March 18, 1930. A. F. PITKIN 1,750,687

STEAM BOILER STAY BOLT

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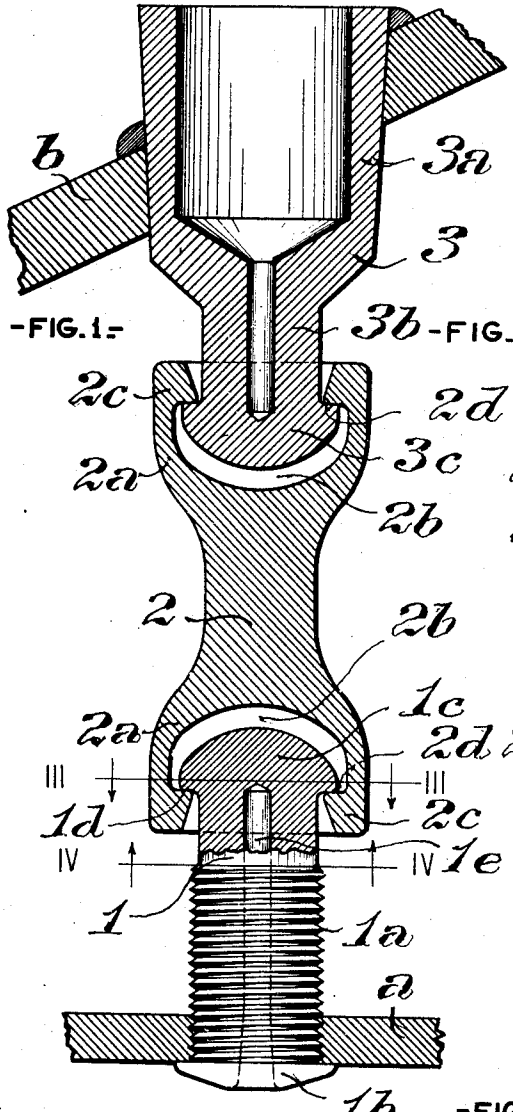
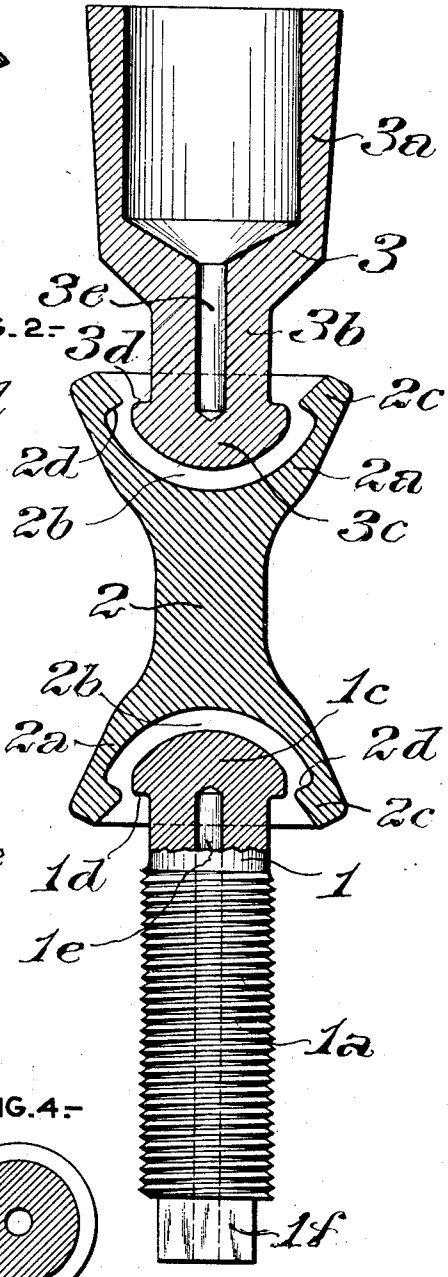
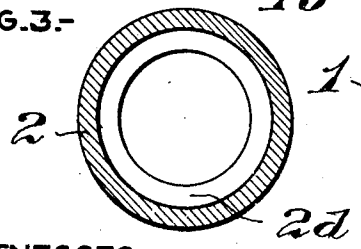


