Feb. 4, 1936. W. H. ARMACOST 2,029,284

FLUID HEATER

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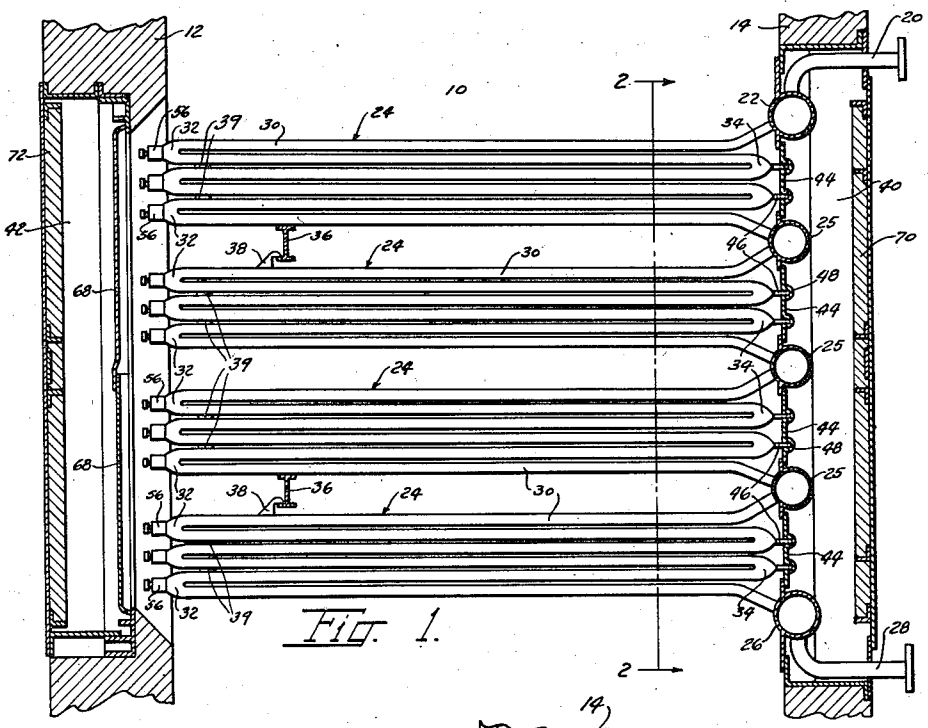


Fig. 1.

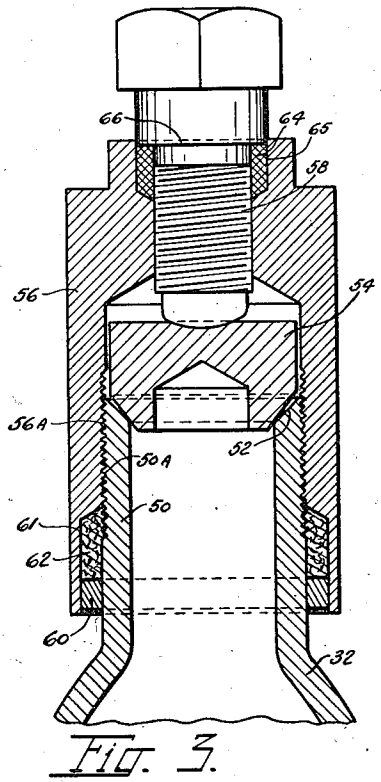


Fig. 3.

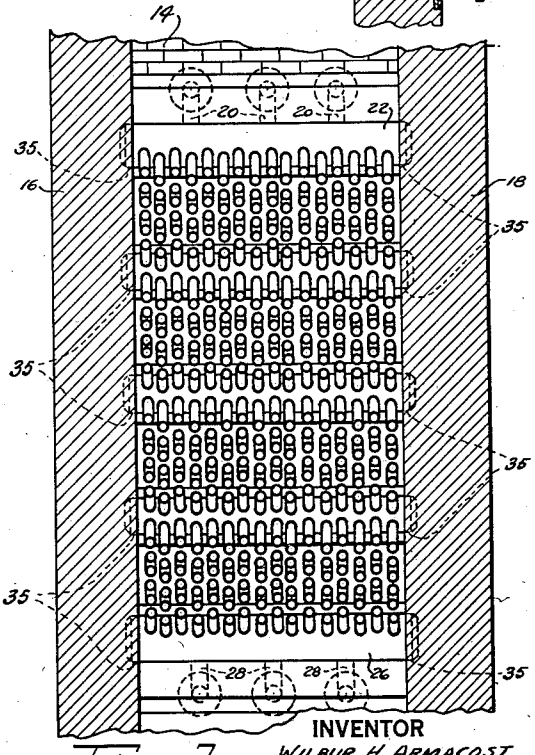


Fig. 2.

