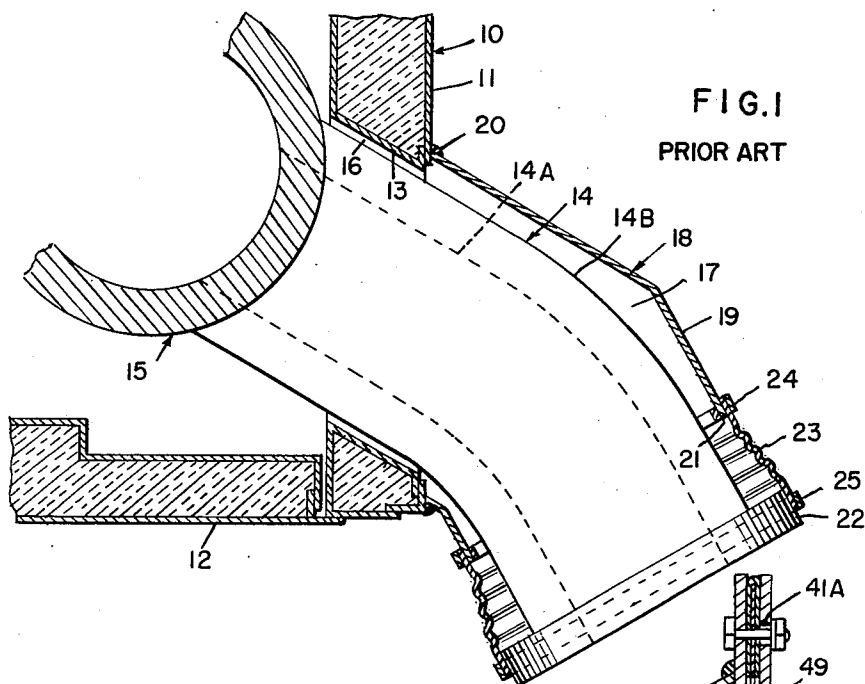
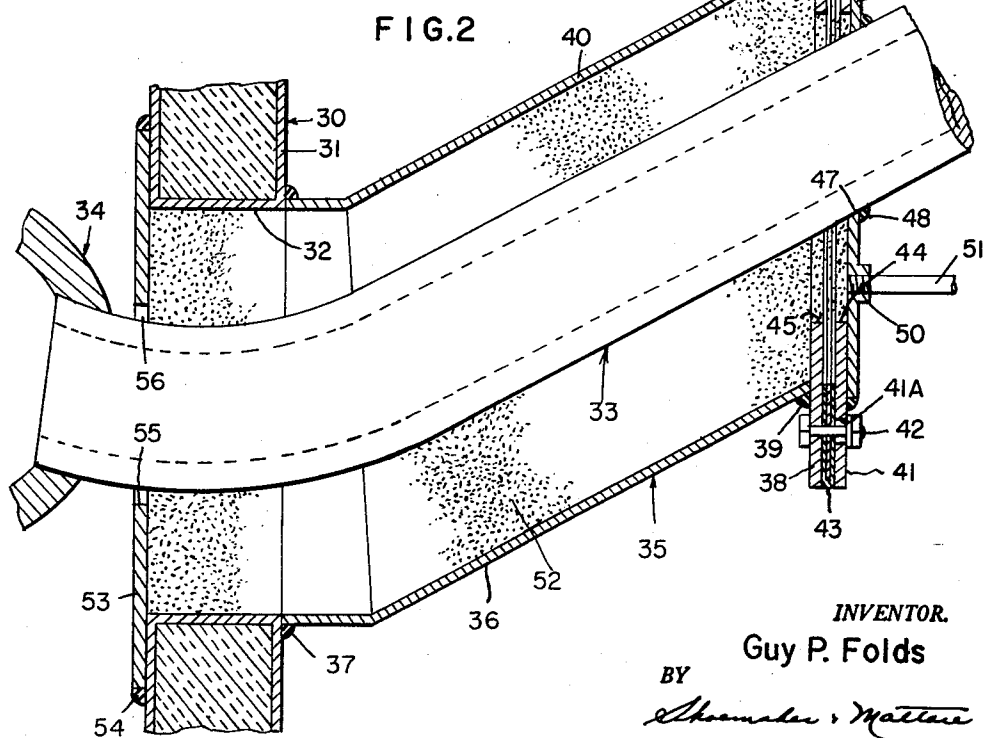