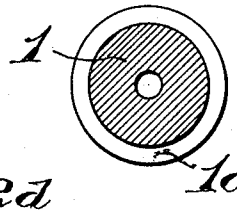
-FIG. 1.-



-FIG. 2.-



-FIG. 3.-



-FIG. 4.-

WITNESSES

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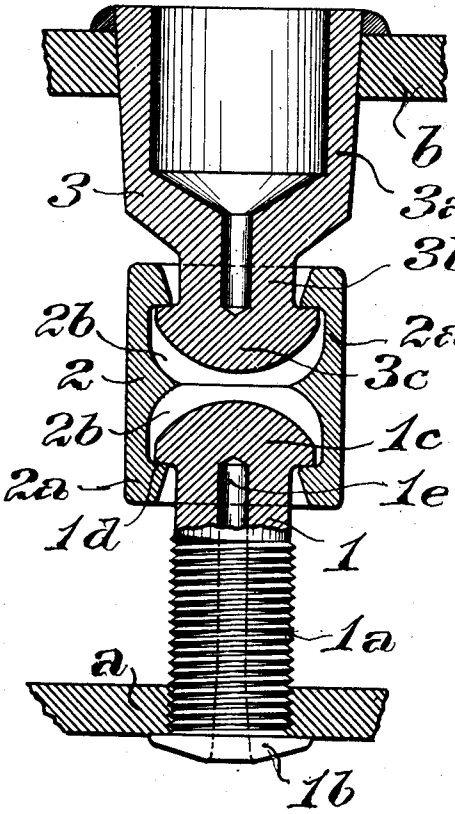
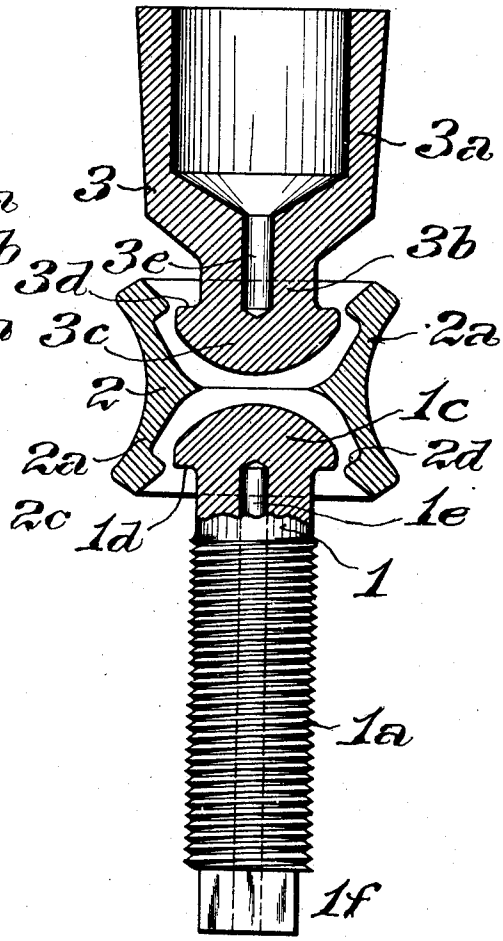
-FIG. 5.-



-FIG. 6.-



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STEAM-BOILER STAY BOLT

Application filed October 29, 1927. Serial No. 229,612.

This invention relates to steam boiler staybolts, of the articulated, or so-called "flexible" type, and its object is to provide a staybolt of such type, in the operation of which, binding or cramping between it and a coordinated member or members of a stay bolt structure, due to the action of friction in operation, will be effectually prevented.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings: Figure 1 is a longitudinal central section, through a staybolt structure, illustrating an embodiment of the invention; Fig. 2, a similar section, showing the members of the structure, in their condition when preliminarily assembled; Fig. 3, a transverse section through the intermediate member, on the line III—III of Fig. 1, the adjoining end member not being shown; Fig. 4, a similar section, through the end member, 1, on the line IV—IV of Fig. 1; Fig. 5, a section, taken similarly to Fig. 1, illustrating a modification of detail; and, Fig. 6, a similar section, showing the members of the structure of Fig. 5 in their condition when preliminarily assembled.

In the operation of staybolt structures, of the general class or type to which the present invention relates, objectionable results have been experienced, resulting from the action of friction between the ordinarily applied ball shaped heads of the bolt members, and their socket shaped seats. When the bolt is new, only a line contact is provided between the surfaces of the bolt head and of the socket, but as wear in service occurs, the contacting surfaces become enlarged, and the friction between them, under load, causes them to bind, and prevents the desired and intended articulated action. This objection is overcome by the present invention.

In the practice of the invention, referring descriptively to the specific embodiment thereof which is herein exemplified, the staybolt structure comprises the following three essential members or elements: a fixed end member, 1, adapted to be secured to an inner boiler sheet, *a*; an intermediate member, 2, one end of which is articulated to the member, 1; and a fixed end member, 3, adapted to be secured in an outer boiler sheet, *b*, and articulated to the other end of the intermediate member, 2. This broadly stated coordination of members was known in the art prior to the present invention, and the novelty thereof consists in the structural features of articulation of the members, which will now be described.

The fixed member, 1, is in the form of a bolt, having an external thread, 1^a, cut upon it, at and adjoining one of its ends, which thread is screwed into an inner sheet, *a*, of the boiler in which the structure is installed, the threaded portion being made of sufficient length to extend, through the sheet, for a proper distance to enable a head, 1^b, to be formed on the member, by riveting it over, on the inner side of the sheet. A rounding head, 1^c, is formed on the other end of the member, 1, said head being of sufficiently greater diameter than the body of the member, to provide an annular bearing face, 1^d, which extends around the bottom of the head. The bearing face is substantially flat, that is to say, at a right angle to the axial line of the member, or, equivalently, curved, on a comparatively long radius, struck from said axial line. A tell-tale hole, 1^e, is drilled, axially, in the member, 1, extending from its end further from the head, nearly to, or slightly into, the head.

