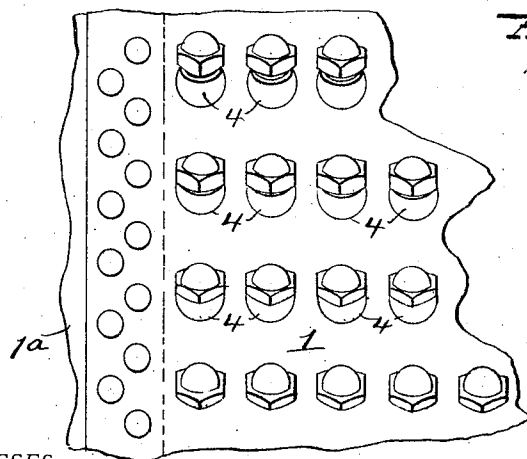
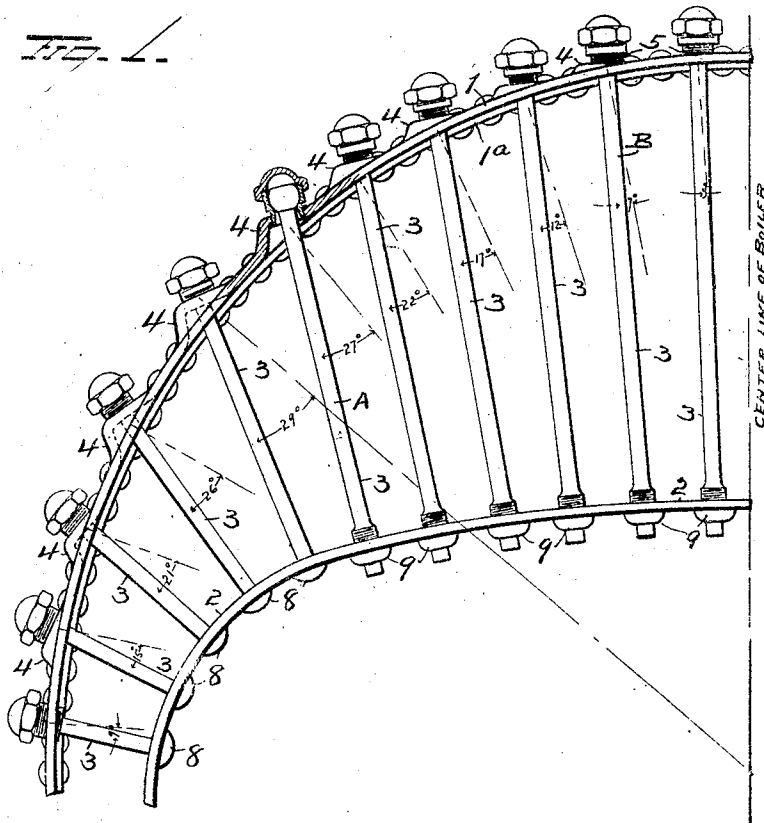


B. E. D. STAFFORD.
 STEAM BOILER AND STAY BOLT FOR SAME.
 APPLICATION FILED OCT. 1, 1909.

984,862.

Patented Feb. 21, 1911.

