

[54] **METHOD FOR CONSTRUCTING SUPERHEATER AND/OR REHEATER MODULES**

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[52] U.S. Cl. **29/157.4, 29/467, 29/469**

[51] Int. Cl. **B21d 53/02, B23p 15/26**

[58] Field of Search **29/156.4, 157.4, 467, 469**

[56] **References Cited**

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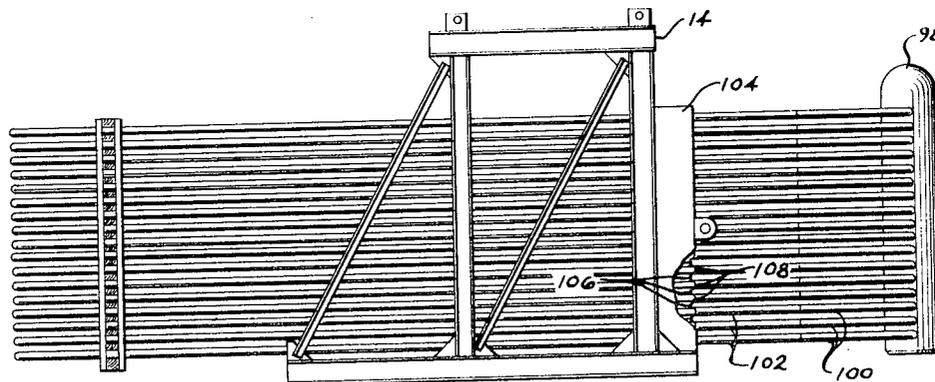
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[57] **ABSTRACT**

A method for shop assembly of superheater and/or reheater modules wherein a segment of a superheater or reheater header, as it is formed in the shop, is accurately positioned in a vertical orientation with respect to a fixed reference base. A lifting and shipping frame is particularly positioned on the reference base with respect to the header segment. Individual tube panels are placed in the frame and joined to the header until a complete module is built up. The module may then be conveniently shipped in its frame to the erection site where it may be positioned and joined to similar modules to form the unitary superheater or reheater structure.