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EXPANSION SEAL

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EXPANSION SEAL

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1 Claim. (Cl. 122-494)

This invention relates generally to expansion seals and pertains, more particularly, to means for effecting a seal between a nozzle or conduit and the wall of a boiler or the like from which the nozzle protrudes.

With particular reference to marine boilers, the same are conventionally provided with sealing means between the wall of the boiler and the steam nozzles protruding therefrom, such seals being required to accommodate expansion and contraction of the nozzle with respect to the boiler wall. Seals commonly in use are subject to certain disadvantages, notably, that after having been in service for some time, they are subject to leakage. It is, therefore, of primary concern in connection with the present invention to provide an improved type of sealing means for steam nozzles and the like which overcomes the disadvantages of present constructions.

The outlet line of the boiler will normally be taken from a superheater assembly. To obtain a good degree of efficiency, the superheaters are normally somewhat elongate so that the absolute amount of thermal expansion is considerable and variations in the amount of expansion will occur dependent upon the demand placed on the boiler and, consequently, the internal temperatures thereof, particularly the temperature to which the superheater is subjected. Consequently, a seal or sealing means must be capable of accommodating such thermal expansion without placing undue stress upon the seal means itself such as might cause its ultimate failure. It is because of this that it has become more or less conventional to utilize expansible sleeves for the sealing means connected between the boiler housing and the nozzle or outlet from the superheater and, of course, similar means are employed for the return.

It is therefore, of primary concern in connection with this invention to provide an improved steam nozzle sealing means which obviates the necessity for expansible sleeves and utilizes, instead, a compressible gasket to accommodate thermal expansion along the length of the steam nozzle itself and which also utilizes a flange construction in combination with the compressible gasket which permits movement in a direction to accommodate for the thermal expansion of the superheater, that is, generally along the longitudinal axis of the superheating means.

Another object of this invention resides in the provision of an improved type of sealing means for steam nozzles which includes flange means cooperating with a generally tubular member to provide a chamber around a steam nozzle protruding through a boiler wall and within which chamber is provided heat retaining insulating means.

A further object of this invention resides in the provision of a seal in accordance with the immediately preceding object wherein means is provided for pressurizing the chamber to prevent the entrance of soot thereinto, such pressurizing means being accomplished by a steady flow of air under low pressure into the chamber.

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Another object of this invention is to provide an improved type of sealing means for a steam outlet tube or nozzle projecting through a boiler wall and which means is capable of accommodating and compensating for the thermal expansion of a superheater, employing for this purpose a tubular member fixed to the boiler wall in surrounding relationship to the steam nozzle and provided at its free end with a flange cooperable with a flange fixed rigidly with the steam nozzle and between which flanges is disposed a compressible gasket member, means being provided for urging the flange members together, yet permitting shifting therebetween in a direction parallel to their opposed surfaces.

As this invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, and since the scope of the invention is defined by the appended claim, all changes that fall within the metes and bounds of this claim or that form its functional as well as conjointly cooperative equivalent is therefore intended to be embraced by this claim.

In the drawings:

FIG. 1 is a sectional view taken through a portion of a boiler and showing a steam nozzle projecting therefrom and also, in section, the sealing means associated therewith, such construction being in accordance with the prior art; and

FIG. 2 is a sectional view taken through a portion of a boiler illustrating the steam nozzle projecting therefrom and further showing in section the sealing means constructed in accordance with this invention.

Referring at this time more particularly to FIG. 1, the assembly as shown therein is in accordance with present practice particularly in the marine boiler art. In this figure, reference numeral 10 indicates in general the body of a boiler assembly having two intersecting wall portions 11 and 12 with the wall portion 11 being provided with an opening 13 through which a steam nozzle indicated generally by the reference character 14 extends.