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FLUID HEATER

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5 Claims. (Cl. 257—230)

My invention relates to fluid heaters and has as its principal object the production of a heater comparatively economical to build and convenient to operate.

In order that my invention may be readily and fully understood, I will now describe in detail by way of example and in connection with the accompanying drawing a fluid heater in accordance with my invention and selected from a number of possible embodiments thereof. In the drawing,

Fig. 1 is a vertical sectional view of a fluid heater.

Fig. 2 is a sectional elevation on the line 2—2 of Fig. 1.

Fig. 3 is a sectional detail illustrating one of the closures appearing in Fig. 1.

The heater illustrated in Figs. 1 and 2 comprising a gas pass 10 through which heating gases flow vertically when the apparatus is in use. Pass 10 is bounded by walls two of which appear at 12 and 14 in Fig. 1 on opposite sides of pass 10, and the other two walls of which appear at 16 and 18 of Fig. 2.

In the arrangement illustrated, fluid to be heated is introduced through pipes 20, 20 into an intake header 22. From header 22 such fluid flows through serpentine units 24, 24 to an intermediate header 25 and thence through other units 24 and intermediate headers 25 to outlet header 26. From header 26 it is discharged by pipes 28, 28. The units 24 have individual elements 30, 30 lying substantially horizontal, adjacent elements 30 being connected in pairs at their one ends by return bends 32, 32 and at their other ends by return bends 34, 34. The units 24 are supported at one end by the headers 22, 25 and 26 the ends of which extend into the fixed walls 16 and 18 and rest thereon at 35, 35 while the units 24 are supported at their other ends by beams 36, 36. Some of the units rest directly on beams 36, 36 and the others are suspended therefrom by suitable connections 38, 38. To transmit the weight from one loop of a unit to the next and so to the beams 36, I weld spacers 39, 39 between loops of the units 30.

In order that units 24 may be readily accessible, doorways 40 and 42 are left in the opposite walls 12 and 14. To prevent the heating gases from flowing into such doorways and at least partially by-passing the units 24, I have provided special wall sections at the inner ends of such doorways. As appears clearly in Fig. 1, the headers 22, 25 and 26 occupy a portion of the area or section of doorway 40 along its inner end and I have supplied removable plates 44, 44 intermediate the headers for closing off the remainder of the inner end of such doorway when the gas pass 10 is in use. I prefer, further, to utilize the plates 44 for supporting the return bends 34 and for this purpose have shown such return bends as provided with projecting pins 46, 46 which enter sockets 48, 48 in plates 44 to thereby support the intermediate elements 30 of units 24 along the side of the units adjacent the headers.

The return bends 32 along the other side of units 34 are designed to permit cleaning the elements 30, the arrangement being shown in detail in Fig. 3. Each return bend 32 has for this purpose a projecting throat 50 provided with a seat 52 at its outer end which is normally closed by a member 54. For holding the members 54 in place against the internal pressure within the units 34, I have provided a novel arrangement comprising a sleeve 56 provided with internal threads 56a adapted to turn on to the external threads 50a on the throat 50. At its outer end, the sleeve 56 also has internal threads cooperating with the external threads of a pressure applying member 58 whose axis is coaxial with that of throat 50 and the closure member 54 and may be screwed down to contact with the member 54 to hold it firmly in place. Tests have shown that the arrangement just described has the capacity of remaining tight under sudden changes of temperature. A return bend having the closure arrangement above described applied thereto may have cold water poured on the closure arrangement without causing it to leak. This is a very severe test and I attribute the success of the arrangement illustrated in withstanding such test to the fact that the sleeve 56 has an ample amount of surface in engagement with the throat 50 so that the sleeve maintains the same temperature as the throat while the pressure member 58 also has an ample amount of engaging surface with the sleeve and thereby is maintained at the temperature of the sleeve and therefore of the throat. Therefore, the parts once having been put under such pressure to make a tight joint at the seat 52, there is small chance for such pressure to be diminished by changes in temperature of the parts to cause a leak, or for the parts to be overstressed by similar changes so that leakage will occur when the parts regain the same temperature.