5 Claims, 10 Drawing Figures



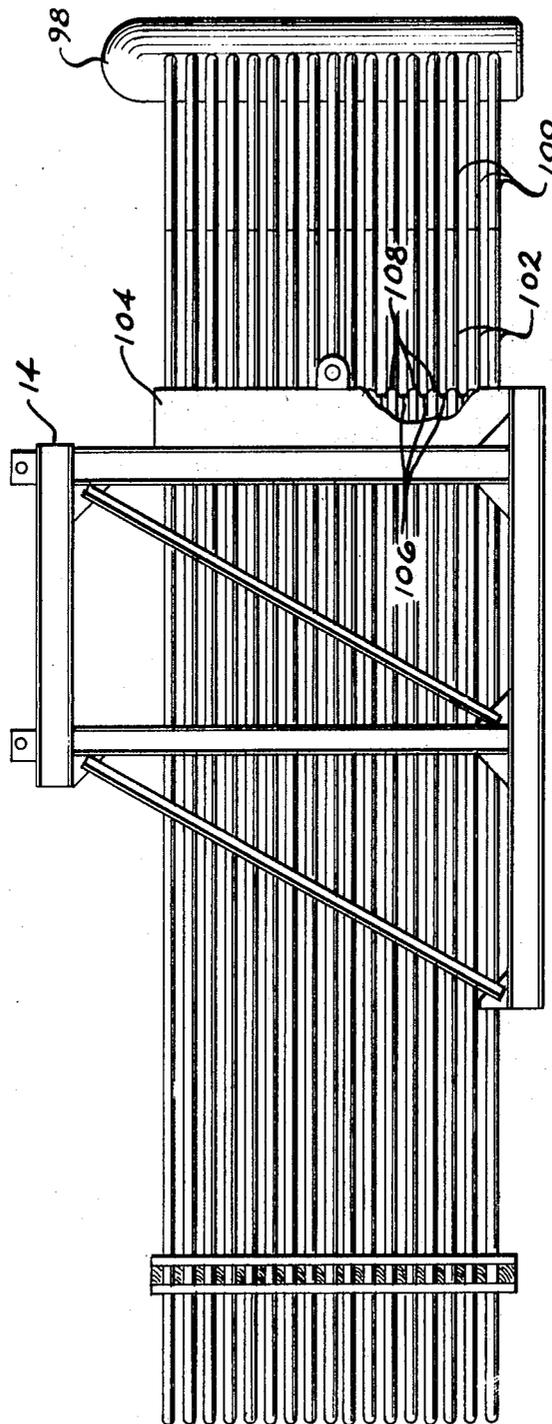


FIG - 1a

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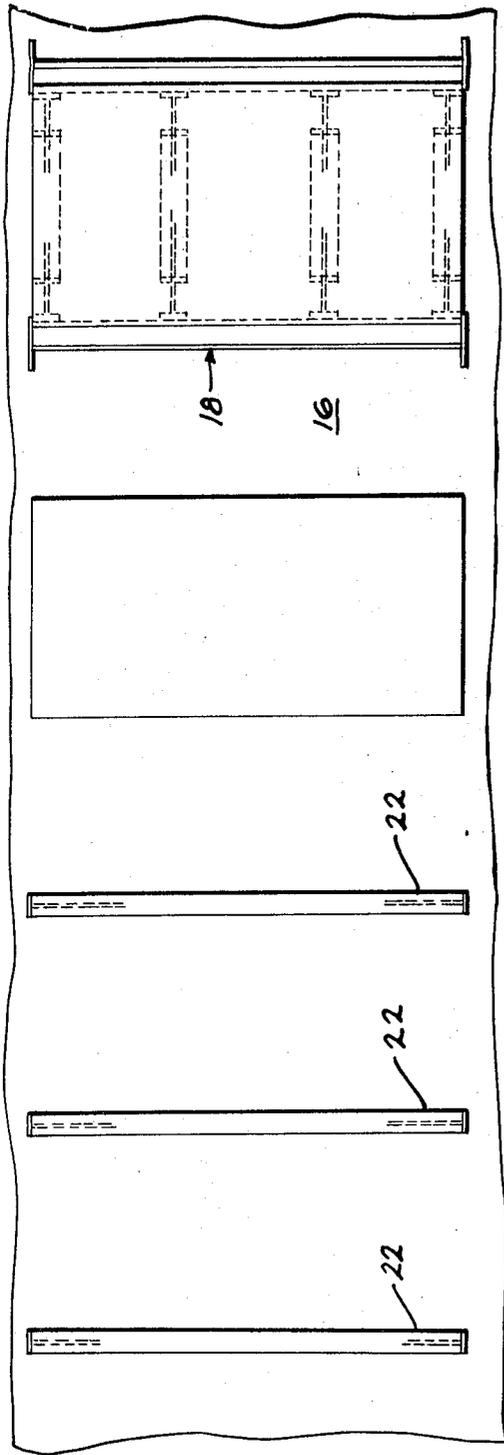


