

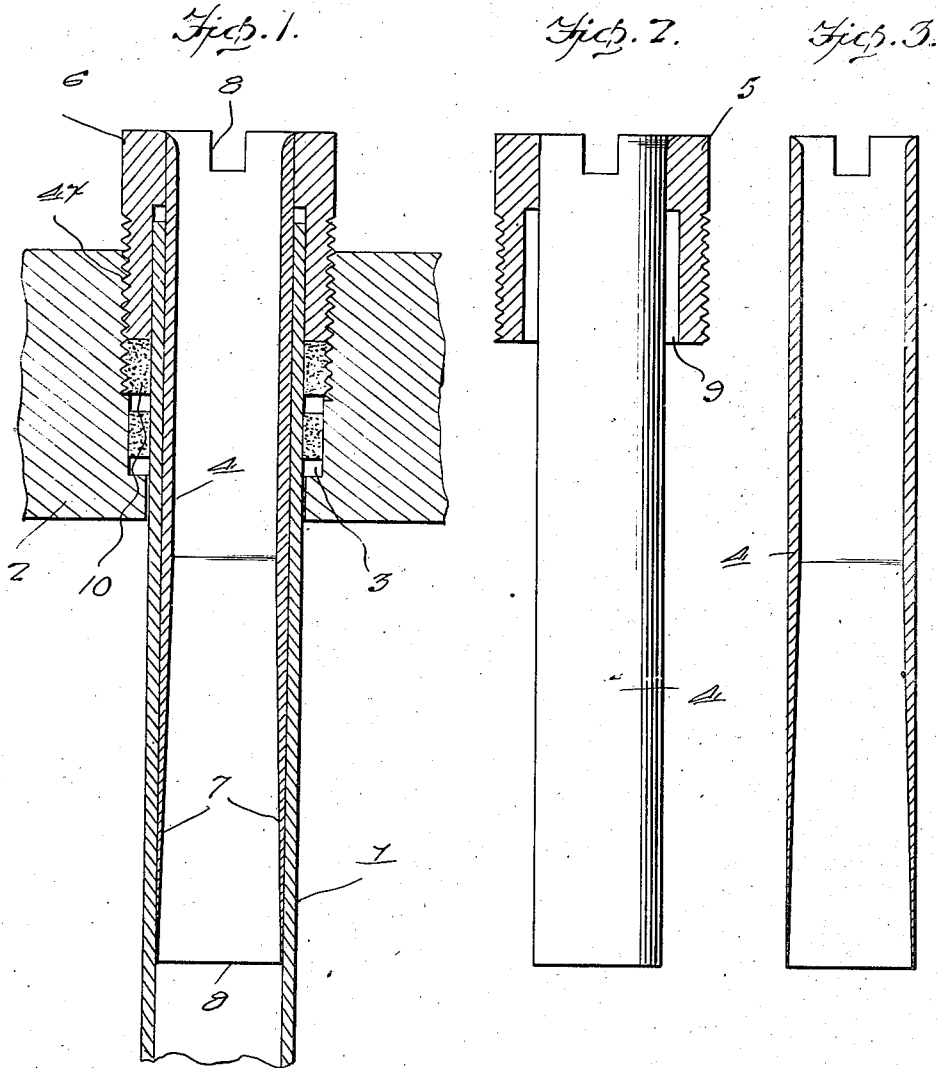
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CONDENSER TUBE AND TUBE SHEET CONNECTION

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CONDENSER TUBE AND TUBE-SHEET CONNECTION.

Application filed May 22, 1926. Serial No. 111,000.

My present invention has to do with the maintenance in a state of high efficiency of condensers used in connection with steam turbines; and it has for its object the provision of a condenser tube and tube sheet connection possessed of the practical advantages ascribed to the same.

The invention in all of its details will be fully understood from the following description and claim when the same are read in connection with the drawings, accompanying and forming part of this specification, in which:—

Figure 1 is a sectional view illustrating the connection constituting the preferred embodiment of my invention.

Figure 2 is a detail view showing the ferrule and the protective sleeve of my improvement as properly arranged relative to each other, the ferrule being shown in diametrical section and the protective sleeve in elevation.

Figure 3 is a diametrical section of the protective sleeve per se of the improvement.

Similar numerals of reference designate corresponding parts in all of the views of the drawings.

I show in Figure 1 a condenser tube 1 of conventional type; and I also show in said Figure 1 a tube sheet 2, the latter being chambered at 3 and threaded at 4.

