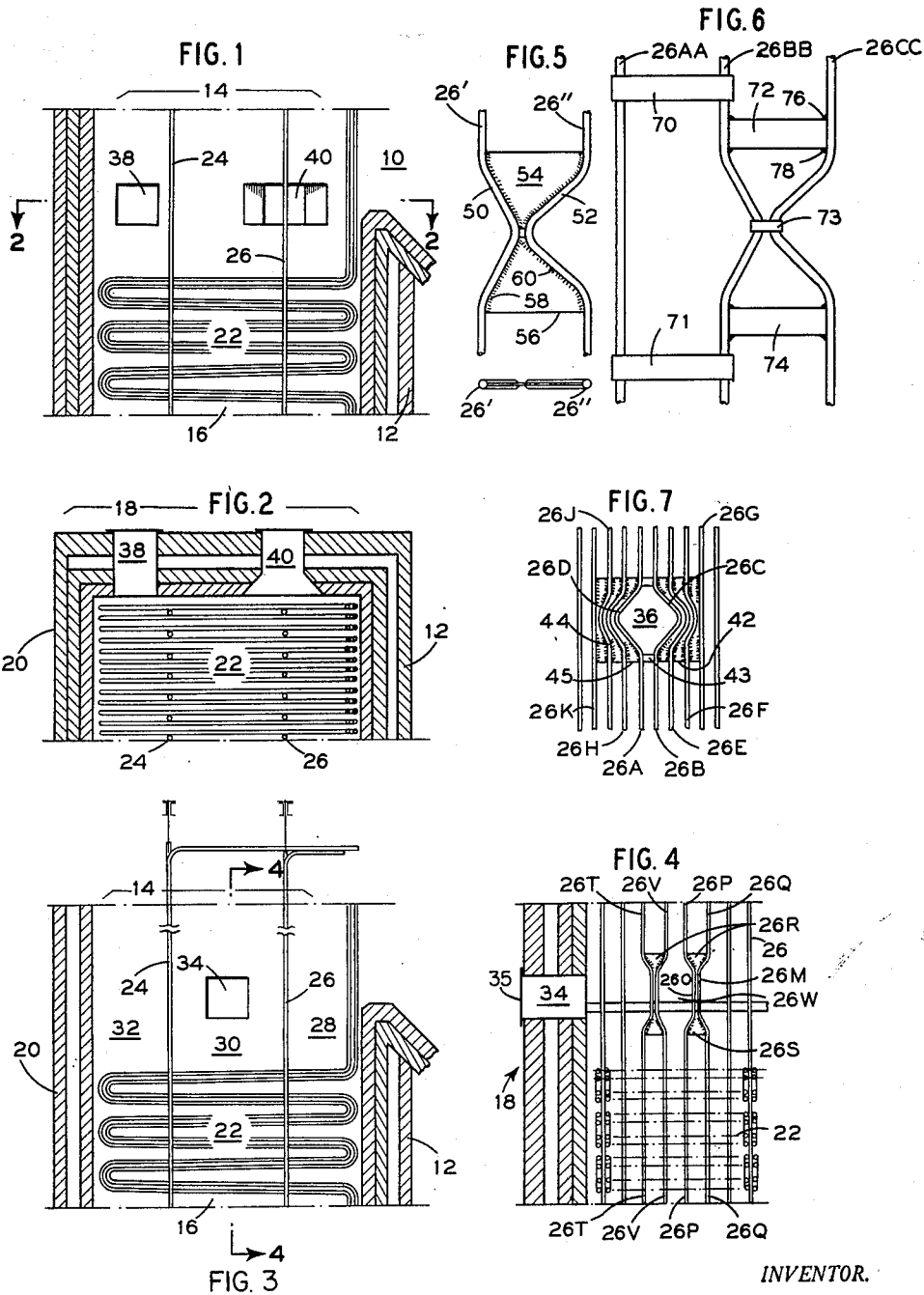


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J. PUHR-WESTERHEIDE
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A ROW WITH A MANWAY THROUGH THE ROW
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INVENTOR.

