(No Model.) 2 Sheets—Sheet 1.

N. W. PRATT.

DEVICE FOR FASTENING HAND HOLE PLATES.

No. 517,885. Patented Apr. 10, 1894.

Fig. 2.

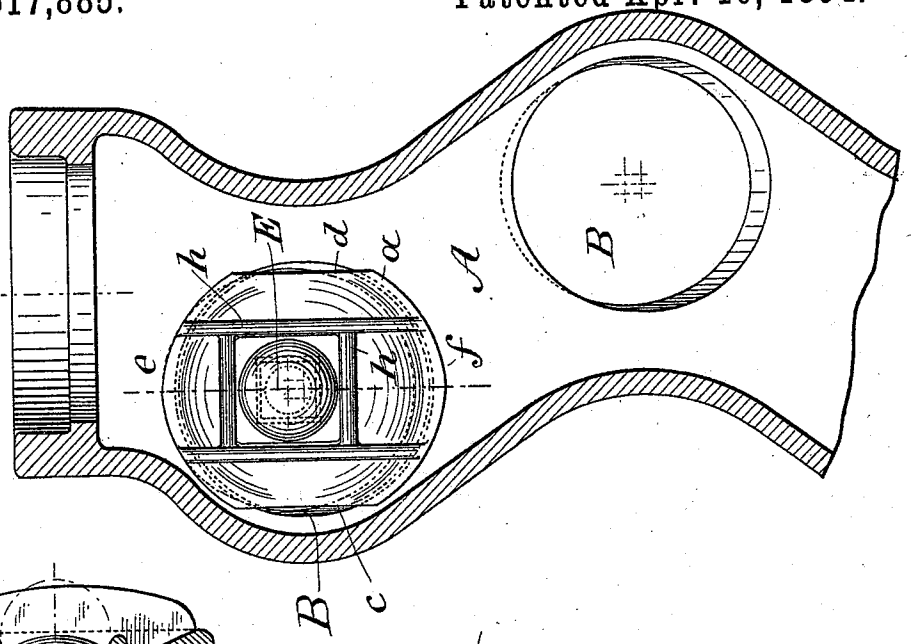


Fig. 3.

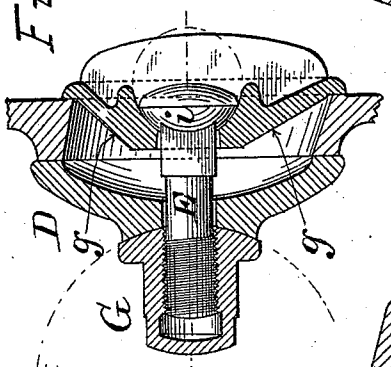


Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

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DEVICE FOR FASTENING HAND HOLE PLATES.