FIG. 2

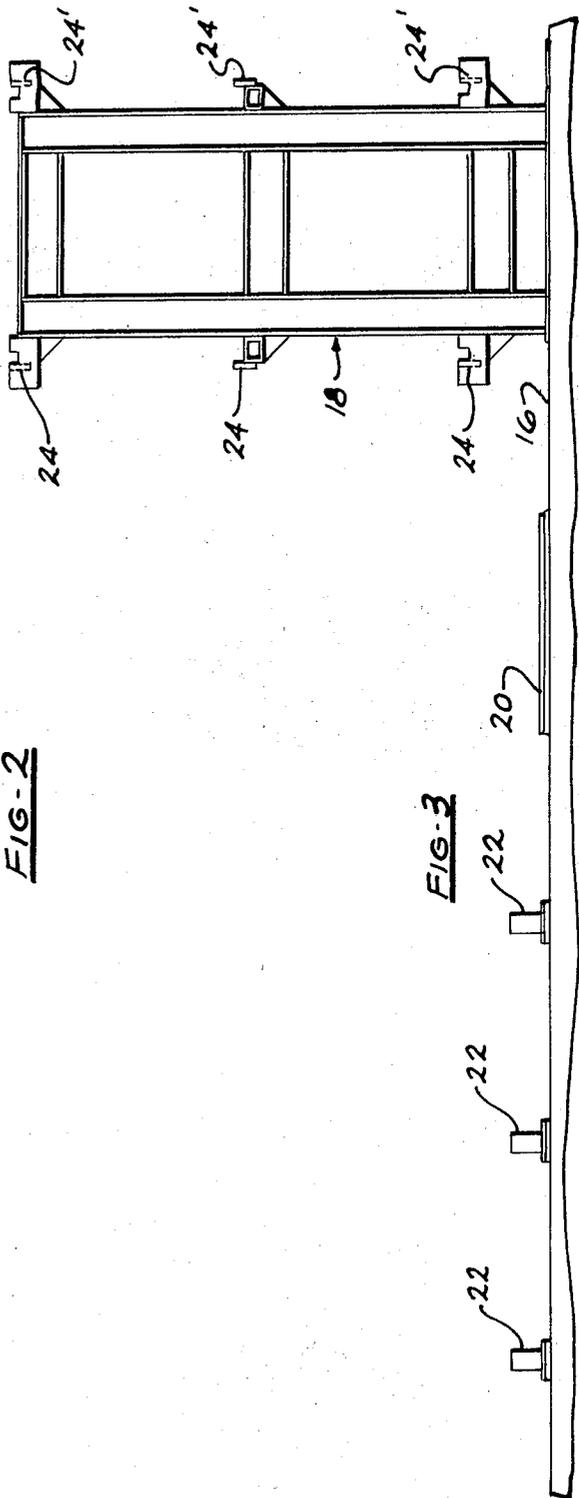


FIG. 3

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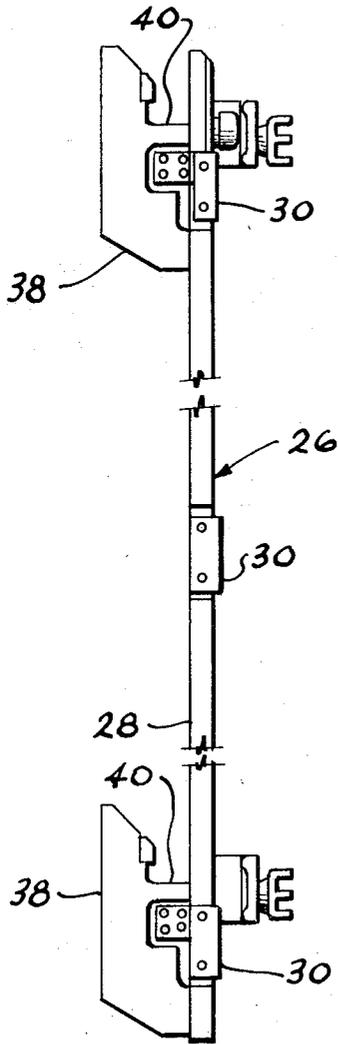
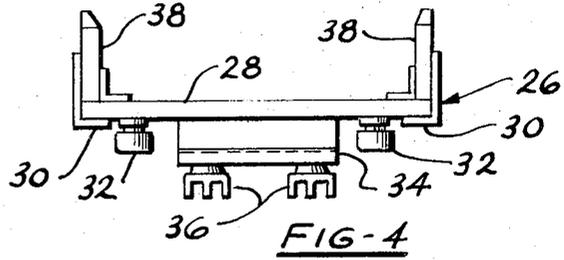


