Oct. 29, 1929. J. F. GRACE 1,733,993

CONDENSER

Filed Dec. 12, 1928

Fig. 1.

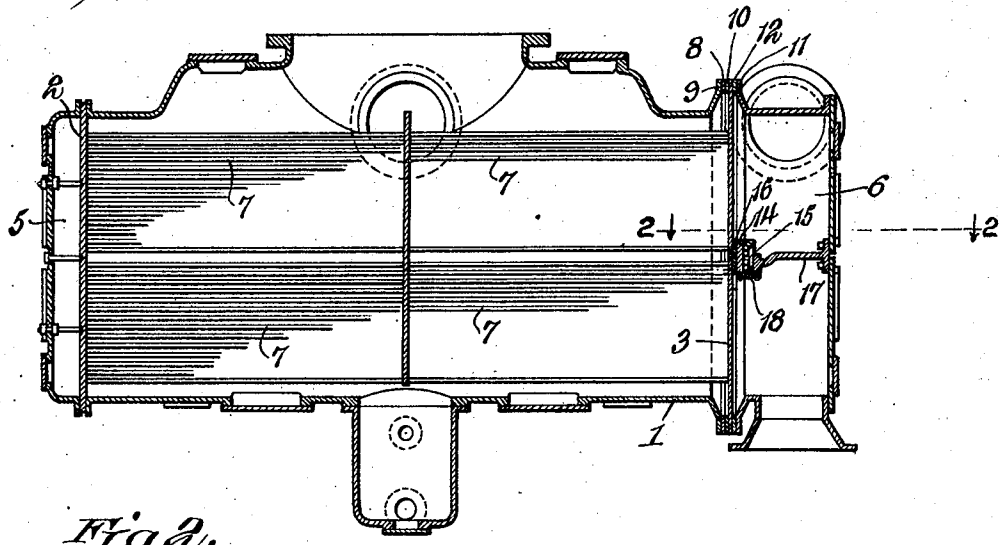


Fig. 2.

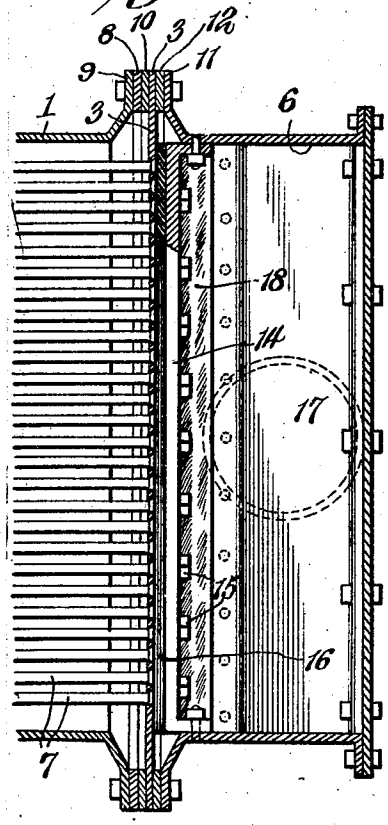
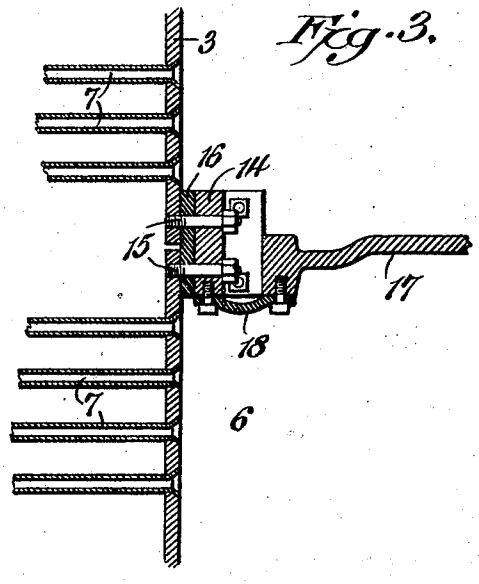


Fig. 3.



John F. Grace,

INVENTOR

BY

ATTORNEY

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UNITED STATES PATENT OFFICE

JOHN F. GRACE, OF ARLINGTON, NEW JERSEY, ASSIGNOR TO WORTHINGTON PUMP AND MACHINERY CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF VIRGINIA

CONDENSER

Application filed December 12, 1928. Serial No. 325,627.

This invention relates to surface condensers and an object of the invention is to provide a surface condenser, constructed to prevent leakage of circulating cooling water into the steam space, in which condenser the cooling water tubes are expanded at both ends into the tube heads, and suitable means are provided to compensate for expansion and contraction of the tubes due to temperature variances within the condenser.

An object of the present invention is to provide a condenser construction of the divided water circulation type, in which the division partition in the water box is constructed to compensate for movement of the tube sheet under expansion and contraction of the tubes without disrupting the connection of the partition and tube sheet and without permitting leakage from one side of the partition to the other.

With these objects in view, the invention consists in various features of construction and combination of parts, which will be first described in the accompanying drawings, showing a condenser of the preferred form embodying the invention, and the features forming the invention will be specifically pointed out in the claims.