2 SHEETS-SHEET 1.



WITNESSES
E. Nottingham
G. F. Downing

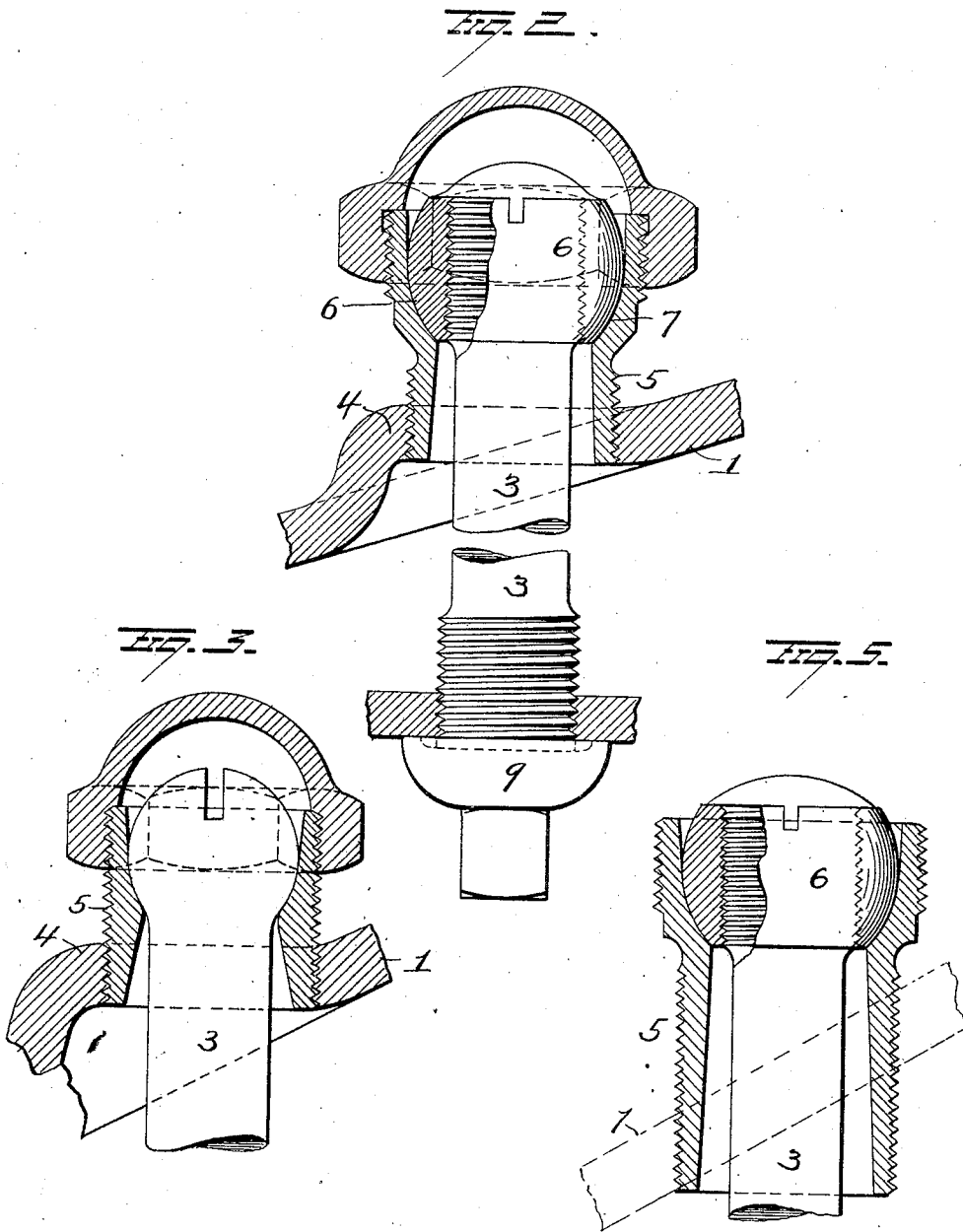
INVENTOR
B. E. D. Stafford
Cy. H. A. Seymour
 Attorney

B. E. D. STAFFORD.
STEAM BOILER AND STAY BOLT FOR SAME.
APPLICATION FILED OCT. 1, 1909.

984,862.

Patented Feb. 21, 1911.

3 SHEETS—SHEET 2.



WITNESSES
E. Nottingham
G. J. Downing

INVENTOR
B. E. D. Stafford
J. H. A. Seymour
Attorney

UNITED STATES PATENT OFFICE.

BENJAMIN E. D. STAFFORD, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO FLANNERY BOLT COMPANY, OF PITTSBURG, PENNSYLVANIA.

STEAM-BOILER AND STAY-BOLT FOR SAME.

984,862.

Specification of Letters Patent. Patented Feb. 21, 1911.

Application filed October 1, 1909. Serial No. 520,543.

To all whom it may concern:

Be it known that I, BENJAMIN E. D. STAFFORD, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Engine Boilers and Stay-Bolts for Same; and I 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.

My invention relates to an improvement in steam engine boiler and stay bolts for same, and it consists in providing the roof sheet of the boiler with raised seats or bosses, the outer faces of which are substantially at right angles to the long axes of the stay bolts, thereby enabling the seats to be more perfectly prepared to receive the sleeves of the stay bolts, and obtaining continuous threads which insure steam tight connection between the parts.

In the accompanying drawings, Figure 1 is a view in section of a portion of a locomotive boiler showing the roof and crown sheets connected by my flexible stay bolts. Fig. 2 is an enlarged view of one stay bolt showing its connection with the sheets, the sleeve and nut being shown in section and the bolt broken away at its center; Fig. 3 is a view in section showing the Tate flexible bolt mounted in a sleeve secured to a raised seat. Fig. 4 is a plan view of a portion of Fig. 1 and Fig. 5 is a view showing the usual method of attaching the stay bolt to the roof sheet.

