J. W. KEELEY.

FLEXIBLE STAY BOLT.

APPLICATION FILED DEC. 22, 1910.

1,000,014. Patented Aug. 8, 1911.

Fig. 1.

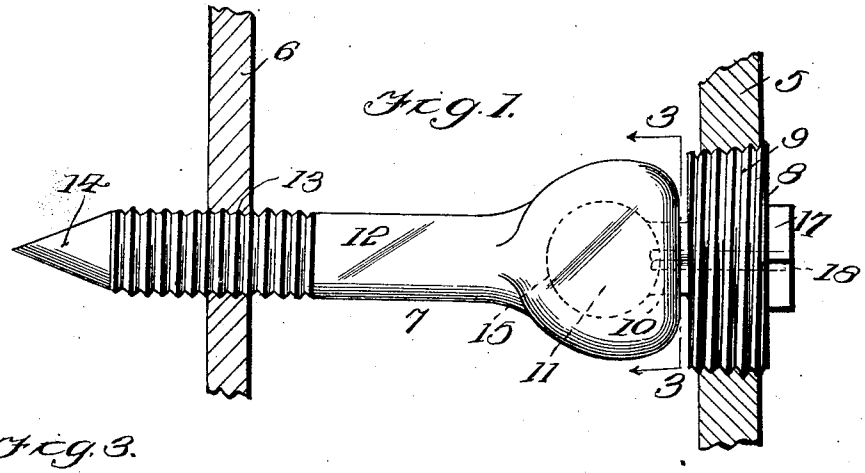


Fig. 3.

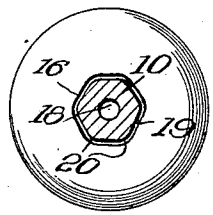


Fig. 2.

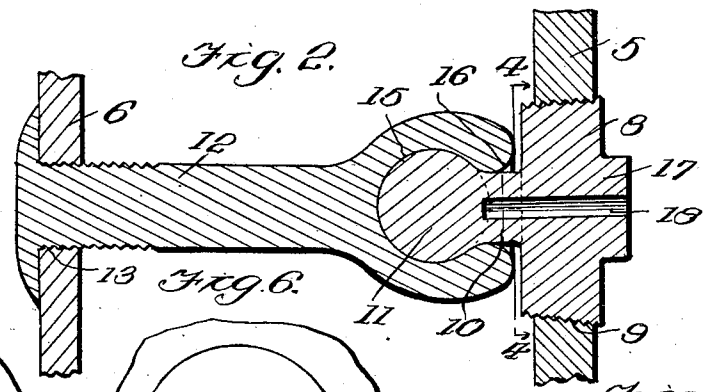


Fig. 4

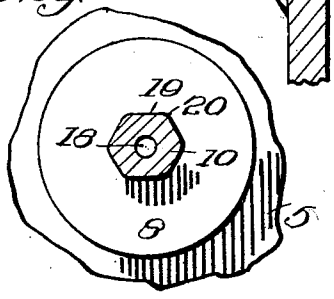


Fig. 6.

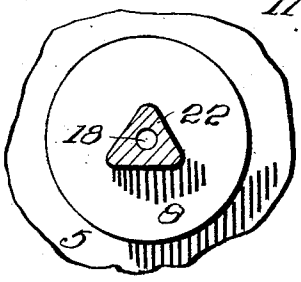


Fig. 7.

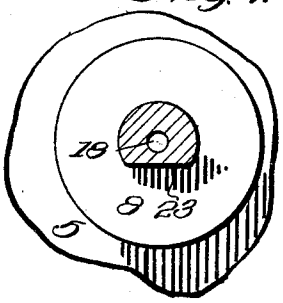
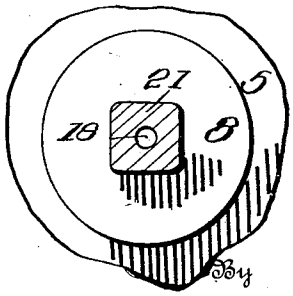


Fig. 5



Witnesses

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UNITED STATES PATENT OFFICE.