My improvement involves the employment of a protective sleeve 4, preferably of the same material as the condenser tube 1, and the improvement also involves the employment of a ferrule 5 which is preferably of standard type save that its head 6 is preferably longer than standard ferrule. The protective sleeve 1 is interiorly tapered, as designated by 7, to a fine edge 8 at its inner end, and the said sleeve 4 is of a size to snugly fit in the condenser tube 1, and is fixed with respect to the head portion of the ferrule 5. Preferably spot welding is resorted to in the fixing of the protective sleeve 4 with respect to the ferrule 5, and the ferrule head and the protective sleeve ends are preferably, though not necessarily, provided with coincident kerfs 8 to receive a removing tool. At 9 the ferrule 5 is adapted to receive the end portion of the condenser tube 1, and in the chamber 3 of the tube sheet 2 conventional or any other appropriate packing 10 may be and preferably is employed.

that the protective sleeve 4 may be manufactured separately and used with standard ferrules at present on the market in which event the spot welding of the sleeve to the ferrule will be advantageous not only because it constitutes a means of quick connection but also because the spot welding is not liable to be affected by the heat.

The practical advantages of the sleeve 4 in the relation defined will be appreciated when it is stated that the sleeve averts cutting away of the end of the tube 1 due to sand and grit in the water circulating through the tube. It also prevents erosion of the tube 4 which ordinarily occurs on the tube ends adjacent to the tube sheet. Moreover, the sleeve 4 lends increased strength to the end portion of the tube 1 and takes up vibration and to a considerable degree prevents the transmission of vibration to the packing. This latter advantage will be appreciated as important when it is stated that in practice condenser tubes such as the tube 1 are small in diameter and from sixteen to twenty feet in length, according to the size of the condenser. Constant vibration brings about fatigue of the metal with the result that the tube fails. The expansion chamber or space 9 in the ferrule affords ample means for expansion of the tube as the sleeve 4 covers said space or chamber 9 and prevents the deposit therein of scale or other foreign substance. Manifestly within the purview of my invention the sleeve 4 may be made of different lengths to meet different conditions, and the interior taper of the sleeve 4 will be appreciated as an important advantage when it is stated that said taper will prevent the formation of a vacuum area in the portion of the tube 1 partially occupied by the sleeve 4. My improvement will be appreciated as further advantageous when it is stated that in the event of the head of the ferrule 5 being worn off by foreign substance in the water and the head being in such a state that a tool cannot be inserted in the kerfs 8, a drift, of angular cross-section, can be driven inside the sleeve and through the medium of a wrench applied to the drift, an operative can turn the ferrule about its axis and remove it from the tube sheet 2. The operation alluded to cannot be carried out when the ordinary connection is employed inasmuch as in inserting a drift of angular cross-section, the drift would be pressed

It will be apparent from the foregoing

against the walls of the condenser tube and would render the condenser tube unsuitable for further use. As is well known in the art, condenser tubes such as 1 are costly, whereas the protective sleeve 4 of my improvement is inexpensive.

It will be apparent from the foregoing that my improvement is calculated to eliminate the vacuum area in the condenser tube adjacent to the ferrule, thereby assuring better conductivity of the water through the tube 1; that my improvement is calculated to prolong the usefulness of the end of the condenser tube which in most cases is the only part of the tube that deteriorates; and that the ferrule 5 characterized as described insures a clear expansion space for the tube 1 at all times and under all conditions, the protective sleeve 4 precluding the occupation of the said space or chamber, which is designated by 9, by sand, grit or other foreign substance present in the water circulating through the condenser.

I have explicitly described the preferred embodiment of my invention in order to impart a full, clear and exact understanding

of the said embodiment. I do not desire, however, to be understood as limiting myself to the precise structure disclosed, my invention being defined by my appended claim within the scope of which modification may be made without departure from my invention.

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

In combination, a tube sheet chambered and provided with a thread, a ferrule chambered and having a thread engaging that of the tube sheet, a protective sleeve fixed to the ferrule and forming the inner wall of the said chamber of the ferrule, a condenser tube snugly receiving the protective sleeve and disposed in the tube sheet and in the chamber of the ferrule, and packing about said tube and in the said chamber of the tube sheet; the said protective sleeve being interiorly tapered to a fine edge at the inner end thereof.

In testimony whereof I affix my signature.

HARRY H. FINCH.