J. R. FLANNERY & E. I. DODDS.

MANUFACTURE OF STAY BOLTS FOR BOILERS.

APPLICATION FILED FEB. 21, 1917.

**1,281,930.** Patented Oct. 15, 1918.

Fig. 1.

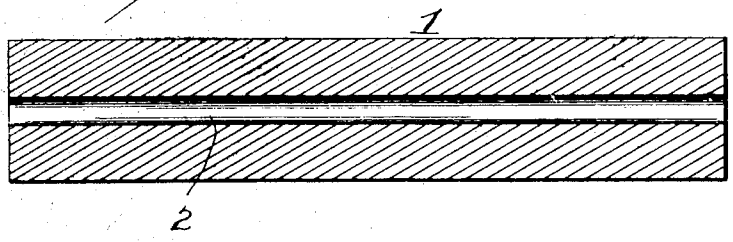



Fig. 2.

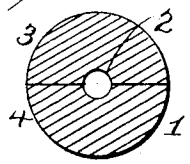



Fig. 3.

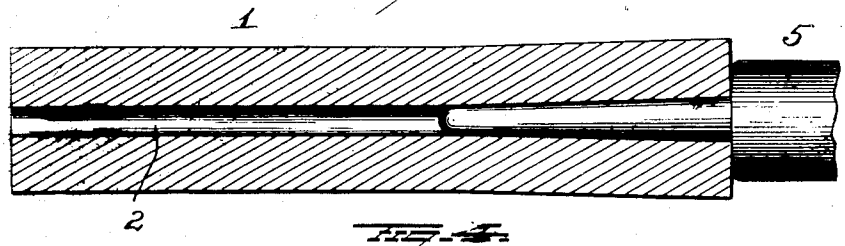



Fig. 4.

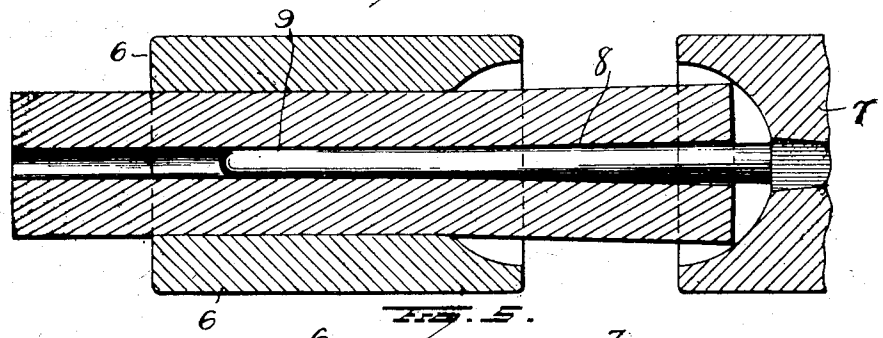
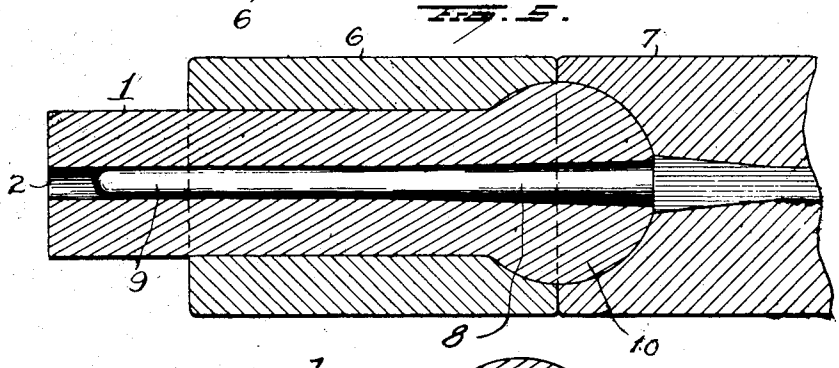



Fig. 5.