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FLEXIBLE STAY-BOLT.

1,000,014. Specification of Letters Patent. **Patented Aug. 8, 1911.**

Application filed December 22, 1910. Serial No. 598,793.

To all whom it may concern:

Be it known that I, JAMES W. KEELEY, citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Flexible Stay-Bolts, of which the following is a specification.

This invention relates to flexible stay bolts of that general class shown and described in United States Letters Patent issued to me on the 13th day of December 1910, under No. 978,596.

The object of the invention is general to improve and simplify the construction of the bolt and to provide means whereby the bolt and plug may be caused to rotate in unison when applying said bolt to boiler sheets, while at the same time preserving the flexible connection between the bolt and plug so as to permit movement of one relative to the other incident to the expansion and contraction of said boiler sheets.

A further object is to provide the exposed face of the plug with an angular head for engagement with a wrench, and the free end of the bolt with a pointed terminal to assist in guiding the bolt to its seat in the inner sheet.

Further objects and advantages will appear in the following description, it being understood that various changes in form, proportions and minor details of construction may be resorted to within the scope of the appended claims.

For a full understanding of the invention and the merits thereof, reference is to be had to the following description and accompanying drawing, in which:

Figure 1 is a side elevation of a flexible stay bolt constructed in accordance with my invention, showing the same in position on the inner and outer sheets of a boiler and before the pointed terminal thereof is flattened or upset; Fig. 2 is a longitudinal sectional view, showing the end of the stay bolt severed and upset to secure the same to the inner boiler sheet; Fig. 3 is a vertical sectional view taken on the line 3—3 of Fig. 1 and looking in the direction of the arrow; Fig. 4 is a similar view taken on the line 4—4 of Fig. 2 and looking in the direction of the arrow; Figs. 5, 6 and 7 are transverse sectional views, illustrating modified forms of the invention.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawing by the same reference characters.

The improved flexible stay bolt forming the subject matter of the present invention is shown by way of illustration applied to a steam boiler of the ordinary construction in which 5 designates the outer or shell sheet and 6 the inner or fire box sheet, said sheets being spaced apart to form an intermediate water and steam compartment 7.

The bolt comprises a removable plug 8 having its side walls tapered and threaded at 9 for engagement with the threads of a correspondingly shaped opening formed in the outer or shell sheet 5. The inner end of the tapered plug 8 is reduced to form a contracted neck or stem 10 defining a spherical head 11, which latter projects a short distance within the compartment 7 for pivotal connection with the stay bolt, indicated at 12. One end of the stay bolt 12 is threaded in an opening 13 in the inner or fire box sheet 6 and is provided with a pointed terminal 14 to assist in guiding the threaded end of the bolt to its seat in the opening 13. The opposite end of the stay bolt 12 is provided with a spherical socket 15 corresponding to and adapted to receive the head 11 of the tapered plug 8, thus to form in effect a universal joint between the plug and stay bolt and permit lateral movement of one relative to the other incident to the expansion and contraction of the boiler sheets.

The walls of the socket 15, at the extremity of the bolt 12, are preferably thickened so as to reinforce and strengthen the socket, while the mouth of said socket is slightly angular in cross section, as indicated at 16.

The outer flat face of the tapered plug 8 is provided with an angular head or projection 17 so as to permit said head to be readily grasped with a wrench or other suitable tool when applying the stay bolt to the boiler sheets, said head 17 being pierced by a longitudinally disposed tell tale opening

18, one end of which extends through the contracted neck of said plug to a point near the base of the spherical head 11, while the other end thereof opens through the head or projection 17, and communicates with the atmosphere so as to permit the ready discharge of steam or water from the compartments 7 and thus notify the engineer or attendant in case of breakage of the stay bolt.

The neck 10 is preferably hexagonal in cross section to produce a plurality of flat faces 19 adapted to engage the walls of the thickened portion 16 of the stay bolt and thus cause the plug and stay bolt to rotate in unison when applying the stay bolt to the boiler sheets. It will here be noted that the walls of the neck 10 at the junction of adjacent flat faces 19 are slightly rounded, as indicated at 20, so as to allow a limited movement of the bolt with respect to the plug incident to the expansion and contraction of the boiler sheets without binding or wedging action between the parts.

