A. C. NEGUS.

FLEXIBLE STAYBOLT FOR STEAM BOILERS.

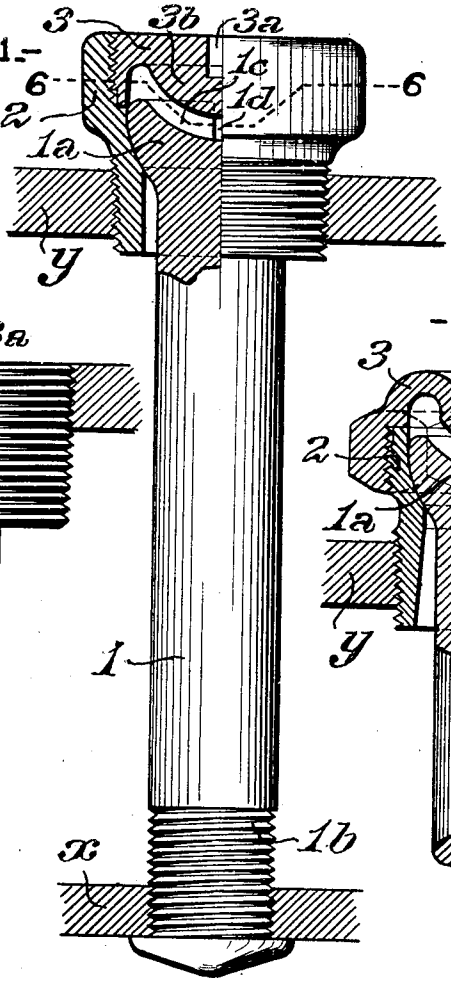
APPLICATION FILED SEPT. 13, 1919.

1,348,657.

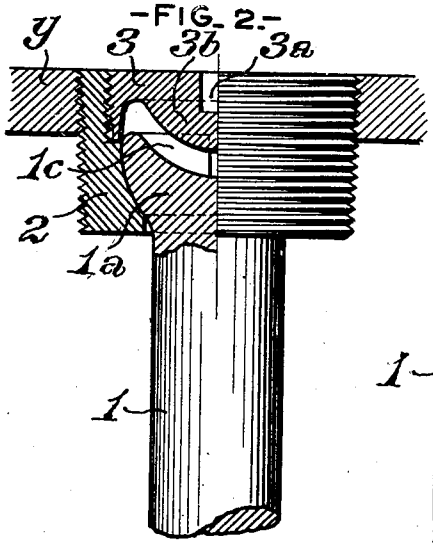
Patented Aug. 3, 1920.