JURGEN PUHR-WESTERHEIDE

BY

R. Holbrook
ATTORNEY

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SUPERHEATER SUPPORT TUBES ARRANGED IN A ROW WITH A MANWAY THROUGH THE ROW

Jurgen Puhr-Westerheide, Oberhausen, Germany, assignor to The Babcock & Wilcox Company, New York, N.Y., a corporation of New Jersey

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3 Claims. (Cl. 257—230)

This invention relates to a type of fluid heat exchange apparatus in which a bank of closely spaced tubes, subject to the flow of high temperature heating gases, is supported by a row of upright tubes closely spaced, with the upright tubes interspersed between the tubes of said bank. The pertinent apparatus involves a heat insulating enclosure including walls forming a gas pass in which the bank of tubes is subject to the upward or downward flow of the high temperature gases.

Within the enclosure there are a number of gas spaces at least two of which are disposed above the bank of tubes and are separated by the row of closely spaced upright tubes. A wall of the enclosure along the side of one of such spaces is provided with an opening constituting a manway for access to the tubes of the apparatus in one of such spaces, and the wall of upright tubes is provided with means holding portions of adjacent upright tubes in more widely spaced relationship to provide a manway in order that there might be access to a second gas space from the first space.

The invention will be set forth in a concise manner in the appended claims, but for a complete understanding of the invention, its uses, and advantages, recourse should be had to the following description which refers to the accompanying drawing.

In the drawing:

Fig. 1 is a vertical section through a part of a high pressure steam generator which is representative of the type of fluid heat exchange apparatus with which the invention is concerned. This figure shows an arrangement including three (3) gas spaces above a bank of closely spaced convection heating tubes with a manway opening in the enclosure wall for each of said spaces. This is an arrangement over which the invention presents a substantial improvement;

Fig. 2 is a fragmentary horizontal section of a part of the Fig. 1 arrangement, on the line 2—2 of Fig. 1;

Fig. 3 is a partial vertical section similar to Fig. 1, but illustrating the novel arrangement of the parts embodied in the invention, with but one manway in the adjacent enclosure wall serving, with the tube wall manways of this invention, for access to the three gas spaces above the bank of tubes;

Fig. 4 is a fragmentary vertical section on the plane indicated by the section line 4—4 of Fig. 3 showing adjacent tubes of an upright wall of closely spaced bank supporting tubes held in more widely spaced relationship to present a manway through that wall;

Fig. 5 involves a fragmentary elevation and fragmentary horizontal section of a modification similar to Fig. 4, showing means for holding adjacent tubes in a modified spaced relationship;

Fig. 6 is a fragmentary elevation showing an additional modified arrangement of means for holding parts of adjacent tubes of the upright tube wall in their manway spaced relationship; and

Fig. 7 is a fragmentary elevation of the manway part of the upright tube wall showing a further modification

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of the means for holding adjacent tubes in their manway forming relationship.

The high pressure steam generator, representative of the convection fluid heat exchange apparatus of the invention may be of the type illustrated by U.S. Patent 2,681,641 wherein heating gases leaving the furnace 10 flow into and downwardly through an upright gas pass 52. As shown in the embodiments of the present invention, gases from a furnace, such as shown in said patent, flow through the opening 10, above the top of the furnace wall 12, into the gas turning space 14 at the top of a downflow gas pass 16. This gas pass has other walls, such as 18 and 20, which are representative of the heat insulating walls for the apparatus.

Within the downflow gas pass 16 there is disposed a bank 22 of closely spaced tubes which may constitute a part of a convection steam superheater, superheating steam received from a steam and water drum which is supplied with incoming steam and water mixtures by steam generating furnace wall tubes, in a manner well known in the art.

The bank 22 of superheater tubes is supported by upright walls 24 and 26 of closely spaced tubes, arranged in interspersed relationship to the tubes of the bank of tubes 22, such relationship being indicated in Fig. 2 of the drawing. The wall formed by the row of tubes 26 separates the gas spaces 28 and 30 of the gas turning space 14 and, similarly, the wall formed by the upright tubes 24 separates the gas spaces 30 and 32.