In applying a stay bolt to the inner and outer sheets of a boiler, the pointed end 14 of the stay bolt is passed through the opening 13, after which the plug is inserted in the opening in the outer sheet 9 and rotated by grasping the head 17 with a wrench or other suitable tool, the angular walls of the neck 10, by engagement with the slightly angular walls of the mouth of the socket 15, serving to cause the plug and stay bolt 12 to rotate in unison and the threads on the bolt and plug to simultaneously engage the threaded openings in the adjacent sheets, thus permitting one man to do the work of two.

If desired, the neck of the plug, instead of being hexagonal in cross section, may be substantially square, as indicated at 21 in Fig. 5, or triangular, as indicated at 22 in Fig. 6, and in some cases, the neck may be provided with a single flat face or groove, as indicated at 23 in Fig. 7 of the drawing, the result being the same, namely, to cause the plug and bolt to rotate in unison without in any manner interfering with the flexibility of the stay bolt when in position on the boiler sheets.

While it is preferred to form the angular portion on the neck of the plug, it will of course be understood that the parts may be reversed, that is to say, the neck may be cylindrical in shape and the inner wall of the thickened portion 16 of the bolt formed with one or more angular faces for engagement with the neck of the plug.

Having thus described the invention, what is claimed as new is:

1. The combination with spaced boiler sheets, of a stay bolt engaging one of the sheets and provided with a substantially spherical socket housed between said sheets, and a plug threaded in the other sheet and having a reduced neck defining a substantially spherical head fitting within said socket, said neck being angular in cross section, thereby to permit the plug and bolt to rotate in unison when applying said bolt to the boiler sheets.

2. The combination with spaced boiler sheets, of a stay bolt engaging one of the sheets and having one end thereof provided with a pointed terminal and its other end formed with a substantially spherical socket housed between said sheets, a plug threaded in the other sheet and having a reduced neck defining a substantially spherical head fitting within said socket, said plug being provided with an angular head having a tell tale opening formed therein and extending within the neck, said neck being provided with an angular face adapted to bear against the inner wall of the socket at the mouth thereof, thus to cause the plug and bolt to rotate in unison when applying the stay bolt to said boiler sheets.

3. The combination with spaced boiler sheets, of a stay bolt enaging one of the sheets and having one end thereof threaded and provided with a pointed terminal at its other end formed with a substantially spherical socket housed between said sheets, the jaws of said socket being thickened and the mouth thereof slightly angular in cross section, a tapered plug threaded in the other sheet and having its exposed face formed with an annular face and its inner face provided with a reduced neck fitting within the mouth of the socket and defining a substantially spherical head seated in said socket, said plug being provided with a tell tale opening, the neck of the plug being angular in cross section, thereby to permit the plug and bolt to rotate in unison when applying the stay bolt to the boiler sheets.

4. The combination with spaced boiler sheets, of a stay bolt engaging one of the sheets and having one end thereof provided with a substantially spherical socket housed between said sheets, the jaws of said socket being thickened and the mouth thereof slightly angular in cross section, a plug threaded in the other sheet and provided with a reduced neck fitting within the mouth of the socket and defining a substantially spherical head seated in said socket, said neck being angular in cross section and having its exterior walls at the junction of adjacent faces thereof rounded to permit movement of the bolt relative to the plug.

5. The combination with spaced boiler sheets, of a stay bolt engaging one of the sheets and provided with a substantially spherical socket housed between said sheets, and a plug threaded in the other sheet and having a reduced neck projecting inwardly beyond said sheet and defining a substantially spherical head fitting within said

socket, the reduced neck and mouth of the socket being provided with locking faces, whereby when the mouth of the spherical socket of the stay bolt is closed down upon the neck, the plug and bolt will rotate in unison to permit the attachment of said bolt to the boiler sheets.

In testimony whereof, I affix my signature in presence of two witnesses.

JAMES W. KEELEY. [L. S.]

Witnesses:
FRANK G. GRIER,
HARRY W. ROMMEL.