroll-shaped, or arcuately bowed or curved on a comparatively wide radius, and said body portion 9 is connected with the outer extremity of the tubular inner end portion 6 by a neck portion 10 which flares outwardly with relation to said inner end portion substantially at an acute angle thereto. By reason of this construction several desirable and important advantages are obtained. In the first place the walls of the body portion and neck are spaced from the outer end portion 8, which projects into said body portion, thus forming an annular channel 13 extending entirely around the portion 8 and threaded end of the bolt and an outwardly diverging passage 14 leading from the bore of the inner end portion 6 to said channel. The end portion 8 is thus entirely spaced from the internal walls of the bushing, allowing the water from the boiler to flow freely into the body of the bushing and about the threaded joint, so that the bolt 1 will be heated to a more uniform degree throughout and a greater degree of uniformity of expansion and contraction thereof secured. At the same time, owing to the described curve of the body portion and its spaced relationship to the end portion 8, the end portion 8 is free to have a wide range of flexible motion to permit of and compensate for longitudinal and universal lateral expansions and contractions of the bolts and sheets, due to variations in the expansion and contraction thereof. In these movements the outer end of the bolt will be supported solely by the end portion 8 and the body portion 9 is free to have spring motion or flexing action at three points, to wit, at or about its center, at or about its point of connection with the neck 10, and at or about its point of connection with the end portion 8, giving a wider range of flexibility than would be possible if the end portion 8 were in contact at any point with the body portion or neck. Furthermore, the area of the channel 13 is such as to avoid the accumulation of a sufficient amount of mud, scale or other deposits liable to interfere with the flexibility of the portion 8, and as the water can have a free circulation between said channel and the space between the boiler sheets the washing out of more or less of any foreign matter which may be deposited within the channel is insured. By disposing the neck portion 10 at the angle stated the passage 14 is made of comparatively wide area and at the same time a V-shaped space is produced between said neck portion and the outer surface of the sheet 4 for the reception of a welding compound 15, whereby the bushing or sleeve may be welded to the sheet when such an additional mechanical fastening and sealing action is desired.

An important advantage incident to my construction resides in the fact that by providing a bushing or sleeve of the form shown, such bushing or sleeve may be entirely or substantially of uniform thickness throughout, gaining its wide range of flexibility or spring action from its peculiar formation, and obviating the necessity of securing a spring action by making the bushing of variable degrees of thickness throughout. I am thus enabled to drop-forge or otherwise form the bushing or sleeve so as to be initially of uniform or substantially uniform thickness, and without the necessity of employing expensive machine work, whereby a bushing of maximum simplicity may be produced at a comparatively low cost from the standpoint of material and labor.

In Figs. 3, 4 and 5 I have illustrated one method of manufacturing the bushing which may be employed. In carrying out this method a blank 16, composed of a disk or plate of sheet metal of proper form and size, is first formed, such blank being provided with a central opening 17 of a form to receive a projection upon a male die. By the action of male and female dies the blank is then given the shape shown in Fig. 4, in which the body portion of the blank is struck up into tubular shape and the central portion thereof projected into the outer end thereof, such portion producing the outer end portion 8 of the finished bushing. The inner end portion of the tubular body shown in Fig. 4 is then contracted or swaged inwardly, as shown in Fig. 5, resulting in the production of the inner end portion 6, the body portion 9 and the neck portion 10. After the bushing is formed as shown in Fig. 5 the interior of the end portion 8 is threaded in any ordinary manner and the bushing applied to the sheet 4 in the manner previously described. This method al-

lows a bushing to be produced in a very simple manner and at a comparatively low cost from sheet metal of any desired gage according to safety factor conditions required in the boiler structure to which it is to be applied. In completing the bushing from the article shown in Fig. 5 no further work, other than threading the end portion 8 is necessary, except when it is desired to have the bore of said end portion of uniform diameter throughout and to form a recess for the reception of a packing washer, for which purposes the said end portion may be modified in form by a secondary shaping action. By my method of construction it is possible to use much lighter material than is required in the use of machined sleeves, an item of advantage in that it is a well known fact in boiler construction that the lighter the material used (with proper factor of safety) the longer the life of the boiler and less liability of cracking of plates. By employing the mode of application shown in Figs. 1 and 2, and also in Figs. 6 and 7, as hereinafter described, I do away with the necessity of threading the bushing into the boiler sheet, reducing the cost of construction and liability of leakage. In Figs. 1 and 2 I have shown the use of a clearer device for cleaning the bushing of any accumulated mud, scale or other deposits when desired. This clearer device consists of a link chain 18 of ring form which surrounds the bolt and which is secured at diametrically opposite sides of the bushing to threaded plugs 19, fitted in threaded openings in the body of the bushing. Under the normal circulation of the water and steam this chain is kept slightly in motion to break up the deposits and allow them to be washed out. Whenever any accumulation of deposits occurs, however, by simply removing the plugs 19 and using them as finger pieces or manipulating devices the chain may be moved back and forth within the bushing to free the deposits for a clearing action.

