J. F. METTEN.

CONDENSER.

APPLICATION FILED JULY 23, 1913.

1,149,276.

Patented Aug. 10, 1915.

2 SHEETS—SHEET 1.

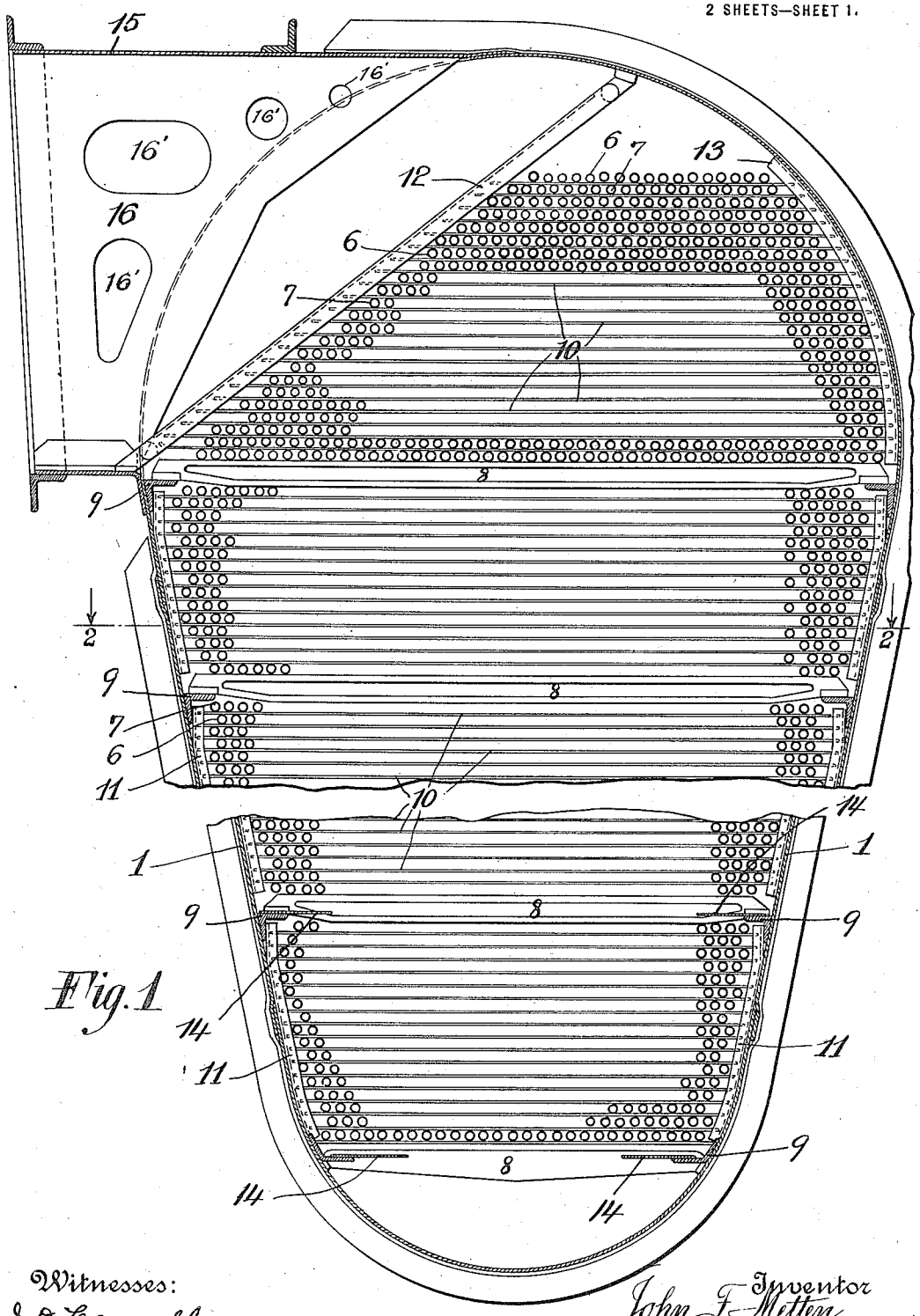


Fig. 1

Witnesses:
J. D. Connolly
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Inventor
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By his Attorneys
Edwards, Sager & Woodcock

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2 SHEETS—SHEET 2.