For the purposes of inspection, repair, or other maintenance of the apparatus, access must be provided whereby a workman may enter the gas spaces 28, 30 and 32. For the purposes of such access the wall 18 is provided with an access opening 34. This opening affords a manway to the gas space 30, and is provided with a closed door 35.

The invention involves means for holding adjacent tubes of the walls of tubes 24 and 26 in more widely spaced relationship at a position above the bank of tubes 22 to provide a manway such as that indicated at 36 in Fig. 7. This arrangement provides for access to the gas spaces 28 and 32, with but a single manway such as 34 in the wall of the enclosure and thus promotes efficient operation of the apparatus by reducing gas leakage such as might be involved in apparatus involving twice the number of enclosure wall manways such as those of the prior art, as indicated at 38 and 40 in Fig. 1.

In the tube wall manway construction of Fig. 7 opposite tubes such as 26A and 26B are bent outwardly as indicated at 26C and 26D. Adjoining tubes 26E, 26F, 26G, 26H, 26J and 26K are similarly bent and these bent out tube portions are held in their Fig. 7 relationships by inter-tube plates such as those indicated at 42—45, preferably welded to the adjacent and contacting tubes.

The modified tube wall manway construction of Fig. 4 involves the inwardly bent portions 26M and 26O of tubes 26P and 26Q, these bent out portions being held in the illustrative relationship by the inter-tube plates 26R and 26S, welded to the tubes which they contact. Similarly arranged and constructed portions of the tubes 26T and 26V cooperate with the tube portions 26O and 26M to provide the manway 26W.

Fig. 5 shows a further modification in which the tubes 26' and 26'' have the manway portions 50 and 52 bent inwardly and held in their operative positions by the plates 54 and 56 welded to the contacting tubes as indicated at 58—60.

The Fig. 6 modification shows the tubes 26AA, 26BB and 26CC held in their operative relationships by tube connecting plates 70—74, these plates being secured to the tubes as by welding, indicated at 76 and 78. The plates 72 and 74 may be regarded as compression mem-

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bers and the plate 73 may be regarded as a traction plate.

The upright tubes of the tube walls 24 and 26 may be appropriately supported from positions above the gas spaces by appropriate hangers which are in turn secured to superposed steel work in the manner in which the tubes 80 of the Patent 2,681,641 are supported. Such supports may involve a header, similar to the header 68 of that patent, to which the tubes of the walls 24 and/or 26 are secured, with the header, in turn, pendently supported by hangers from superimposed steel work.

The tubes of the rows 24 and 26 may also have appropriate lugs or other supporting means of conventional type (not shown) secured thereto and extending laterally therefrom beneath the transversely extending tubes of the bank of tubes 22 in order to support the latter in their operative spaced relationships indicated in the drawing.

Whereas the invention has been described as relating to the details of certain preferred embodiments, the invention is not to be considered as limited to all of the details of the embodiment. It is rather to be considered as of a scope commensurate with the scope of the sub-joined claims.

What is claimed is:

1. In a vapor generator, wall means forming a gas pass, a bank of horizontally disposed spaced superheater tubes arranged within said gas pass for flow of high temperature gases transversely over and between the tubes, a row of upright closely spaced vapor generating tubes with the upright tubes extending through intertube spaces of said bank and arranged in heat exchange contact therewith to take the load of said bank, means anchoring the

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upright tubes at their upper parts, means forming a closeable manway access opening in a wall of said gas pass above said bank of superheater tubes, the row of upright tubes separating adjacent spaces above the bank and the predominant spacing of the tubes of the row being much less than that required for a manway through the row, corresponding portions of adjacent tubes being bent out of and returned to tube alignment in the plane of the tube row to increase the spacing between tubes and provide a manway therebetween, and metallic spacer means holding the bent portions of the upright tubes of said row in said increased spacing, each of said spacer means being unitary and attached to a bent tube and to an adjacent tube spaced from said manway.

2. Apparatus according to claim 1 wherein said metallic spacer means consists of plates each welded to one of said bent tubes and to at least said adjacent tube.

3. Apparatus according to claim 1 wherein said metallic spacer means consists of bars each welded to one of said bent tubes and to at least said adjacent tube, and where some of said bars are under tension and others are under compression.

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