The nozzle assembly 14 includes the nozzle proper as indicated by reference character 14A which is lagged or insulated as indicated by reference character 14B. The tube or nozzle 14A is connected to and projects from the header 15, which header would normally be a part of the superheater assembly. Such superheaters are of elongate character, that is, extending generally axially of the header 15. Since the superheater will be at the highest temperature in the boiler, in order to correspondingly superheat the steam as much as possible, the thermal expansion of the superheater will be considerable, most of the expansion thereof occurring in the longitudinal direction, that is, axially of the header 15. This type of thermal expansion will be hereinafter termed lateral expansion inasmuch as the nozzle 14A extends substantially radially of the header and it is with respect to the nozzle itself that the expansion is related. The nozzle itself, of course, will have axial or longitudinal expansion in and of itself and, of course, some will be imparted in this direction also from the boiler construction. This type of expansion will be hereinafter referred to as longitudinal expansion inasmuch as it is in a direction extending generally longitudinally with relation to the nozzle.

The point at which the nozzle assembly 14 passes

through the boiler wall opening 13 will ordinarily be in a smoke region of the boiler so that soot will tend to pass through the peripheral clearance space 16 provided between the nozzle and the boiler wall opening and into the chamber 17 defined between the nozzle assembly 14 and the expansion seal assembly 24 which is indicated generally by the reference character 18.

The seal assembly 18 consists of a sleeve or cuff 19 which is joined as by welding 20 to the outer side of the boiler wall 10 in surrounding relationship to the nozzle 14 and which terminates as at 21 short of the end flange 22 on the nozzle. An asbestos cloth sleeve 23 extends from this end portion 21 of the sleeve 19 to the flange 22 with the opposite ends of the sleeve 23 being clampingly held in place on the respective portions 19 and 22 by means of clamping bands 24 and 25.

The purpose of the asbestos cloth sleeve 23 is, of course, to permit longitudinal and lateral expansion and contraction of the nozzle 14, such expansion and contraction being of sufficient magnitude to necessitate some such expansion accommodating means since the steam in the nozzle 14 and in the header 15 will be at relatively higher temperatures, being superheated.

In use, as previously mentioned, soot will pass into the chamber 17 through the clearance space 16 and during normal operation, moisture will tend to collect in this region—particularly at such times when the boiler operation is such that the temperature in the region of the sealing means will permit condensation of water vapor. The mixture of the soot and the water is acidic and will attack the metallic portions of the seal assembly and eventually deteriorate the same to such an extent that leakage will occur. Also, it will be appreciated that the asbestos cloth 23 is not of sufficient structural strength to withstand a great deal of abuse and once the seal assembly has been perforated in any way, whether it be the metallic portion or the asbestos cloth portion thereof, soot and smoke will pass through such perforations, necessitating replacement of the seal assembly.

To overcome this objectionable feature, the construction shown in FIG. 2 has been devised. In FIG. 2, the boiler is indicated generally by the reference character 30, the wall 31 thereof being provided with the usual opening 32 to permit the steam nozzle 33 to project there-through as shown. As in the case of FIG. 1, the nozzle 33 in FIG. 2 emanates from a superheater header 34 and the opening 32 is of greater diameter than the nozzle to provide a clearance space therearound, as shown.

The improved seal assembly which is indicated generally by the reference character 35, includes a cuff or collar 36 of sleeve-like form welded as at 37 to the outer side of the wall 31 and having a flange plate 38 welded as at 39 to its outer extremity and at an angle to the axis of the main body portion 40 of the cuff. A secondary flange plate 41 is bolted as by the fasteners 42 to the flange plate 38 and interposed between these two flange plates is a compressible gasket 43 preferably of the copper clad type. The secondary flange plate 41 has a central opening 44 substantially identical to the central opening 45 in the primary flange plate 38, both of which are of such a diameter as to provide adequate clearance for the nozzle 33 which projects through these two flange plates. A cover plate 46 provided with an opening 47 receiving the nozzle 33 is welded as at 48 to the nozzle and as at 49 to the secondary flange plate 41 so that, in effect, the secondary flange plate 41 and, the cover plate 46 are an integral unit attached to the nozzle.