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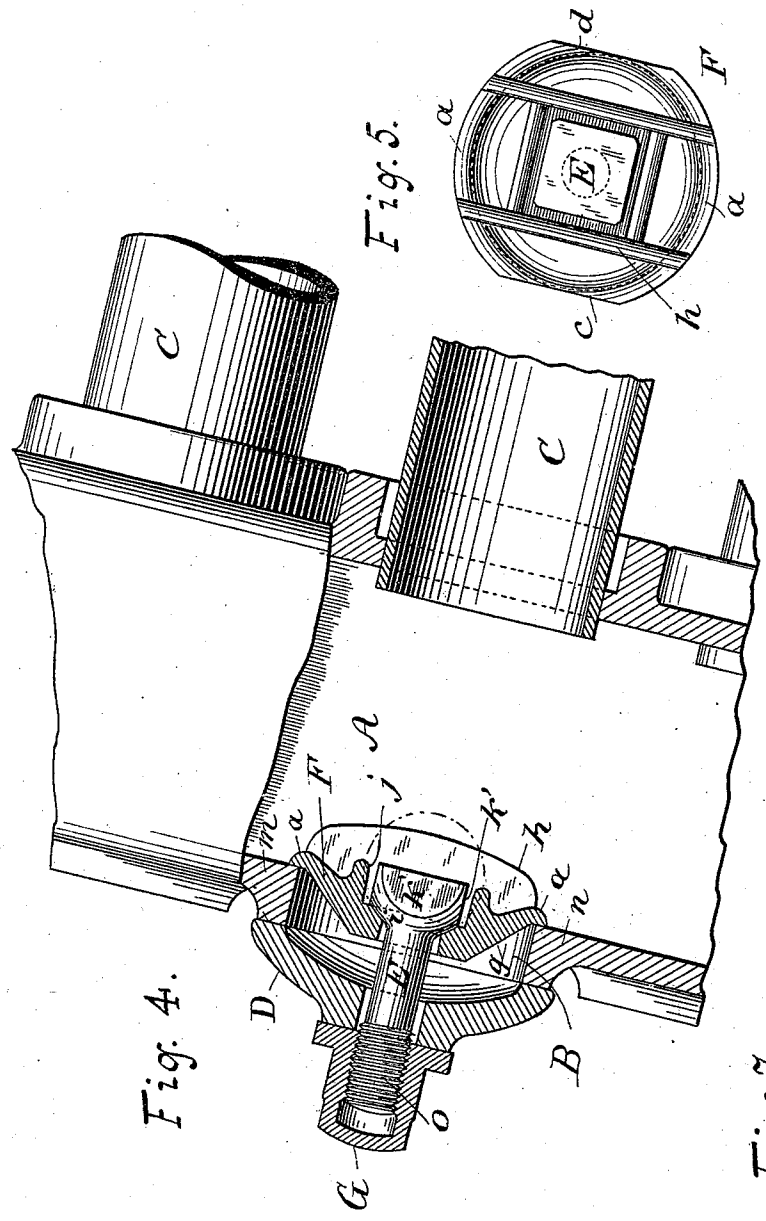


Fig. 4.

Fig. 5.

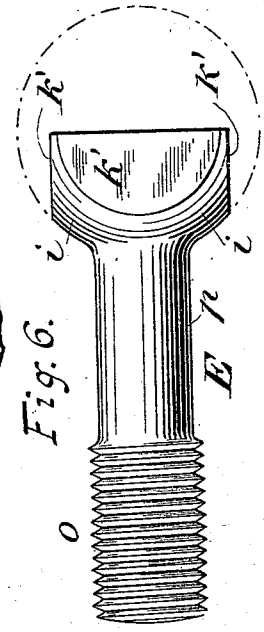


Fig. 6.

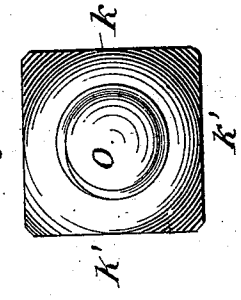


Fig. 7.

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DEVICE FOR FASTENING HAND-HOLE PLATES.

SPECIFICATION forming part of Letters Patent No. 517,885, dated April 10, 1894.

Application filed March 3, 1893. Serial No. 464,540. (No model.)

To all whom it may concern:

Be it known that I, NAT. W. PRATT, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Devices for Fastening Hand-Hole Plates, of which the following is a specification.

This invention is particularly adapted for fastening hand hole plates upon the hand holes formed in the headers opposite the tubes in a sectional water tube steam boiler; and the object of said invention is to secure the perfect seating of the hand hole plate, and clamping plate, irrespective of variations in their positions, and in the perpendicularity of the bolt, which may arise from irregularities in the formation of the hand hole.

In order to accomplish the aforesaid ends, a bolt is herein provided which is ball headed, being practically universally jointed to the clamping plate, and it may also be universally jointed to the hand hole plate by employing a ball faced nut.

Referring to the accompanying drawings: Figure 1, is a side elevation partly in section, showing the upper portion of a header of the description to which my invention applies; Fig. 2, a transverse section of Fig. 1, taken on the line *x—x;* Fig. 3, a sectional view showing a modified construction of the nut bearing surface; and Figs. 4, 5, 6 and 7, a modified construction of the bolt, and the adaptation of the plate to an inclined header.

