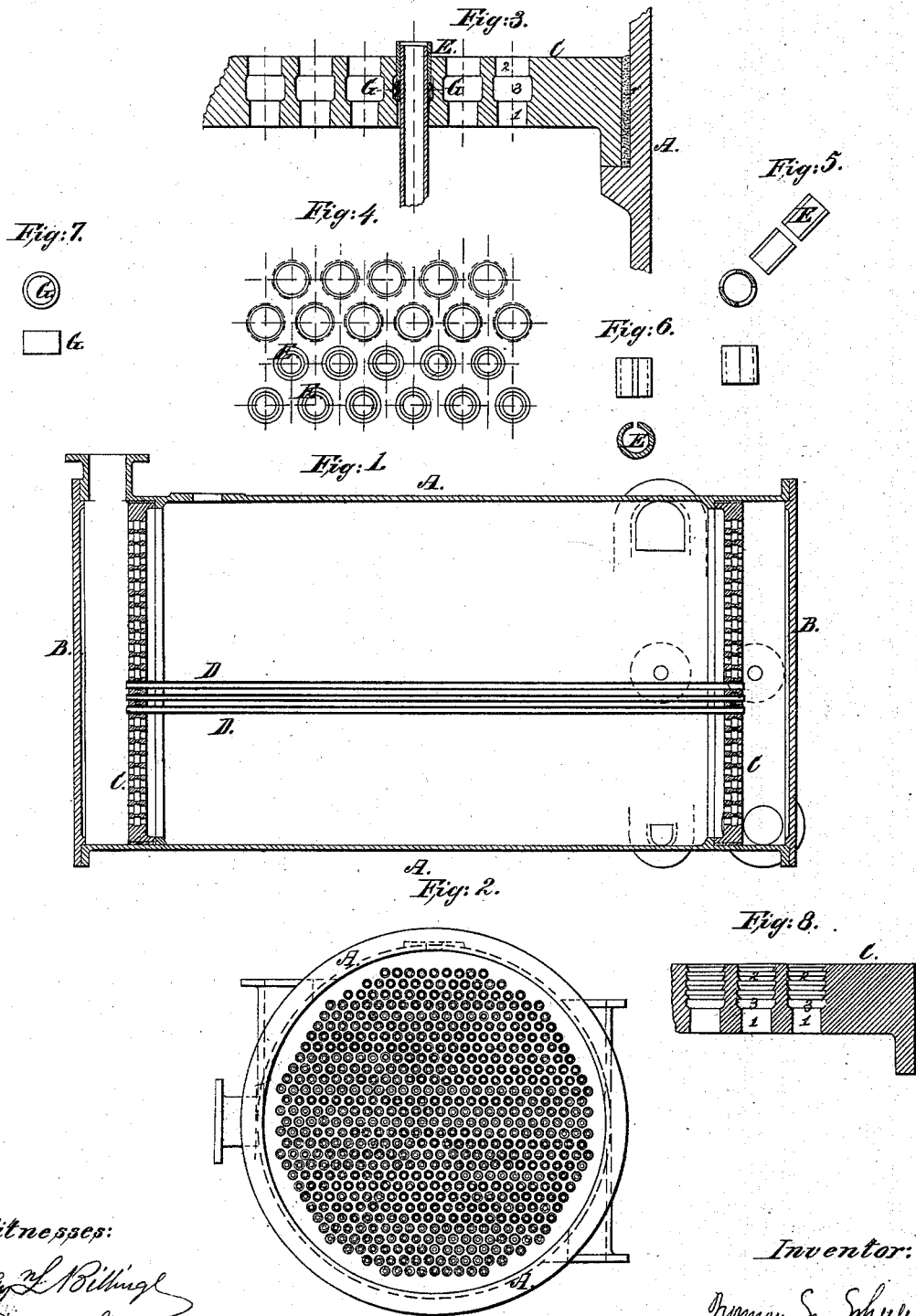


*N. W. Wheeler,*  
*Steam-Boiler Tube.*

*N<sup>o</sup> 47,480.*

*Patented Apr. 25, 1865.*



*Witnesses:*  
*Blair & Billing*  
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# UNITED STATES PATENT OFFICE.

NORMAN W. WHEELER, OF BROOKLYN, NEW YORK.

## IMPROVEMENT IN TUBULAR CONDENSERS.

Specification forming part of Letters Patent No. 47,180, dated April 25, 1865.

*To all whom it may concern :*

Be it known that I, NORMAN W. WHEELER, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Condensers and Analogous Tubular Structures; and I do hereby declare that the following is a full and exact description thereof.

My invention relates to the joining of the tubes to the plates or partitions, which junction it is necessary to keep tight, and at the same time to allow a sliding of the tubes endwise therein to accommodate the expansion and contraction. The means heretofore generally employed for such purpose have been open to the objection either that the joint would not keep tight or else that the nicety required in the construction and the labor and expense involved therein tended greatly to offset their usefulness and retard their introduction.