The secondary flange plate 41 is provided with enlarged openings 41A through which the fasteners 42 pass. These openings 41A may be either merely enlarged or they may be elongate in a direction longitudinally of the superheater header 34. The purpose of this construction is to permit the plates 38 and 41 to shift relative to each other in a direction parallel to their opposed faces and in a direction longitudinally of the header 34 to thus

accommodate for lateral expansion and contraction with respect to the nozzle 33. In view of the fact that the compressible gasket 43 is utilized between the two flange plates 38 and 41, it will be seen that they are not completely rigidly interconnected such as would be the case were they directly in contact, the gasket 43 being sufficiently resilient to permit the aforementioned shifting and movement to accommodate lateral expansion and contraction. This is particularly true in view of the fact that at the same time that lateral expansion and contraction will be present, longitudinal expansion will occur so that the net effect will be to relieve the compressive force upon the gasket 43 which will more readily permit movement of the flange plates to accommodate for lateral expansion.

The cover plate 46 is provided with a threaded nipple portion 50 into which is threaded one end of a pneumatic line 51, the purpose of which will be presently apparent.

The chamber formed between the cuff 36 and the nozzle 33 is filled with a granular material 52 which preferably may consist of Amosite. Amosite is a trade name of an article manufactured by the Union Asbestos and Rubber Company, and has an average chemical analysis as follows:

	Percent Amosite
Silica (SiO ₂)	49
Iron oxides (FeO and FeO ₂)	39
Magnesium oxide (MgO)	6
Water of hydration	2
Calcium and sodium oxides	2
Aluminum oxide (Al ₂ O ₃)	2

The chamber within which the Amosite is contained is closed on its inner side, if desired, by means of a plate 53 welded as at 54 to the inner side of the boiler wall 31 and having an opening 55 providing a peripheral clearance space 56 between the nozzle and such plate.

Naturally, some leakage will occur on the inner side of the sealing connection and in the absence of the filler 52, this would tend to permit soot to pass into the chamber space between the nozzle and the cuff or sleeve 36. To further enhance the rejection of seepage into the space, the pneumatic line 51 bleeds air under low pressure slightly higher than the boiler air pressure into this chamber so as to positively prevent the entry of soot and foreign material thereinto.

Therefore, the combined effect of the presence of the filler material 52, together with the introduction of the air through the nipple 50, effects the prevention of soot and foreign material into the space between the steam nozzle and the housing 40.

The gasket 43 is sufficiently compressible to permit the normal expansion and contraction of the component parts and the holes through the plates 38 and 41 receiving the fasteners 42 are slightly elongated and/or oversized, as aforementioned, to permit parallel shifting of these plates relative to each other.

I claim:

In combination, a boiler assembly including a wall having an opening formed therein, said boiler assembly including a header having a steam nozzle connected therewith and projecting through and spaced from said opening to permit movement of said nozzle with respect to said wall, a sleeve fixed at one end to said wall around said opening and extending therefrom in surrounding relationship to said steam nozzle to define an annular chamber between said sleeve and said steam nozzle, first flange means fixed to the outer end of said sleeve and extending outwardly thereof, plate means secured to and surrounding said steam nozzle, secondary flange means supported by said plate means and having a peripheral portion thereof disposed in facing spaced relationship to said first flange means, a thick, compressible gasket disposed between the facing portions of said first and secondary flange means, securing means for detachably

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and slidably securing said first and secondary flange means together, at least one of said flange means having elongated slots formed therein receiving said securing means, a mass of floccular insulating material filling said annular chamber between said sleeve and said steam nozzle, said plate means having an opening formed therein, and means connected with said last-mentioned opening for introducing a fluid under pressure into said annular chamber between said sleeve and the steam nozzle for preventing leakage from said boiler assembly into said annular chamber.

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