A, represents the tubular header composed of cast or wrought metal, contoured in serpentine form as shown in Fig. 2, having the hand holes B, formed therein at the extreme outward undulations of the serpentine curves. The boiler tubes C, as shown in Fig. 1, are inclined with reference to the vertical header A, expanded therein, and in order to make the hand hole B, as small as possible so as to reduce the size of the hand hole plate or cap D, and so lessen the area under pressure which is held down by the bolt E, the hand hole opening B, is made on a rake, or inclined parallel with the tube C. In Fig. 4, the header is shown at right angles to the tubes and the hand hole opening in a line with their axis.

The hand hole clamp F, composed of a malleable casting or drop forging is of larger diameter than the circle of the hand hole, affording lapping flanges *a*, and the two sides *c*, *d*, are reduced so that the plate F, can be passed through the hand hole B, and then drawn outward against it; the two ends *e*, *f*, forming a bearing against which the bolt E, pulls.

The solid hand hole clamp F, serves to keep the hole B, practically closed, if the bolt should give way. The hand hole plate F, is convexed into the hole B, presenting beveled surfaces *g*, which serve to assist in centering the plate F, upon the margins of the opening B, when drawn into place. The plate F, is moreover webbed at *h*, on its concave side, promoting strength.

The bolt E, is ball headed at *i*, fitting the hemispherical socket *j*, in plate F, and the shank of the bolt plays loosely in the hole through which it is passed. In this instance the shank of the bolt is squared at *k*, preventing it from turning when the nut G is screwed up.

When the face of the hand hole plate D, is seated upon the aperture of the header A, and the nut G drawn against it, the ball head of the bolt bears on the inside of the clamp F, allowing the clamp to rest equally on all sides of the hand hole opening, and yet get a square pull at the bolt, so that the faces of the hand hole plate and nut where they come in contact, are not thrown out of line by any stiffness of the bolt.

It occurs in practice, especially in wrought iron headers, and sometimes in those of cast iron, that the thickness of the casting or forging at *m*, or *n*, representing the depth of the margins of the hand hole, is unequal, in which case, if a stiff bolt rigidly projected from the clamp F, or having a square shouldered head seating thereon, is used, there is a tendency to throw the strain more on one side than another, and to throw the fitted faces of the nuts and plates out of line with each other. Moreover, when the plates F, D, are being clamped together, whether they lie parallel or not, the ball headed bolt E, will accommodate itself to the lateral adjustment of the nut G, such as required in order to find its seat and abut equally on all sides of the bolt.

It will be observed that the threads *o*, of the bolt E, project beyond the diameter of the neck *p*, rendering the full strength of the bolt unimpaired by reduction of the cross sectional area of the material or stock of which it is composed, thus providing against fracture as sometimes occurs when the threads are cut within the normal diameter of the bolt.

The modification in Fig. 3, consists in providing the seating surface of the nut G, upon the hand hole plate D, with a convexity whereby the seat forms a part of an imaginary sphere indicated by the dotted line *q*, thereby constituting a practically ball headed nut. Thus two points of universal play are allowed in the bolt E, further promoting perfect seating of the parts to be clamped.

The modifications shown in Figs. 4, 5, 6 and 7, consist in dispensing with the square portion of the body or shank of the bolt, and making the head of the bolt square as shown at K, the socket in the clamp F being of corresponding shape but slightly larger in order to give sufficient clearance to allow the bolt to rock on its ball bearing and yet prevent it from turning when the nut is applied.

What I claim, and desire to secure by Letters Patent, is—

1. A steam generator having a header and inclined tubes, hand hole openings in said header in axial line with the tubes, and a cover plate and clamp secured with the universally jointed bolt as set forth.

2. A steam generator having a vertical header and inclined connected tubes, the hand hole openings in said header being formed in axial line with the inclined tubes and fitted with a cover plate and clamp connected by a bolt arranged at right angles to the face of the header and universally jointed to the clamp, substantially as and for the purpose set forth.

3. A clamp or yoke for cover plates of steam boilers of greater diameter than the opening, having two of its parallel sides reduced combined with a securing bolt having a ball bearing head upon which the yoke is free to oscillate when adjusted to place, and a squared portion which prevents it from turning when in place, as set forth.

4. A clamp bolt for securing a cover plate constructed with a ball bearing head and a shank or body of less diameter through the plate aperture whereby the bearing faces of the nut and plate are brought in uniform contact, and any lateral strain on the threaded portion of the bolt relieved as set forth.

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