The intermediate member, 2, of the staybolt structure is a bolt, having a solid cylindrical body, and a head, 2^a, formed on each of its ends, each of the heads being recessed to provide a socket, 2^b, for the reception of the head of an end member. Inwardly extending projections or flanges, 2^c, are formed on the ends of the sockets, the inner faces

of said projections providing annular bearing faces, 2^d, on which the bearing faces of the end members abut, when assembled for operation.

The fixed end member, 3, comprises a tapered plug, 3^a, a short body or neck, 3^b, and a rounding head, 3^c, similar to the head, 1^c, of the end member, 1, and formed with a similar annular bearing face, 3^d. The plug portion of the member is of tubular section, its shell being made only sufficiently thick to safely resist the strain to which it is exposed in service, and a tell tale hole, 3^e, is drilled in the member, extending to, or nearly to, the head. The plug is fitted in an opening of corresponding form, in an outer sheet, *b*, of the boiler, and is secured therein, in the ordinary manner.

In assembling the structure for operation, the heads 1^c and 3^c, of the end members, 1 and 3, are inserted, respectively, in the sockets, 2^b, of the intermediate member, 2, as shown in Fig. 2, and the end projections, 2^c, thereof, are swaged over the heads, so as to present the annular bearing faces, 2^d, for contacting with the corresponding bearing faces, 1^d and 3^d, of the end members, sufficient clearance being left between the heads and the sockets to allow relative movement, as shown in Fig. 1. The assembled structure is inserted and secured in position in the boiler sheets, by passing it through the opening in the outer sheet, until the lower end of the member, 1, on which there is formed a squared wrench fit, 1^f, projects through the opening in the inner boiler sheet. This end is then gripped with a wrench, applied from the inside of the firebox of the boiler, and the member, 1, is screwed into the inner boiler sheet, until the member, 3, is drawn into place in the outer sheet, in which it is secured by welding, or other known means. The member, 1, is then further screwed into the sheet, until the structure is drawn to the proper tension, after which the wrench fit, 1^f, is cut off, and the end of the bolt riveted over, or expanded to make a tight joint with the sheet, in the ordinary manner.

Figs. 5 and 6 illustrate a modification of structural detail, in which the intermediate member, 2, is made as short as possible, by eliminating the body portion and locating the end sockets closely together. The formation of the annular bearing faces, and the manner of assembling the structure, are the same as in the instance hereinbefore described.

While the bearing faces of the articulated members are herein shown as being flat, it is to be understood that they would similarly operate if curved on a comparatively long radius, and would constitute the mechanical equivalent of flat bearing surfaces. The application of curved bearing surfaces can be made without departure from the spirit and operative principle of the invention, and is, therefore, within the contemplation thereof, the essential resultant in either instance being, that the coacting faces provide a rocking relative movement between the sections upon which the faces are formed without creating injurious relative sliding movement therebetween.

What is claimed as the invention and desired to be secured by Letters Patent is:

1. An articulated staybolt having opposed end portions adapted to be secured respectively in the inner and outer sheets of a steam boiler, and a tension resisting intermediate section having a substantially flat face at each end, said end portions being provided at one end thereof with a substantially flat face engaging a corresponding face of the tension resisting section when in the assembled position, said co-acting faces providing a rocking relative movement between the end portions and the tension resisting intermediate portion without creating relative sliding movement.

2. An articulated staybolt having opposed end portions adapted to be secured respectively in the inner and outer sheets of a steam boiler, and a tension resisting intermediate section having end sockets provided with substantially flat faces, said end portions being provided at one end thereof with a head of substantially semi-spherical outline, the bottom surface of said head being substantially flat adapting it to engage the substantially flat surface of the socket when in assembled position, said co-acting faces providing a rocking relative movement between the end portions and the tension resisting intermediate portion without creating relative sliding movement.

3. An articulated sectional staybolt comprising a tension resisting intermediate section having a substantially flat face at an end thereof, an adjacent tension resisting section having a substantially flat face engaging the face of the said intermediate section when in the assembled position, said co-acting faces providing a rocking relative movement between the sections without creating relative sliding movement, and a tension resisting section adjacent and connected to the opposite end of the intermediate section to permit articulation therebetween, the opposed ends of the said adjacent sections being adapted to be rigidly secured respectively to the inner and outer sheets of a steam boiler.

4. An articulated sectional staybolt comprising a tension resisting intermediate section, an adjacent tension resisting section articulated to one end of the intermediate section, the articulation comprising a socket on one of the sections and a head on the other section, the socket and head being provided with substantially flat engaging faces, said

faces providing a rocking relative movement between the sections without creating relative sliding movement, and a tension resisting section adjacent and connected to the opposite end of the intermediate section to permit articulation therebetween, the opposed ends of the said adjacent sections being adapted to be rigidly secured respectively to the inner and outer sheets of a steam boiler.

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