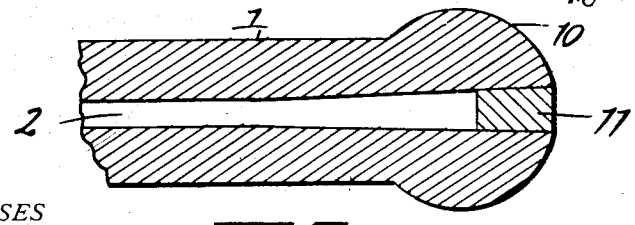




Fig. 6.

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# UNITED STATES PATENT OFFICE.

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## MANUFACTURE OF STAY-BOLTS FOR BOILERS.

1,281,930. Specification of Letters Patent. **Patented Oct. 15, 1918.**

Application filed February 21, 1917. Serial No. 150,204.

*To all whom it may concern:*

Be it known that we, JOHN R. FLANNERY and ETHAN I. DODDS, citizens of the United States, and residents of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in the Manufacture of Stay-Bolts for Boilers; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in the manufacture of staybolts for boilers and more particularly to such as are of the type known in the art as "flexible" staybolts and formed with tell-tale holes,—the object of the present invention being to provide a simple and efficient method of making a stay bolt from a bar having a bore extending continuously through the same from end to end, and forming an integral head thereon in such manner as to avoid contracting or closing the bore during the formation of the head.

With this object in view, the invention consists in certain novel features in the method of making a staybolt as hereinafter set forth and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view of a tubular bar from which the bolt may be made; Fig. 2 is a cross section of the same; Fig. 3 is a view illustrating the first step in the method of forming the head; Fig. 4 is a view illustrating the beginning of the second step, Fig. 5 is a view illustrating the conclusion of the second step, and Fig. 6 is a view showing the manner in which the tell-tale bore may be permanently closed at the headed end of the bolt.

1 represents a tubular bar or blank from which the staybolt is made,—the bore 2 forming the tell-tale hole for the finished bolt. The bar or blank may comprise two grooved members 3, 4, welded together as indicated in Fig. 2. One end of the bar or blank may be heated and a conical mandrel or male die 5 may then be forced into the bore 2 at one end thereof to partially expand the metal at the end of the bore, as indicated in Fig. 3.

The end portion of the bar will then be subjected to the action of two female dies 6—7 with a conical male die or mandrel 8 extending from the female die 7 and entering the partially expanded bore,—the free end portion 9 of the die or mandrel 8 being made cylindrical to conform to the normal contour of the bore 2. The female dies 6, 7 are then brought together as indicated in Fig. 5, resulting in upsetting or expanding the metal of the end of the bar into the cavities of the dies 6—7 and around the die or mandrel 8, and thus forging a head 10 on the outer end of the bolt,—said head being, in the present instance, spherical in form, although it may be given any other contour desired.

When the bolt shall have been removed from the dies, we prefer to close the end of the bore at the headed end only of the bolt, in any suitable manner (as by means of a plug 11), so that the tell-tale hole formed by said bore shall extend from the inner end of the bolt to a point within the head at the outer end thereof.

Having fully described our invention what we claim as new and desire to secure by Letters-Patent, is:—

1. The method of making a staybolt consisting in providing a bar with a longitudinal bore from end to end thereof, expanding one end of the tubular bar, forging the expanded end portion of the bar into a head, and then permanently closing the bore at the headed end of the bolt.

2. The herein described method of making a staybolt having a tell-tale bore, consisting in heating one end portion of a tubular bar, forcing a conical mandrel into the bore at the heated end of the bar and expanding the latter, disposing the said portion of the bar between female dies, forging a head on the end of the bar between said dies and simultaneously inserting a mandrel into said bore beyond the portion of the bar on which the head is forged, and finally closing the tell-tale hole at the headed end of the bolt.

In testimony whereof, we have signed this specification in the presence of two subscribing witnesses.

JOHN ROGERS FLANNERY.
ETHAN I. DODDS.

Witnesses:
F. H. ALLISON,
EDWIN S. RYCE.