In certain classes of apparatus, the heating gases ordinarily carry corrosive substances which are apt to settle on the threads of closure arrangements and damage them. Ordinarily,

therefore, the closure arrangements for clean-out structures in apparatus employing serpentine units have wall plates through which the return bends of the units project and packing to prevent the gases from passing between such plates and the elements to the outsides of the plates and there attacking the closure arrangements. Such a structure is comparatively expensive to install and also requires expense for maintenance to insure that such packed joints are maintained tight against the gases. It is clear from Fig. 1 that I have omitted any such plates and packed joints, the closure arrangements and return bends **32** lying in the gas stream. In the arrangement illustrated, I am enabled to do this by providing packing adapted to protect the ends of the threads on the throats **50** and on the pressure member **58**. As shown, in Fig. 3, throat **50** has an external collar **60** thereon, and the sleeve **56** is countersunk at its inner end to receive collar **60** and to provide a pocket **61** for receiving compressible asbestos packing **62** or its equivalent between collar **60** and the bottom of pocket **61**. At its outer end, the opening for the bolt **58** is also countersunk at **65** to provide room for a body of packing material **64** similar to **62** on throat **50**. The outer end of bolt **58** also has a collar or enlargement **66** thereon, adapted to fit in countersink **65**. It will be obvious that the body of packing **62** will be able to protect it when sleeve **56** is screwed on the throat **50**, and that, similarly, the packing **64** will protect the opening when bolt **58** is screwed into sleeve **56**. In order to provide convenient access to the ends of the elements **30** having the clean-out throats **50** thereon, the doorway **42** is closed adjacent the return bends **32** by readily removable doors **68, 68**. It will be seen further, that preferably the doorways **40** and **42** are covered at their outer ends by suitable plates **70** and **72** respectively which can be easily taken down and replaced.

While the arrangement illustrated herein has all the clean-out openings in the gas path, I do not limit myself to this in all cases, as I consider it within the scope of my invention to place part of the clean-out openings in the gas path and to protect the other part by a packed wall plate. It will be understood further, that I wish the appended claims to be construed broadly in other respects wherever their terms so permit.

What I claim is:

1. A heater having a substantially vertical gas pass, a pair of headers one above the other at one side of said pass, a serpentine pipe unit having its ends connected into the said headers and its elements substantially horizontal and lying in said pass, a plate lying between said headers and forming a wall section on one side of said gas pass, means for supporting said unit in part from said plate, and means forming a wall for said gas pass opposite the said headers and plate.

2. A heater having two tube bundles each including a plurality of loops, wall supports for said loops at the one end thereof, a beam intermediate said bundles, the lower tube of one bundle resting on said beam and the upper tube of the other bundle suspended from said beam, and means connecting each two of said loops of both said bundles so as to transfer to said beams such of the weight thereof as is not carried by said wall supports.

3. A heater as set forth in claim 2 and in which the wall supports include plates in a wall formed in part by headers for the tube bundles, such plates having sockets, and pins on the ends of the loops nearer the headers for entering said sockets.

4. A heater having a plurality of spaced horizontal tube bundles each including a plurality of spaced loops, cleanouts at the one end of said loops, a beam intermediate two of said bundles and acting to support the ends of both bundles having said cleanouts thereon, and mechanical connections between each two adjacent loops of a given bundle whereby the loops are maintained at the desired spacing at the ends supported by said beam.

5. A heater having a plurality of horizontal tube bundles in a vertical flue, each such bundle including a plurality of spaced loops, spaced headers at one end of each of said bundles through which the fluid to be heated enters and leaves the bundle, wall plates intermediate said headers along one side of said flue, cleanouts at the ends of said loops opposite said headers, means providing ready access to said cleanouts, a beam intermediate two tube bundles and supporting both such bundles at points nearer said cleanouts than said headers, and mechanical connections between external surfaces of the loops of said bundles in the vertical line near said beam.

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