To all whom it may concern:

Be it known that I, Ethan I. Dodds, a citizen of the United States, residing at Central Valley, in the county of Orange and State of New York, have invented new and useful Improvements in Fire-Box Stay-Bolts for Locomotive and other Boilers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a longitudinal section through a portion of one form of bolt made in accordance with my invention; Fig. 2 is a plan view of the same; Fig. 3 is a view similar to Fig. 1 of a modified form of bolt; Fig. 4 is a plan view of the bolt shown in Fig. 3; Fig. 5 is a view similar to Fig. 1, showing another modified form of bolt; Fig. 6 is a plan view of the bolt shown in Fig. 5; and Figs. 7, 8, 9 and 10 are views similar to Fig. 1, showing other modified forms of bolts.

My invention relates to Improvements in stay bolts that extend from the fire box sheet to the outside boiler sheet through the water and steam space of the boiler, and are secured to both said sheets by means of screw threaded connections.

The object of my invention is to provide a bolt having a semi-universal joint so that the fire box sheet may yield and equalize itself when it expands and contracts.

Another object of my invention is to provide a bolt of this character which is cheap of construction, which can readily be assembled, and which can be placed in position from the inside of the fire box, without dismantling or stripping off the lagging, etc.

Another object of my invention is to provide a bolt of this character in which the various parts are secured to each other by cast metal, and thereby overcoming the use of expensive dies for forming the various parts.

The precise nature of my invention will be best understood by reference to the accompanying drawings, which will now be described; it being premised, however, that various changes may be made in the details of construction and general arrangement of the parts, without departing from the spirit and scope of my invention as defined in the appended claims.

In Figs. 1 and 2 of the drawing, the numerals 1 and 2 designate the boiler sheets or plates; 3 designates the body of the stay bolt, which is provided with hemispherical heads 5; extending radially from the body of the bolt 3 are fins 4; 7 and 8 are caps, which are secured to the ends of the bolt 3 by means of the metal 6, which is poured into the caps through the ends thereof, to fill the space between the heads 5 and said caps. The cap 7 is provided with a screw threaded portion 9, while the cap 8 is screw threaded on its periphery, as indicated at 11, and is provided with a wrench seat 13. The inner diameter of the threads 11 on the cap 8 is greater than the outer diameter of the cap 7, so that the cap 7 is first passed through the opening in the sheet 2, and its screw threaded portion 9 is engaged with the screw threads in the plate 1, while the screw threads 11 on the cap 8 engage the screw threads in the opening in the plate 2. The member 8 is rotated until the cap 7 jams up against the face of the plate 1. The three members are rotated with each other by means of the fins 4, which extend into slots 10 and 12 in the caps 7 and 8 respectively.

14 designates tell-tale holes which are drilled through the cast metal 6 and into the body of the bolt 3, and are adapted to permit steam or water to escape, if any portion of the caps or the bolt is broken.

The device shown in Fig. 1 is assembled in the following manner: The caps 7 and 8 and the bolt 3 may be made in any well known manner. A suitable core is then placed around each end of the bolt between the heads and the fins 4, and the ends of the bolt are then inserted into the caps 7 and 8. Metal of a suitable alloy is then poured through the openings through the ends of the caps, which fills the entire space within said caps around the heads 5 and the
core, and after the metal has been cooled, the cores are broken up and removed from said space.

In Figs. 3 and 4, I have shown a modified form of bolt which comprises a tubular member 15, and socket members 27 which are cast in the ends of the tube. This tube 15 is provided with shoulders 17 for retaining the cast metal in position. 20 designates the end connecting members which are provided with balls seated in the sockets in the cast metal positions 27, and are provided with fins 22 which engage slots 13 in the ends of the tube 15. These connecting members are also provided with tell-tale holes 26 and are also screw threaded in a manner similar to the members 7 and 8, shown in Figs. 1 and 2. This bolt is built up or assembled in the following manner:—A piece of metal such as indicated at 19 is first slipped into the tube and a core is placed about the neck of each of the connecting members 29. These members are then inserted into the ends of the tube 15, and metal is then poured into the space surrounding the heads through openings 17 through the tube, after which the core about the necks of the connecting members is removed.

In Figs. 5 and 6, I have shown still another modified form of bolt, in which 28 designates a tubular bolt, one end of which is provided with a hemi-spherical recess 29 for the heads of the connecting member 32. The other end of this tube is provided with a shoulder 30 and the space between the end of the connecting member at this end of the tube and the shoulder 30 is filled with cast metal 27 in a manner similar to the filling of the space in the construction shown in Figs. 3 and 4. The inner ends of the connecting members 32 are slotted for the reception of key plate 33, which forms the driving connection between the two members 32.

In the construction shown in Fig. 7, 34 designates the bolt which is provided with fins 4, similar to the fins shown in Fig. 1, the ends thereof being provided with grooves 35 for retaining the heads 37 in position. One end of this bolt is provided with a bushing 43, which is internally threaded for the reception of a threaded plug 45 having screw threads for engaging a threaded opening in the sheet 1. Each of these bushings is provided with grooves 41 for the reception of the fins 4. In this construction the heads are cast about the ends of the bolt within the bushings, the outer ends thereof being milled at the points indicated at 38. The plug 45 is then placed in position and the bolt is ready for use.

In Fig. 8, I have shown two connecting members having spherical sockets, which engage the heads 49 of the bolt 48. The socket members are placed in their proper position 65 within a mold and cast metal is poured through openings 53 in the socket members, and the bolt 48 is cast in position, together with the fins 4 extending therefrom, which are adapted to engage the grooves 41 in the socket members. After the bolt has been cooled, the gate is cut out of the openings 53 so as to permit the heads 49 to move freely within the sockets.

In Fig. 9, I have shown a construction in which the bolt member is formed from a tube 87 having annular flanges 88 on the ends thereof. In this construction, I also use connecting members similar to those shown in Fig. 8, merely casting the heads 87 on the ends of the tube in a manner similar to the casting of the entire bolt and heads in Fig. 8.

In Fig. 10, I have shown a construction somewhat similar to that shown in Fig. 9, in which the bolt is formed from a tube 64 having a plurality of openings 17, through one of which the case metal 65 is poured, the cast metal passing out through the opening 17 in the connecting members to connect the head of the body of the bolt, and also passing out through openings in the lower face of the tube to form projections 4. In this construction the metal passing out through vents 53 is also drilled out after completion of the bolt in order to permit the heads of the bolt to move freely within the sockets.

The advantages of my invention result from the provision of a stay bolt having three members connected to each other so that they will readily vibrate with relation to each other and at the same time form a connection for rotating the one with relation to the other.

Another advantage of my invention results from the provision of a bolt in which the several parts are connected to each other by means of cast metal which is poured during the assembling thereof to connect the several parts to each other.

I claim:

1. A stay-bolt having a body portion, a screw threaded connected member at each end, and a cast metal portion between each connecting member and the body portion for connecting the body portion to the connecting members; substantially as described.

2. A stay-bolt having a connecting member secured to each end, said connecting members having spherical sockets, and cast metal heads, within said sockets and on the ends of the stay-bolts for connecting the bolt to the socket members; substantially as described.

3. A stay-bolt having screw-threaded connecting members secured to both ends by ball and socket joints, each of said connect-
ing members having slots in their adjacent ends and radially extending fins on the bolt registering with said slots; substantially as described.

4. A stay-bolt having connecting members at each end, said connecting members having sockets, flanges on the ends of the bolt within the sockets, and cast metal surrounding the ends of the bolt within the sockets for securing the bolt to the connecting members; substantially as described.

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