My invention is designed to make the junction absolutely tight and to maintain it in that condition, and to allow a movement of the tubes endwise, so as to accommodate themselves to varying temperature, and all without involving much labor in the construction of the joints, and without requiring much nicety in the fitting or even turning or otherwise finishing the ends of the tubes.

To enable others skilled in the art to make and use my invention, I will proceed to describe it by the aid of the drawings hereto annexed, which form a part of this specification, and of the letters of reference marked thereon.

Figure 1 is a longitudinal central section through my condenser, only a few tubes being represented, but the full set being supposed to be similarly fitted. Fig. 2 is an end elevation of the same. In this latter all the tubes are represented in position. Fig. 3 is a cross-section through a portion of one end of the condenser and through one joint, represented as completely formed. Fig. 4 is an end view—the two higher rows show the holes prepared to receive the tubes, the two lower rows show the tubes in place. Fig. 5 shows different views of the pieces of wood which I use to retain and compress the packing. Fig. 6 shows the same in a different form. Fig. 7 indicates the form of a ring of a rubber used as a packing material. Fig. 8 is a cross-section

showing another form of hole in which to construct my joint.

Similar letters of reference indicate corresponding parts in all the figures.

The drawings show the novel portions with so much of the other parts as is necessary to indicate their relations thereto.

A is a cylindrical shell of cast-iron. B B are the outside heads or ends. C C are the inner heads, in which the ends of the tubes D are secured. The heads C C are connected to the shell A by a firm rust-joint.

My condenser is represented as provided with apparatus and suitable nozzles to receive steam and cold water and perform the functions of a surface-condenser. These connections may be made and arranged in any approved manner.

Figs. 1, 3, and 4. These figures show the holes in the heads C C as each made of three different diameters, at different points, indicated respectively by 1, 2, and 3. The part 1 at the inner end of each hole is a little larger than the exterior of the tubes D. The part 2 at the outer end of each hole is of greater diameter than the part 1, and is so much larger than the tube D as allows the insertion of the wooden ring or annulus E. This latter may be formed in several parts, as represented in Fig. 5, or may be formed in a single part, with an open joint, as indicated in Fig. 6. Either of these forms is adapted to allow the diameter to change within wide limits. I prefer to make these parts E of maple wood, I make them of such thickness that they may be driven tightly around the tube D, so as to be compressed in the space provided therefor by the large diameter of the hole at 2. The part 3 of the hole is midway between the outer and the inner surface of the plate C. This part of the hole is of still greater diameter than the part 2.

In preparing the hole to receive the tube, I first introduce a ring of vulcanized rubber, and allow it to spring out by its elasticity so as to be retained in the large part 3. I then introduce the tube D, allowing it to project a little beyond the outer edge of the plate. I then drive in the part E with a mallet or other suitable device, so as to support the tube D very accurately in the center of the hole, and also to press against the edge of the rubber ring or packing G. I press the rubber by this

means only to a sufficient extent to thicken it and cause it to press gently but tightly against the exterior of the tube D. In this condition the tube is at liberty to slide endwise to any required extent, and the rubber packing G maintains a tight joint around the same in all positions, even after the wood is much worn.

If the tube D is quite rough, it is liable to cut or abrade the rubber, but the roughness soon becomes partly filled by the material thus received from the packing-ring G, and the destruction becomes less rapid.

When the condenser has been a short time in use, I proceed to tighten the pressure of the packing G upon the tube D by driving in the annulus E a little farther than at first. After this my condenser will serve for a long period without further trouble, and whenever it exhibits a tendency to leak it may be remedied by driving the annulus E a little farther until the packing G is nearly consumed, when the whole may be removed and a fresh supply of material, G and E, introduced as before.

I can use other wood than maple for the material of the piece or pieces E, or I can use iron and various other materials, if a suitable wood cannot be obtained. I can use other soft material, as hemp or cotton, in lieu of rubber, for the packing G. I have found ordinary vulcanized rubber and wood or other analogous soft material to give good satisfaction.

Fig. 8 represents another form in which the holes may be prepared. I introduce the packing G, the tube D, and the ring or compressing part E in the same relative positions as before described. Sharp internal ridges in this form tend to cut or slightly indent themselves into the material of the part E and serve to retain the latter with great force. Their form, being perpendicular on the edges or faces nearest the packing G and very greatly beveled on the other side, allows the annulus E to be readily driven inward, but holds it very securely against its being returned or pushed outward by the elasticity of the packing G.

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

The improvement in condensers and analogous tubular constructions herein described—to wit, the employment of the soft packing G and driven annulus E, the latter holding itself in place and supporting and guiding the tube D and compressing the packing G, substantially in the manner and with the effect herein set forth.

NORMAN W. WHEELER.

Witnesses:

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D. W. STETSON.