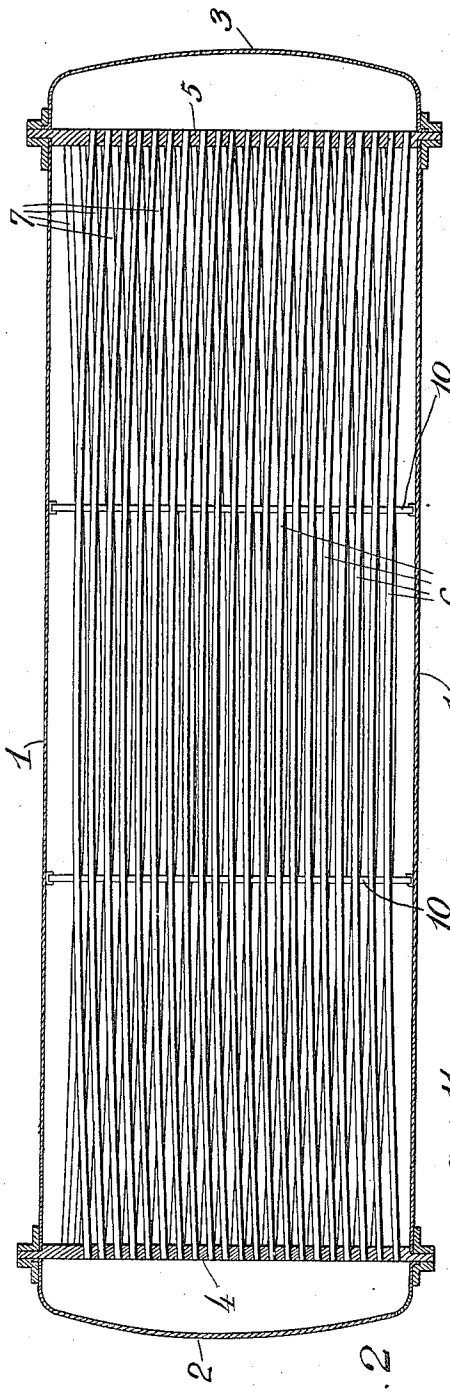


Fig. 2

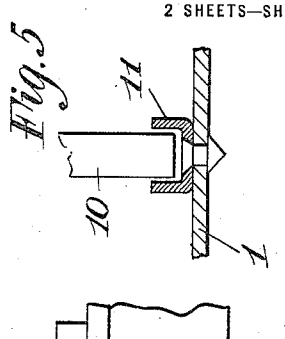


Fig. 5

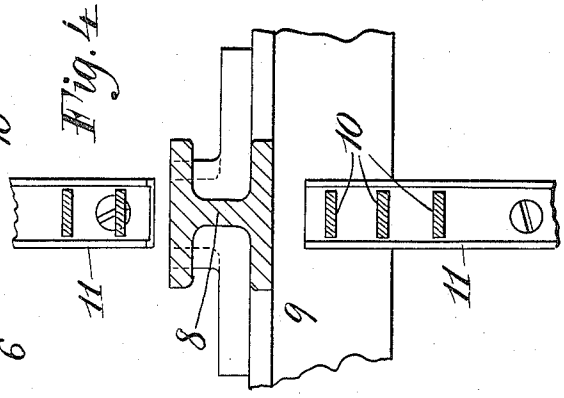


Fig. 4

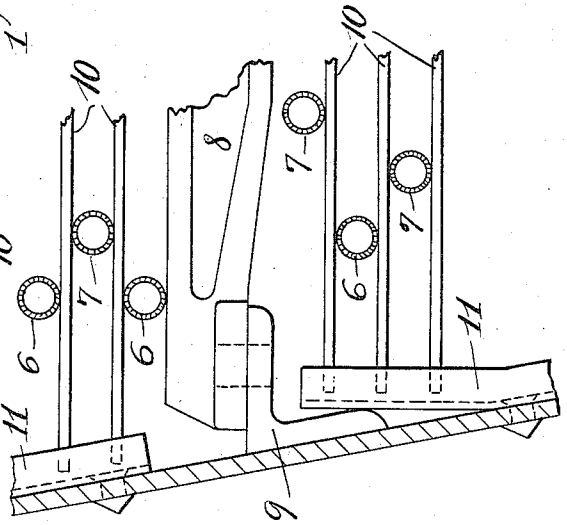


Fig. 3

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UNITED STATES PATENT OFFICE.

JOHN F. METTEN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE WILLIAM CRAMP & SONS SHIP & ENGINE BUILDING COMPANY, A CORPORATION OF PENNSYLVANIA.

CONDENSER.

1,149,276. Specification of Letters Patent. Patented Aug. 10, 1915.

Application filed July 23, 1913. Serial No. 780,683.

To all whom it may concern:

Be it known that I, JOHN F. METTEN, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Condensers, of which the following is a full, clear, and exact specification.

This invention relates to devices for condensing steam and the like.

The main object of the invention is to provide a condenser in which the expansion and contraction of the cooling tubes may be permitted and, at the same time, the flow of steam will be broken up, by preventing the flowing of large volumes of steam in straight lines through the condenser.

Other and ancillary objects of the invention will appear hereinafter.

In the accompanying drawings which illustrate the invention Figure 1 is a vertical transverse section of the condenser, partly broken away; Fig. 2 is a horizontal section on a reduced scale on the line 2, 2 of Fig. 1 looking in the direction of the arrow; Fig. 3 is a portion of a vertical transverse section showing the manner of supporting the tubes; Fig. 4 is an end view of the structure shown in Fig. 3 looking from the right; and Fig. 5 is a detail plan view showing the manner of securing the tube supporting strips from longitudinal movement.