2 SHEETS—SHEET 1.

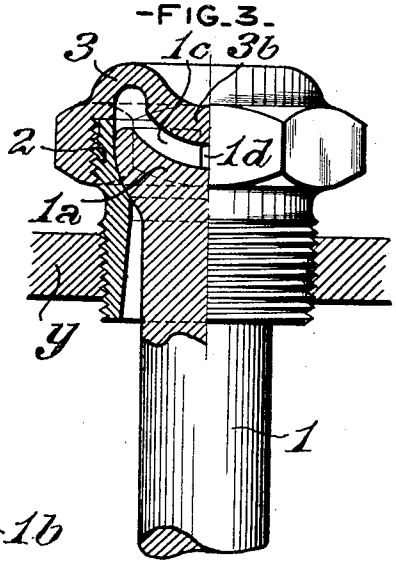
-FIG. 1.-



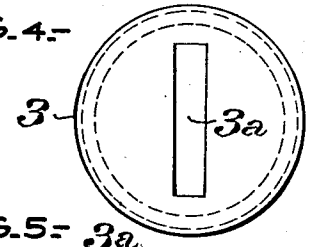
-FIG. 2.-



-FIG. 3.-



-FIG. 4.-



-FIG. 5.-

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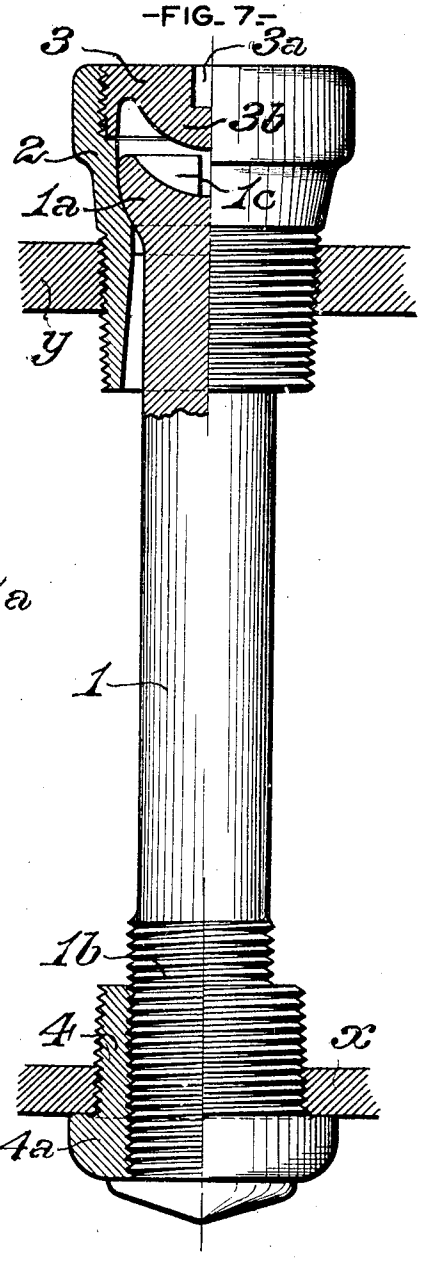
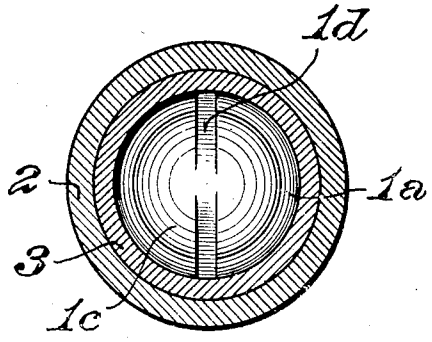
2 SHEETS—SHEET 2.

-FIG. 7-



-FIG. 6-



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FLEXIBLE STAYBOLT FOR STEAM-BOILERS.

1,348,657. Specification of Letters Patent. Patented Aug. 3, 1920.

Application filed September 13, 1919. Serial No. 323,449.

To all whom it may concern:

Be it known that I, ALFRED C. NEGUS, of Schenectady, in the county of Schenectady and State of New York, have invented a certain new and useful Improvement in Flexible Staybolts for Steam-Boilers, of which improvement the following is a specification.

My invention relates to steam boiler stay bolts of the so-called "flexible" type, in which the bolt, instead of being rigidly secured to each of the two boiler sheets which it connects, as universal in practice prior to said type, is articulated, through a ball and socket joint, to one of said sheets, so as to have the capacity of swiveling movement relatively thereto. Early instances of this type, which have been extensively applied in locomotive boilers, are exemplified in the German patent to Siegmuth and Wehrenpfennig, No. 5551, November 27, 1878, and the British patent to Leach, No. 4728 of 1885.

The object of my invention is to provide a steam boiler stay bolt of the type above specified, which, while possessing the same adaptability of application and operative capacity as those of the prior constructions, may be produced at a reduced cost of manufacture; be less in weight without reduction of strength; and, when applied in a boiler, will occupy a minimum amount of space thereon.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings: Figure 1 is a view, partly in elevation, and partly in section, of a steam boiler stay bolt and its accessories, illustrating an embodiment of my invention, the bolt being shown as connecting the inner and outer sheets of a locomotive firebox; Figs. 2 and 3, similar views of bolts, illustrating modifications of structural detail; Fig. 4, a plan or top view of the cap; Fig. 5, a transverse section through the same; Fig. 6, a similar section, through the cap, sleeve, and bolt head, on the line 6—6 of Fig. 1; and, Fig. 7, a view, similar to Fig. 1, showing a further modification of structural detail.

In the practice of my invention, referring descriptively to the specific embodiment thereof which is herein exemplified, and first to Figs. 1 to 6 inclusive, I provide a cylindrical stay bolt, 1, having a head, 1^a, at one end, and a screw thread, 1^b, at and adjoining the other end. The head, 1^a, is in the form of a section of a sphere included between two planes, and is, as in long established practice, connected to the body of the bolt by a fillet or reversely curved portion. The head of the bolt, instead of being solid, as in usual practice, is relieved in weight by a recess or depression, 1^c, which extends downwardly from its top, said recess being in the form of an end section of a sphere, the major transverse dimension of which is nearly equal to that of the bolt head and a transverse slot, 1^d, is punched, or otherwise formed, in the head, extending from its top to the bottom of the recess, 1^c, and serving, in holding the bolt while being threaded, and in screwing the bolt into the inner sheet, *x*, of a boiler firebox in which it is to be installed.