1 represents the roof sheet and 2 the crown sheet connected by the bolts 3. In the present instance I have shown in Fig. 1, the roof sheet composed of a double thickness, the inner plates 1^a being riveted to the outer plates as clearly shown in Fig. 1. This roof sheet, or the outer plates 1 of the roof sheet, is provided at certain points, with seats 4 which latter project outwardly from the sheet, and are formed by forcing the metal, by dies or otherwise outwardly as shown in Fig. 2. The height of the seat depends altogether on its location on the roof sheet, but in each instance the height is such that the outer face of the seat will be approximately at right angles to the long diameter of the bolt 3 passing through same. In some situations as at A, where the stay bolt is at an angle of about twenty seven degrees, from a

line at right angles to the inner face of the roof sheet, the seat 4 must be raised considerably, whereas with another, say bolt B, where the latter stands at an angle of about seven degrees from a right angle, the height of the seat is much less. In each instance the seat is of an area sufficient to receive the sleeve 5, which latter is screw threaded externally and is screwed into a threaded hole formed in the seat. This sleeve is substantially of the shape and construction shown in the Tate Patent No. 753,329 granted March 1st, 1904, and forms a support for the spherical nut 6, which constitutes the head of the bolt 3. This nut is a sphere with flattened ends, the threaded bore extending from one flat end to the other, to receive the threaded end of the bolt 3. After the bolt has been screwed home into the nut, or the nut screwed onto the bolt, the head of the latter is upset or riveted over the upper flattened end of the nut, thus locking the bolt to the nut as shown in Figs. 2 and 5. This spherical nut rests on the curved seat 7 formed in the sleeve, and has a free rocking movement therein, the lower end of the sleeve 5, below the head being flared to allow the bolt to have such free movement. The lower end of the bolt may be secured to the crown sheet by screw threads and then upset as shown at 8 in Fig. 1, or they may be provided with button heads as shown at 9 in the same figure. The outer end of the sleeves are closed by the caps screwed to the externally threaded ends of the sleeves.

In the construction shown in Fig. 3, the head of the bolt is formed integral with the body as in the Tate patent above referred to.

With this improvement the bosses or seats 4 are stamped or otherwise formed to the correct angle for each row of staybolts thereby insuring seats at right angles to the stay bolts; which can be readily machined, and which permit of continuous threads for securing the sleeves to the sheet.

In the present methods of securing the flexible stay bolt sleeve to the roof sheet of a locomotive boiler, the extreme angles in some locations, as at A in Fig. 1 and also in Fig. 5, do not provide for continuous thread engagement between the sleeve and sheet, consequently allowing steam and water to follow the threads left open, and eventually leaking when the parts corrode. Again, in applying the bolts all machining operations

are done with portable tools without permanent or rigid supports, hence it is quite impossible to secure a perfect fit between all the bolts and the roof sheet. By providing the roof sheet with raised seats, I overcome the above objections and can employ shorter sleeves, than can be employed directly in the curved shell of the boiler.

By this improvement the stay bolts have free movement to cope with the differences in expansion of the crown and roof sheets, and renders the boiler more safe and serviceable.

It is evident that many slight changes might be resorted to in the relative arrangement of parts shown and described without departing from the spirit and scope of my invention hence I would have it understood that I do not wish to confine myself to the exact construction and arrangement of parts shown but.

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

1. The combination with the roof and crown sheets of a boiler, the roof sheet being provided with raised seats, of sleeves removably secured in said seats, and stay bolts secured to the crown sheet and provided with heads which are loosely mounted in the sleeves in the roof sheet.

2. The combination with roof and crown

sheets of a boiler, the roof sheets having raised seats, the outer faces of which are approximately at right angles to the stay bolts, of sleeves screwed into said seats and stay bolts secured to the crown sheets and provided with rounded heads loosely mounted in the sleeves in the roof sheet.

3. The combination with roof and crown sheets of a boiler the roof sheet having a series of raised seats the outer faces of which are approximately at right angles to the stay bolts, of sleeves screwed into said raised seats and stay bolts secured to the crown sheet and provided with rounded heads screwed onto the ends of the bolts and seated in the sleeves.

4. The combination with roof and crown sheets the former having a raised seat the outer face of which is approximately at right angles to the stay bolt, and a sleeve screwed into said seat, of a stay bolt secured to the crown sheet, a rounded head screwed to the upper end of the stay bolt and resting on a curved seat in the sleeve and a cap closing the upper end of the sleeve.

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

BENJAMIN E. D. STAFFORD.

Witnesses:

EDWIN S. RYCE,

WM. F. McNABB.