Referring to the drawings, the egg-shaped form of condenser shown is of the conventional type used on vessels known as torpedo boat destroyers, but it will, of course, be understood that the invention is not limited to this type. In the drawings there is shown a casing comprising the straight sided portion 1 to the ends of which are secured the end caps or heads 2 and 3. Secured near the ends of the casing are the tube sheets 4 and 5 which form water-tight partitions so that the casing is divided into a middle chamber inclosed by the portion 1 of the casing and the tube sheets 4 and 5 and two end chambers between the heads 2 and 3, and the tube sheets 4 and 5 these end chambers being fluid-tight from the middle chamber. Between the tube sheets 4 and 5 are supported tubes which open into the chambers within the heads 2 and 3, and extend through the central chamber. The tubes are arranged in layers, for instance, there are the tubes 6 of one layer and the tubes 7 of another layer. It will be observed that in the layer comprising the tubes 6, the tubes are curved laterally, while in the next layer which comprises the tubes 7, the tubes are curved laterally in the opposite direction, and this method of arrangement, namely, having the tubes of alternate layers curved in opposite directions, is carried out in the different layers of tubes in the condenser. As will be seen, the holes in the tube sheets in which the ends of the tubes are inserted are staggered; that is, the tube holes of successive layers are not in vertical alinement.

To support the tubes truss bars or beams 8 are supported upon brackets 9 secured to the casing, these beams being distributed vertically in sufficient numbers and spacing to support the weight of the tubes, the number and spacing of such beams being obviously dependent upon the design of the condenser, as will be well understood. Also, these beams will be distributed horizontally of the condenser, according to the length of the tubes. Between each layer of tubes are placed strips 10 which serve to separate the layers and support the tubes in proper position. These strips are distributed longitudinally of the condenser, their number depending upon the length of the tubes, as will be well understood. The strips 10 are prevented from longitudinal displacement by means of channel bars 11 which are secured to the sides of the casing and within which the ends of the strips enter. At the top of the condenser, in the design shown in the drawings, the strips are secured at one end by channel bars as 12, which may also serve as braces, while at the other ends of these strips is a curved channel bar 13. Baffle plates as 14 may be secured in any suitable manner so as to project from the sides of the casing, retard the flow of fluid, and direct it to the center.

The steam to be condensed is passed into the condenser through an intake 15 which may be reinforced by a brace 16, which is shown in Fig. 1 as a vertical plate in which are apertures 16′. The steam will then pass downwardly transverse to the layers of tubes, and will be condensed as it passes down and around the cooling tubes. The condensed steam settles to the bottom of the casing from which it may be drawn by any suitable provision, as will be understood.

It will be observed that as the steam pro-

gresses through the condenser, it finds no straight path for large bodies of steam between the tubes, but that the cooling tubes cross each other and are again and again interposed in the path of the steam so that this path is broken up and the condensation of the steam promoted.

It will be further observed that by the difference in direction of curvature of the tubes of different layers, the condenser sides 1 may be straight, whereas if the tubes curved in the same direction in all layers, if the sides of the casing were not made curved to follow the curvature of the tubes, there would be waste spaces at the middle on one side and at the ends on the other. It is, therefore, with the present construction entirely practicable to use condenser casings having straight sides, and at the same time use the curved tubes which permit of expansion and contraction.

The fluid passed through the cooling tubes would ordinarily be water and, under some circumstances, it might be sufficient if the end heads and tubes were filled with water, the convection in this fluid serving to convey sufficient heat from the condensed steam to the exterior of the casing, and thus answer the purposes of heat dissipation. In most cases, however, a circulation of water will be kept up through the end heads and the tubes and this might be effected by introducing water into one end head, passing it through the tubes and withdrawing it from the other end head. Any well known manner of supplying and withdrawing the water may be employed, as will be well understood.

While I have described the invention in what is considered its best application, it is to be understood that it may be embodied in other structures without departing from its spirit, and is not, therefore, limited to the structure shown in the drawings.

Having thus described my invention, I declare that what I claim as new and desire to secure by Letters Patent is:

1. In a surface condenser, the combination with a casing having tube sheets spaced from each end to form an intermediate condensing chamber, of corresponding rows of horizontal holes in each tube sheet, the holes in one row being inclined oppositely to those of adjacent rows, said rows of holes in one tube sheet being inclined toward the holes of corresponding rows in the other tube sheet, and curved tubes fitted in said respective rows of holes in said tube sheets so that the tubes of one row cross those of the adjacent rows to break up the steam flow from straight lines.

2. In a surface condenser, the combination with a casing having tube sheets spaced from each end to form an intermediate condensing chamber, of corresponding rows of horizontal holes in each tube sheet, the holes in one row being staggered and inclined oppositely to those of adjacent rows, said rows of holes in one tube sheet being inclined toward the holes of corresponding rows in the other tube sheet, the number of holes in each row decreasing from the top to the bottom of said tube sheets, and curved tubes fitted in said respective rows of holes in said tube sheets so that the tubes of one row cross those of adjacent rows to divert the steam flow from straight lines while concentrating it toward the bottom.

In testimony whereof I affix my signature, in presence of two witnesses.

JOHN F. METTEN.

Witnesses:
FRANCIS L. CRAMP,
JAMES H. KURTZ.