The stay bolt, 1, is adapted to be seated in a sleeve or bushing, 2, on which an external screw thread is cut to engage the outer sheet, *y*, of a boiler firebox, and on the bore of which there is formed a seat or socket, which is spherically curved, in conformity with the curvature of the periphery of the head, 1^a, of the bolt, the bearing for which is normally formed by the socket. The sleeve, 2, is closed, at its top, by a screw cap, 3, having a transverse slot, 3^a, extending across its top, for the insertion of a wrench, and a projection, 3^b, on its inner side, which projection is in the form of an end section of a sphere, the curvature of which corresponds substantially with that of the recess, 1^c, of the bolt head. The projection, 3^b, depends below the cap only so far as will permit a clear space to be interposed between it and the bolt head, throughout its entire surface.

The differences of structural detail shown in Figs. 2 and 3, involve no departure from the essential features and operative principle of the structure above described, being, respectively, merely as to the position of the top of the sleeve and the cap, relatively to the outer boiler sheet, *y*, and the location of the screw thread on the cap, 3. As shown in Fig. 2, the sleeve is of the so-called "flush" type, its top being even or flush with the outer surface of the boiler sheet, instead of projecting therefrom as in Fig. 1,

and in Fig. 3, the cap is screw threaded interiorly, instead of exteriorly, to engage the sleeve.

The stay bolt structure shown in Fig. 7, corresponds in all essential particulars with that shown in Fig. 1, and before described except that, instead of the bolt, 1, being threaded directly into the inner firebox sheet, x, its screw thread, 1^b, engages an internal thread in a sleeve or bushing, 4, having a flange, 4^a, on its outer end, which abuts on the side of said sheet next the fire. The sleeve is screwed into said sheet. The end of the bolt, 1, which projects outside the bushing, is riveted over, on the outside of the bushing, the construction described providing a button head on the bolt.

Among the advantages of my invention, there may be noted the following. The bolt may be forged in a bolt machine, thereby reducing the cost of production, as compared with the present methods, and the caps may be made on an automatic machine from bar stock, eliminating the cost of drop forging. The provision of the spherical section recess in the head, considerably reduces its weight, and, if the bolt should, by variation in the relative position of the inner and outer firebox sheets, be raised so far that the head is moved, partially or wholly, away from its bearing on the sleeve, the substantially correspondingly curved projection on the inner surface of the cap is adapted to abut against the spherical surface of the recess in the head, and thereby to provide a bearing for the latter. The form of the slot in the head of the bolt is such that its depth and holding power are greatest at its ends, which facilitates the bolt being held in place in the machine while being threaded, and eliminates the objection found in the operation by reason of the fact that in the ordinary construction, the ends of the slot are of the least depth or practically feather edged, and there is a consequent tendency for the bolt to work out of place while being threaded.

I claim as my invention and desire to secure by Letters Patent:

1. A flexible stay bolt having a head which is in the form of a section of a sphere included between two planes, and which is recessed, at its top, in the form of an end section of a sphere and provided with a transverse slot extending through the wall of the recess.

2. The combination of a flexible stay bolt having a head which is in the form of a section of a sphere included between two planes, and is recessed, at its top, in the form of an end section of a sphere, the major transverse dimension of which is nearly equal to that of the bolt head; a sleeve in which said head is socketed; and a cap, closing said sleeve and having a projection on its inner side which enters the recess of the head, and depends below the cap only sufficiently far as to admit the interposition of a clear space between it and the bolt head, throughout its entire surface.

3. The combination of a flexible stay bolt having a head which is in the form of a section of a sphere included between two planes, and is recessed, at its top, in the form of an end section of a sphere, the major transverse dimension of which is nearly equal to that of the bolt head; a sleeve in which said head is socketed; and a cap, closing said sleeve and having a projection, on its inner side, in the form of an end section of a sphere, which enters the recess of the head, and depends below the cap only sufficiently far as to permit the interposition of a clear space between it and the bolt head, throughout its entire surface.

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