FIG-5

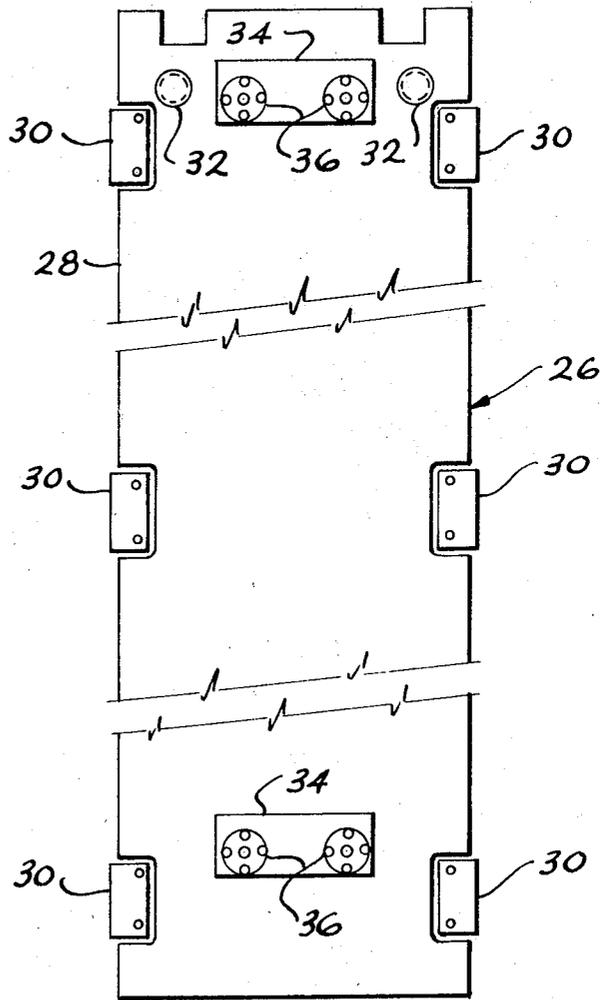


FIG-6

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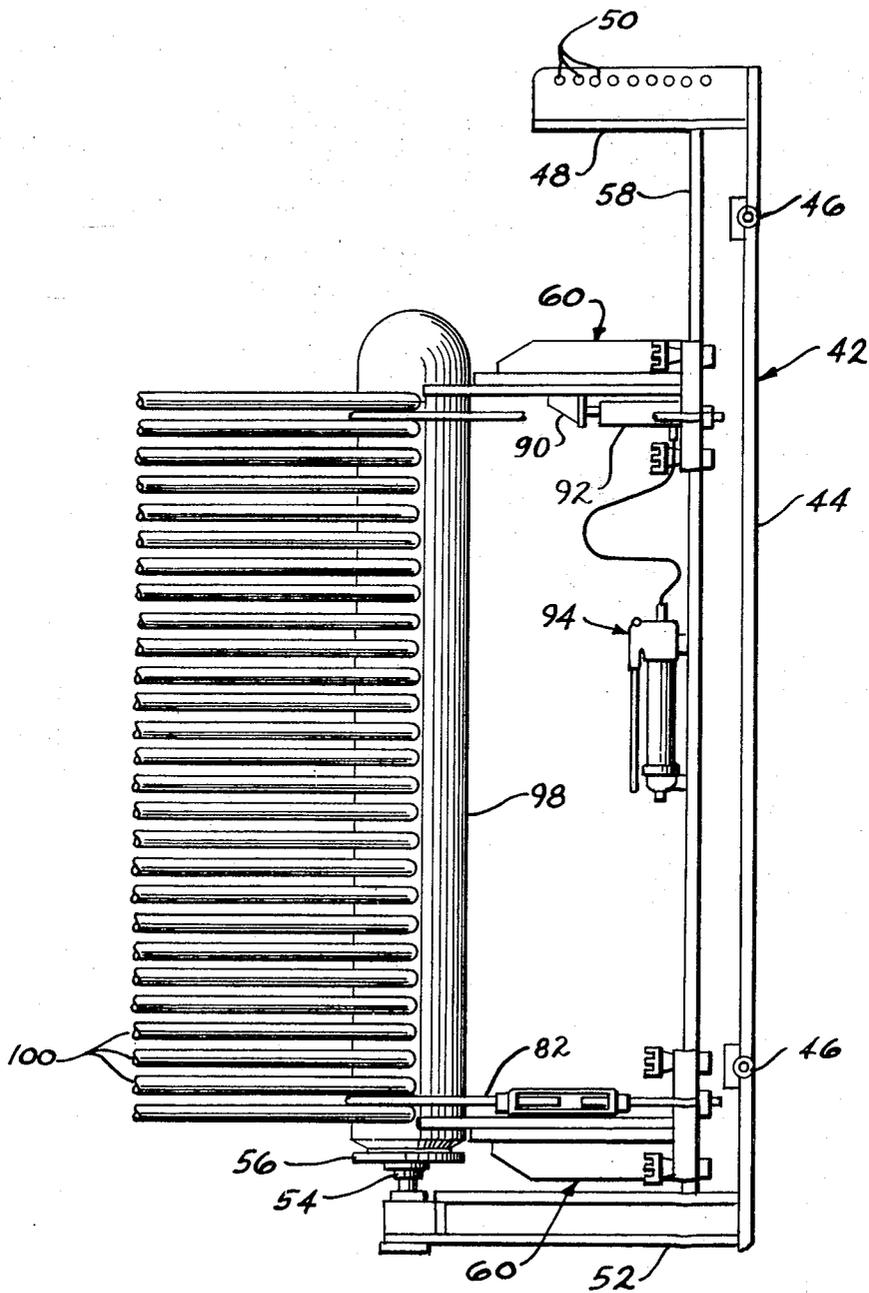