In the drawings:

Fig. 1 is a longitudinal section through a surface condenser constructed in accordance with this invention.

Fig. 2 is a fragmentary horizontal section through the improved condenser.

Fig. 3 is an enlarged fragmentary view illustrating the expansion joint connection between the water box partition and tube sheet.

Referring more particularly to the drawings, a surface condenser of any approved construction is shown in the drawings, which includes the shell or casing 1, having the tube sheets 2 and 3 mounted therein between the steam space 4 and the water boxes 5 and 6. The water circulating tubes 7 are carried by the tube sheets 2 and 3 and preferably have their ends expanded into the tube sheets in any approved manner. The tube sheet 3 is preferably larger in diameter and may be thinner in thickness to permit flexing of this tube sheet under expansion and contraction of the tubes 7 due to temperature variances within the condenser, such a construction being shown and described in my companion application, filed March 8th, 1928, Serial No. 260,020, and executed May 26th, 1928.

In the present invention, a gasket 8 of any suitable material, preferably canvas and red lead, is positioned between the attaching flange 9 on the condenser shell 1 and the filler 10 which engages against the tube sheet 3. The filler 10 is provided, so that in case of repairs, the tubes 7 are shortened and packed, the position of the filler may be reversed, that is, placed between the tube sheet 3 and the attaching flange 11 on the water box 6. A cylinder gasket 12, preferably of rubber, or other suitable material, is placed between the flange 11 and the tube sheet 3, so as to provide a fluid tight joint embodying sufficient resilience to permit flexing of the tube sheet 3 under expansion and contraction of the tubes without rupturing the connection between the tube sheet and water box.

In the drawings, the tube sheet 3 is shown as formed of two sections meeting in the horizontal plane of the longitudinal axis of the condenser. The sections of the tube sheet 3 are connected by a tube sheet joint, or joining bar 14, which is clamped to the tube sheet 3 in any suitable manner, such as by bolts 15, and a fluid tight connection between the bar 14 and tube sheet 3, as well as a seal for the joint formed at the meeting edges of the sections of the tube sheet is provided by means of the gasket 16.

The water box 6 is divided by a partition 17 which extends horizontally thereacross, to permit divided circulation of cooling water through the condenser. To prevent rupturing of the division partition under movement of the tube sheet 3 under expansion and contraction of the tubes, and consequent leakage from one compartment of the water box 6 into the other, an expansion joint 18 is provided which connects the joining bar 14 and the partition 17, as clearly shown in Fig. 3 of the drawings.

While the invention has been above referred to as applicable to multiple-pass condensers, it is equally applicable to single-pass

condensers, having divided cooling water circulation, and while it is shown in the drawings, as applicable for use in connection with a flexing tube sheet to compensate for expansion and contraction of the tubes, it is equally applicable to any type of moveable tube sheet devised for such purpose, an example of which is that shown in the application, Serial No. 126,800, filed August 3rd, 1926.

It will be understood that the invention is not to be limited to the specific construction or arrangement of parts shown but that these may be modified widely within the invention defined by the claims.

What is claimed is:

1. In a surface condenser, a water box, a tube sheet, a division partition in said water box, and a flexible water tight connection between said tube sheet and partition.

2. In a surface condenser, a water box, a tube sheet, a division partition in said tube sheet, and an expansion joint forming a water tight connection between the tube sheet and partition.

3. In a condenser, a water box, a tube sheet, tubes connected to said tube sheet, said tube sheet adapted to move under expansion and contraction of said tubes, a division partition in said water box, and flexible means establishing a fluid tight joint between said partition and tube sheet and adapted to flex to maintain said joint tight under movement of the tube sheet.

4. In a condenser, a water box, a tube sheet, tubes connected to said tube sheet, said tube sheet adapted to move under expansion and contraction of said tubes, a division partition in said water box, and a flexible expansion joint between said partition and tube sheet.

5. In a condenser, a water box, a tube sheet formed of a pair of sections, a joining bar connecting said sections, a partition in said water box and an expansion joint connected to said joining bar and partition to form a flexible fluid tight connection between the partition and tube sheet.

6. In a surface condenser, tube sheets, one of said tube sheets being larger in diameter than the other, a water box, a dividing partition in said water box, and an expansion joint forming a fluid tight connection between said partition and larger tube sheet.

7. In a surface condenser, tube sheets, one of said tube sheets being thinner than the other, a water box, a dividing partition in said water box, and an expansion joint forming a fluid tight connection between said partition and thin tube sheet.

8. In a surface condenser, tube sheets, one of said tube sheets being larger in diameter and thinner than the other tube sheets, a water box, a dividing partition in said water box, and an expansion joint forming a fluid tight connection between said large thin tube sheet and said partition.

9. In a divided water circulation surface condenser, tubes, a water box, a dividing partition in the water box, means to permit limited movement of said tubes under expansion and contraction action, and means associated with said partition to compensate for movement of the tubes without disrupting the fluid tight seal between the water box compartments as formed by said partition.

In testimony whereof I affix my signature.

JOHN F. GRACE.