In the modified form of my invention shown in Figs. 6 and 7 a bushing of the same general construction as that illustrated in Figs. 1 and 2 is disclosed, the only difference being that instead of positively flanging or beading the portion 6 a slight flare or lip is produced, as shown at 11′, to seal the joint between the bushing and wall of the opening 7 and assist in holding the bushing against any liability of outward displacement.

In the form of my invention shown in Figs. 8 and 9 the portion 6 of the bushing is illustrated as externally threaded at 6′ to fit within a threaded opening 7′ in the boiler sheet 4, which construction may be employed when desired, and in this form of the invention also the outer end of the bolt is provided with an inner cylindrical threaded portion 20 having an outer flaring or tapered threaded portion 21 to fit within corresponding threaded portions 22 and 23 of the inturned end portion 8′, enabling a secure fastening and sealing connection to be produced when it is desired to dispense with the use of a washer. In this form of the invention I have also shown the outer end of the bolt 1 provided with a tell-tale passage 24 opening through its outer extremity, whereby in the event of the fracture of the bolt steam will be allowed to escape to the atmosphere to indicate a leak and that replacement is necessary.

Having thus fully described my invention, I claim:

1. A flexible sleeve for stay bolts having a tubular inner end portion to fit within an opening in a boiler sheet, a tubular, internally threaded outer end portion projecting into and terminating within the body of said sleeve, a body portion curved on the arc of a circle to form a spring member, said body portion being of greater diameter than the tubular inner end portion, and a neck portion extending outwardly at an angle from the tubular inner end portion and connecting the same with the body portion, said body portion and neck portion being continuously spaced from the inwardly projecting outer end portion to provide an annular channel around said tubular outer end portion and a passage connecting said channel with the bore of the inner end portion, the said portions of the sleeve being substantially of like thickness throughout.

2. A flexible sleeve for stay bolts formed from a single piece of material of substantially uniform thickness throughout, said sleeve comprising a tubular inner end portion, a tubular outer end portion projecting inwardly into and terminating within the body of the sleeve and adapted for connection with an end of the stay bolt, a body portion curved on an arc of comparatively wide radius and connected at its outer side with the outer portion of the sleeve, and a neck portion extending substantially at an acute angle outwardly from the outer extremity of the tubular inner end portion and connecting the same with the curved body portion, the inner extremity of the tubular outer end portion being constantly spaced at all points from said body portion and neck.

3. Means for yieldingly attaching a stay bolt to a boiler sheet, consisting of a housing having terminal axially alined and permanently spaced sleeve members for engagement respectively with the bolt and sheet and a relatively bulged resilient annular arched member connecting said terminal members and maintaining them permanently in axially movable relation.

4. Means for attaching a stay bolt to a

boiler sheet, consisting of a housing for receiving a bolt, and comprising axially alined independently movable, permanently spaced sleeve members connected by an annular axially yieldable arch member, one of said sleeve members being engageable with a boiler sheet and the stay bolt being engageable with the other sleeve member and axial extension through the first named sleeve member.

5. A stay bolt anchoring device consisting of an annular longitudinally arched housing having terminal reduced permanently spaced sleeve members for respective engagement with a boiler sheet and a stay bolt.

6. The combination with a boiler sheet having an opening therein, of a stay bolt connection comprising a bowed body portion curved on an arc of comparatively wide radius, an outer internally threaded end portion projecting into said body portion, an inner end portion of relatively smaller diameter than the body portion and fitted in the opening in the boiler sheet, and a neck portion extending outwardly at an angle between the inner end portion and the body portion, said neck portion being arranged to form an angular space between the same and the boiler sheet, and a welding material disposed in said space and welded to the neck portion and boiler sheet.

7. A stay bolt anchoring device consisting of terminal spaced sleeve members connected by an annular bulged intermediate member capable of flexion to permit relative axial movement of the terminal members, the latter being adapted for respective engagement with a stay bolt and a boiler sheet.

8. A stay bolt connection for boiler sheets comprising a bushing sleeve, a bolt extending through said sleeve and in threaded engagement therewith, a clearer within the sleeve for the removal of deposits, and means for manipulating said clearer.

9. A stay bolt connection for boiler sheets comprising a bushing sleeve, a stay bolt extending through and in threaded engagement with said sleeve, a ring-shaped clearer of link material disposed within the sleeve and surrounding the bolt, and manipulating members engaging the sleeve and adapted for disengagement therefrom whereby said clearer may be manipulated.

10. A stay bolt connection for boiler sheets comprising a sleeve in which a portion of a stay bolt is adapted to be mounted, and means within said sleeve actuated by the circulation of water and steam therein to reduce accumulation of deposits.

11. A stay bolt connection for boiler sheets comprising a sleeve in which a portion of a stay bolt is adapted to be mounted, and means within said sleeve adapted to surround said bolt and actuated by the circulation of water and steam therein to reduce accumulation of deposits.

In testimony whereof I affix my signature.

PETER F. GALLAGHER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents. Washington, D. C."