FIG-7

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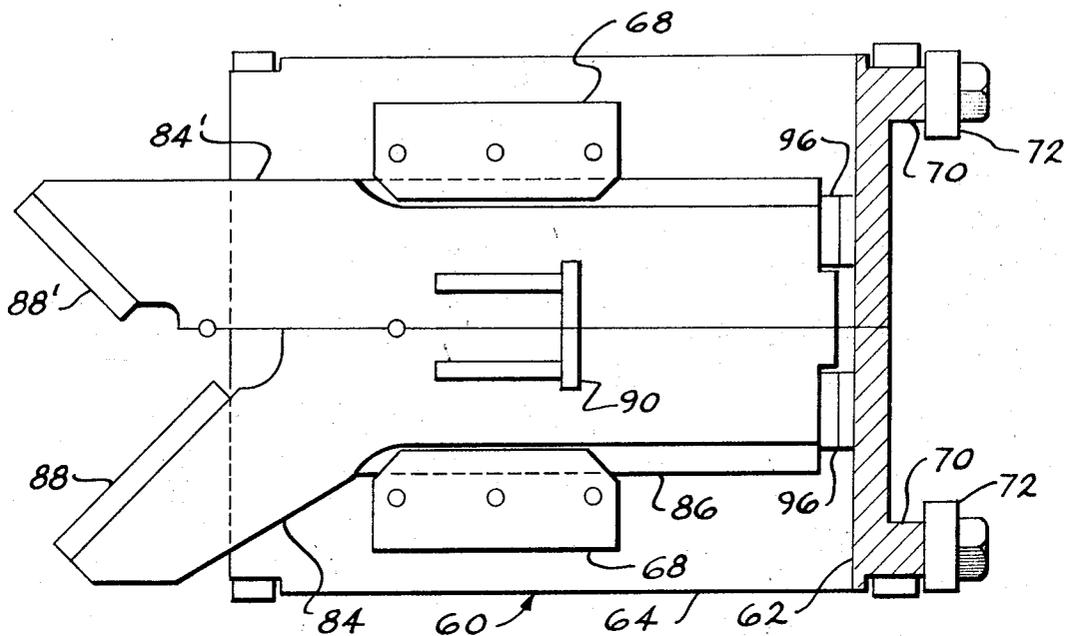


FIG-8

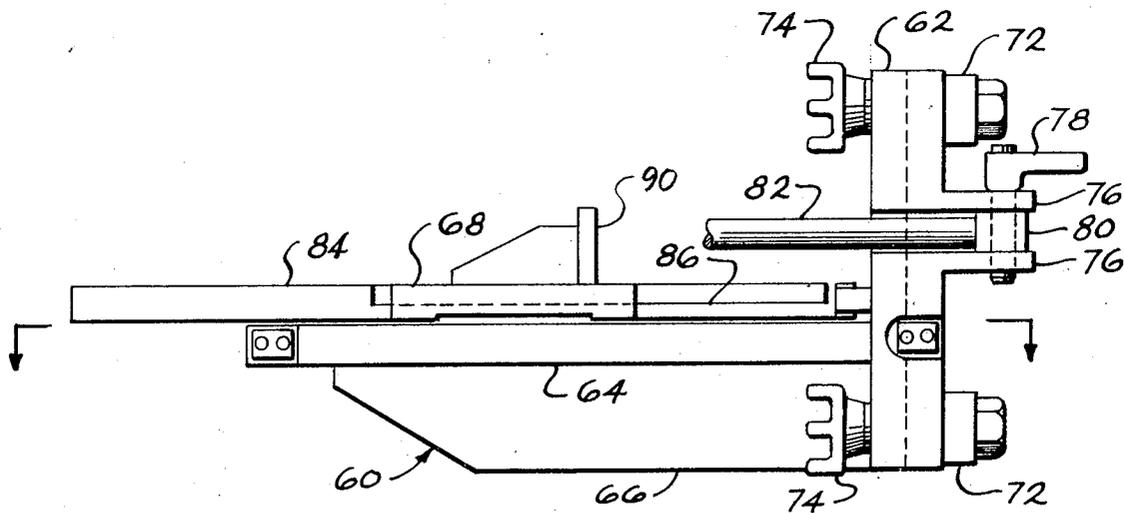


FIG-9

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METHOD FOR CONSTRUCTING SUPERHEATER AND/OR REHEATER MODULES

BACKGROUND OF THE INVENTION

The construction of boiler units for steam generation in utility power plants and large industrial facilities is accomplished directly at the location selected for the plant. This is due to the size and lack of standardized construction of these facilities. Field erection is expensive in that construction and erection equipment must be brought to the building site and erection efficiency is dependent upon a transient labor market of inconsistent quality.

The advantages of shop assembly, as opposed to field erection, have long been realized in the manufacture of industrial boilers of somewhat smaller size. Standard designs with maximum use of standardized fabrication procedures considerably reduces the cost of these units over comparably sized field erected units. Additionally, labor control is more readily accomplished so as to insure more reliable and efficient construction of the boiler equipment.

While overall economy of construction of utility plant and large industrial boilers is dependent upon many factors, in general there is an attempt to optimize this economy by utilizing shop assembly techniques for component construction where shipping considerations permit. Boiler components, and the procedures for the fabrication thereof, whenever possible are being standardized and moved into the shop so as to maintain more accurate control over their manufacture as well as reducing their cost.

When high final steam temperatures are required for the above-noted facilities, panel type superheaters are necessary to provide the required heat transfer surfaces. In the past, superheater and reheater construction for these large boiler systems has necessarily been accomplished in the field due to the size and variable configurations thereof. These superheater and reheater arrangements were constructed by hanging headers and then raising and welding individual tube panels thereto. This construction technique is not only expensive and time consuming but requires a large number of accurate field welds by skilled welders which are not always available.

SUMMARY OF THE INVENTION

It is the purpose of this invention to provide a novel method whereby shop assembly of superheaters and/or reheaters for utility plants and large industrial boilers may be accomplished. Each segment of a superheater or reheater header, as it is formed in the shop, is accurately positioned in a vertical orientation with respect to a fixed reference base on which is particularly positioned a lifting and shipping frame. Individual tube panels are placed in the frame and joined to the header until a complete module is built up. The module may then be conveniently shipped in its frame to the erection site where it may be positioned and joined to similar modules to form the unitary superheater or reheater structure.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation of the assembly fixture for constructing superheater and/or reheater modules according to the method of this invention.

FIG. 1a is a side elevation of a superheater/reheater module assembled in the lifting and shipping frame according to the method of this invention.

FIG. 2 is a plan view of the structural frame and module support of FIG. 1.

FIG. 3 is a side elevational view of the structure of FIG. 2.

FIG. 4 is a plan view of the mounting plate of FIG. 1.

FIG. 5 is a side elevational view of the mounting plate of FIG. 4.

FIG. 6 is a rear elevational view of the mounting plate of FIG. 4.

FIG. 7 is a side elevational view of the V-slide base of FIG. 1.

FIG. 8 is a plan view of the V-slide assembly of FIG. 1.

FIG. 9 is a side elevational view of the V-slide assembly of FIG. 8.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In order to optimize economical construction of utility and large industrial steam generating facilities, there has been an attempt to assemble components thereof in the shop where fabrication of the elements of the components occurs. It is the purpose of this invention to provide a novel method for construction of superheaters and/or reheaters by shop assembly of components in an economical and efficient form for shipping and final onsite erection. The method derived involves assembling the superheater or reheater in modules or elements in the shop and shipping them to the field to be joined in the overall structure into the ultimate superheater or reheater configuration.

The superheater or reheater header is fabricated in cylindrical segments of between 8 and 14 feet in length. In turn, each header segment is accurately positioned in a vertical orientation relative to a fixed reference base. A lifting and shipping frame is particularly positioned on the fixed reference base relative to the header segment. Tube panels, which are preassembled with the appropriate sealing means to form the sealing wall of the boiler casing, are then placed one at a time in the shipping frame and joined to the header (and to each other). If two headers are necessary, the header segments are accurately positioned relative to one another and then the tube panels are joined thereto.

Because of the particular positioning of the header segment and lifting and shipping frame, the tube panels will be accurately positioned to form desired superheater or reheater modules. Additionally, because the module is built up in a lifting and shipping frame, handling for shipping and erection at the site of the steam generating facility is readily and efficiently accomplished. As a result, there is a considerable cost savings due to the fact that the large number of tube-to-header welds are accomplished in the shop under standard, supervised conditions.

One apparatus for accomplishing this novel method of superheater or reheater module shop construction is shown in the copending patent application Ser. No. 32,573 of J. N. McClain and R. P. Sullivan filed Apr. 28, 1970. The structure of the application is herein repeated to the extent necessary for a complete understanding of how that structure can be related to the instant method.

An assembly fixture 12 for assembling the superheater or reheater modules or elements 10 comprises a structural frame tower 18 mounted on the fixed reference base 16 (FIG. 2). In relation to the tower 18 there is positioned a bed plate 20 and bed rails 22 on the fixed reference base 16 for the support of module 10 during assembly. The structural frame tower 18 has mounted thereon longitudinally oriented machined surfaces 24 accurately positioned with respect to the fixed reference base 16. The tower 18 may have additional machined surfaces 24' mounted on the side opposite from machined surfaces 24 in order to accomplish simultaneous construction of several modules at one time.

A mounting plate assembly 26 is particularly supported by the structural frame tower 18 so as to maintain an accurate relationship with the reference base 16. As best seen in FIGS. 4-6, the mounting plate assembly 26 comprises a mounting plate 28 which has accurately machined surfaces 30 positioned thereon so as to mate with the machined surfaces 24 to provide the desired accurate support therebetween. At the top portion of the plate 28 are mounted rollers 32 which serve to support the mounting plate assembly 26 and permit transverse adjustment thereof along the machined surfaces 24. Additionally, the plate 28 has horizontal guides 34 which assist in the support and guiding of the mounting plate assembly 26. The horizontal guides 34 have clamp means 36 so as to secure the position of the mounting plate assembly 26 with reference to the structural frame tower 18 and the shipping frame 14 when proper transverse positioning is accomplished. Extend-

ing form the plate 28 are V-slide base supports 38 which have particular shaped notches 40 in the upper portions thereof for the purpose of accurately supporting the V-slide base 42.

The V-slide base 42 (best shown in FIG. 7) is comprised of a structural base 44 upon which are mounted guide rollers 46 which engage the notches 40 of the V-slide base supports 38 of the mounting plate assembly 26. The base 44 has an upper extension 48 which in turn has a series of holes 50 to permit lifting and positioning of the V-slide base 42. Additionally, the structural base 44 has a lower extension 52 which supports a longitudinal positioning jack 54 and a header support means 56.

The structural base 44 has an integral slide track 58 upon which V-slide assemblies 60 may be positioned. The V-slide assembly 60, as best seen in FIGS. 8 and 9, is comprised of a baseplate 62 having a standard 64 extending outwardly therefrom supported by web 66. The standard 64 has guide bearings 68 mounted thereon. The baseplate 62 of the V-slide assembly 60 has guides 70 formed by blocks 72 affixed to the base plate 62. These guides 70 ride on the slide track 58 so as to be adjustably positionable thereon. Clamp means 74 serve to secure the position of the V-slide assembly 60 relative to the V-slide base 42. The baseplate 62 additionally has bosses 76 through which a locking handle 78 extends. The locking handle 78 passes through an end connection 80 of a header retention cable 82 for the purpose to be explained hereinbelow. A header locating plate 84 is positioned on the standard 64 and has tracks 86 which are engaged with guide bearings 68 of the V-slide assembly 60 so as to permit relative movement therebetween. The header locating plate 84 has a V-notch 88 in the outwardly extending end (FIG. 8 shows two half views of the header locating plate 84, the first header locating plate 84 with notch 88 for the purpose of supporting large headers and the second header locating plate 84' with notch 88' for smaller headers) and a ram reaction plate 90 mounted centrally thereon. As seen in FIG. 7, a hydraulic ram 92 actuated by an hydraulic actuator 94 is positioned between the ram reaction plate 90 and the baseplate 62 of the V-slide assembly 60 to control the position of the header locating plate 84. Blocks 96 (FIG. 8) are inserted between header locating plate 84 and the baseplate 62 to maintain their relative positions.

The assembly fixture 12 may be utilized to assembly superheater or reheater elements or modules 10 according to the aforementioned novel method in the following manner. A segment of the superheater or reheater header 98 having the tube nipples 100 extending therefrom is positioned on the header locating plates 84 of the V-slide assemblies 60, the V-slide assemblies in turn being positioned on the V-slide base 42 so as to support the ends of the header 98 and clamped in the supporting position by clamps 74. The header 98 is retained against the header locating plates 84 by the header retention cables 82 which are locked by the locking handles 78. The end of the header 98 is supported by the header support means 56 and longitudinal positioning jack 54.

After the hydraulic jack 92 is actuated to move the header locating plate 84 to accurately position the header 98 with respect to the base 44 of the V-slide base 42, the V-slide base 42 is lifted by means (not shown) engaging the lifting holes 50 in the upper extension 48 lifting and positioning the guide rollers 44 into the notches 40 of the mounting plate assembly 26 to accomplish the correct relative positioning therebetween. The mounting plate 26 is accurately positioned on the machined surfaces 24 of the structural frame tower 18 and clamped in position so that the header 98 is mounted in a vertical orientation and a fixed position relative to the structural frame tower 18. The longitudinal positioning jack 56 may then be utilized to position the header 98 with respect to its height above the fixed reference base 16. With the header so positioned, a lifting and shipping frame 14 is particularly positioned on the bed rails 22 so as to permit tube panels 102 for the superheater or reheater module 10 to be accurately positioned relative to the header 98 to build up the module 10. If two headers are associated with the superheater or reheater

arrangement, the second header segment is accurately vertically positioned on the assembly 12 relative to the reference base 16 and the first header segment, in the same manner in which the first header segment is positioned. The tube panels can then be readily joined to each header segment to form the desired superheater or reheater configuration.

After the lifting and shipping frame 14 is positioned on the bed rails 22, the high crown end bars 104 are located thereon. The first tube panel 102 is then positioned in the shipping frame and welded to the corresponding nipple 100 on the header 98. The welding is accomplished by clamping the tube panel 102 to the respective tube nipples, tack welding the tubes and tube nipples removing the clamps and completing the welding. After the welding of the first tube panel is completed, the next tube panel is positioned and the high crown support bar 106 thereof is welded to the seal band 108 of the preceding tube panel. The high crown support bars 106 are then welded to the high crown end bar 104 and the procedure is repeated until a complete module 10 is built up. The high crown end bar, high crown support bar, and the seal bands serve to form the sealing wall of the boiler casing. At that point the shipping frame 14 may be completed and the entire unit positioned for shipping by the manipulation of the lifting and shipping frame 14.

In view of the above, it can be seen that there is provided a novel method for shop assembling superheater and/or reheater modules. By vertically positioning a segment of a superheater or reheater header in a particular orientation with respect to a lifting and shipping frame, tube panels may be accurately joined thereto. With such particular positioning, the standard modules can be easily built up in a shop environment in a convenient form for shipping and site erection.

While this preferred embodiment of the invention has been shown and described, it will be understood that it is merely illustrative and that changes may be made without departing from the scope of the invention as claimed.

What is claimed is:

1. A method for shop assembly of superheater or reheater modules, the steps comprising: accurately positioning a segment of the superheater or reheater header having integral nipples thereon in a vertical orientation with respect to a fixed reference, positioning a lifting and shipping frame means on said fixed reference relative to said header, positioning a first tube panel in said frame means adjacent said header for joining thereto, joining said first tube panel to said nipples on said header, positioning and joining additional tube panels with respect to said header until the superheater or reheater module is built up, and completing the shipping frame.
2. The method of claim 1 wherein said joining of said tube panel to said header is accomplished by welding.
3. The method of claim 2 wherein welding of said tube panel to said header comprises the steps clamping the tubes of said tube panel to said header nipples, tack welding said tubes to said nipples, removing said clamps, and finish welding said tubes to said nipples.
4. The method of claim 2 further including the steps of fixing high crown end bars to said shipping frame in their proper orientation prior to the step of positioning said first tube panel; joining sealing means between each additional tube panel as it is positioned, and then joining in turn each sealing means to said high crown end bars.
5. A method for shop assembly of superheater modules, the steps comprising: accurately positioning a segment of a first superheater or reheater header having integral nipples thereon in a vertical orientation with respect to a fixed reference, accurately positioning a segment of a second superheater or reheater header having integral nipples thereon in a vertical orientation with respect to said fixed reference and said first header segment, positioning a lifting and shipping frame means on said fixed reference relative to said headers, positioning a first tube panel in said frame means adjacent said integral nipples of said headers, welding said first tube panel to said nipples on said headers, positioning and welding addi-

tional tube panels with respect to said headers until the super-heater or reheater element is built up, and completing the shipping frame.

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