June 14, 1938. A. R. HOUSER ET AL 2,120,805

TUBE SUPPORT

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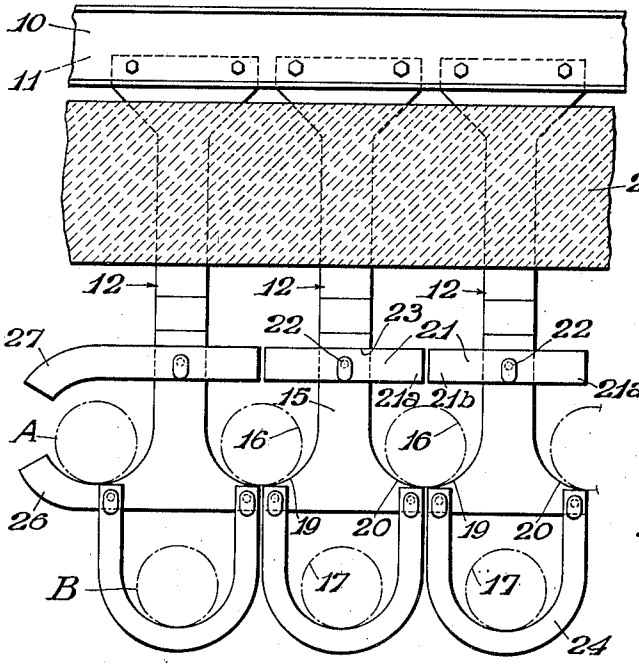


Fig. 1

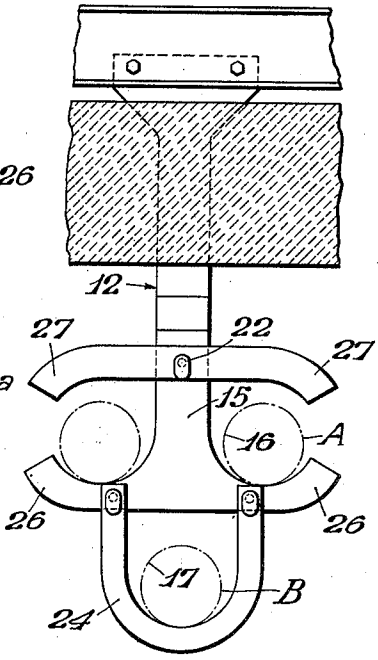


Fig. 2

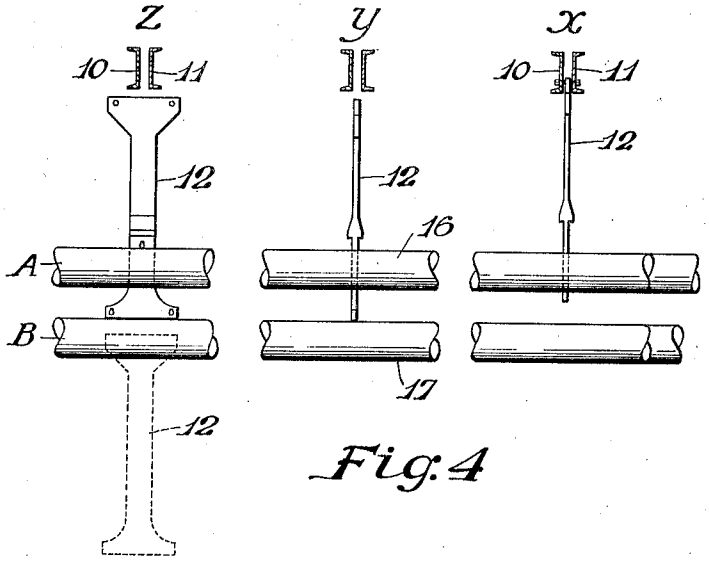


Fig. 4

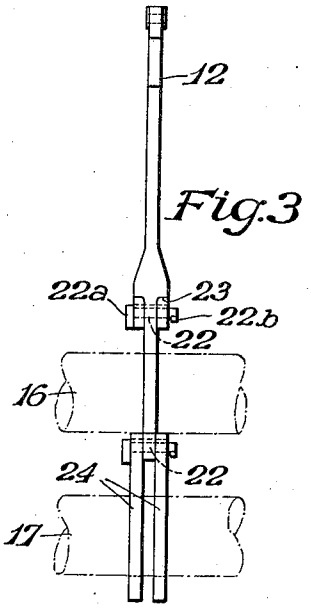


Fig. 3

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TUBE SUPPORT

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8 Claims. (Cl. 122—510)

The present invention relates to improvements in furnace construction, and more particularly to an improved means for supporting and holding down the tubes in a furnace.

In certain furnaces, particularly in furnaces for heat treating petroleum by indirect heating, a plurality of rows of tubes are employed for conducting the fluid through the furnace. These tubes are definitely spaced and supported at their ends by the tube plates of the header boxes in a well known manner (not shown). These tubes must also be supported and maintained in their spaced relationship intermediate their ends. Various forms of hanger arrangements have been proposed as a solution to this problem—the present invention being an improvement over the form disclosed in the patent to Scott and Ducommun No. 1,977,247.

Due to the intense heat present, it is found that individual hanger assemblies fail from time to time and must be replaced. In prior forms of hanger assemblies, where the tubes are both supported and held against vertical movement, it has been found necessary to remove the tubes in order to replace a defective hanger assembly, which obviously works a great inconvenience and expense. This is true of the device of the Scott and Ducommun patent, as reference to Figures 1 and 2 thereof will show. We have found in attempting to replace the hangers of the form shown in Figures 1 and 2 of the Scott and Ducommun patent that the shoulder 7, which performs a hold-down function, prevents the independent removal of the individual hanger assemblies without disturbing the tubes supported thereby. The form shown in Figure 7 of the Scott and Ducommun patent omits the shoulder 7 but cannot be removed without first removing the lower tube B (Figure 7) since the upper end of the hanger 23 cannot otherwise be lowered to clear the lower edge of its support to permit of rotation about the vertical axis of the hanger for removal. This form also lacks the hold-down means which is very essential for preventing undue vertical movement of the tubes.

It is an object of the present invention to provide a hanger assembly which can be replaced readily without the removal of tubes, and which is effective to support and hold down a plurality of tubes in a furnace.

Figure 1 is an assembly view showing the preferred embodiment of my improved hanger.

Figure 2 shows a modification of the form of hanger shown in Figure 1.

Figure 3 is an end elevation showing certain parts in greater detail.

Figure 4 is a development showing the progressive steps involved in replacing an individual hanger without disturbing the tubes or any of the other hangers in accordance with the teaching of our invention.

Referring particularly to Figure 1 of our drawing, we have disclosed only so much of the furnace as necessary to fully show our novel arrangement, the remaining portion of the furnace being broken away. A suitable support forming also a part of the structure of the roof is provided for supporting a plurality of hanger members. As shown in Figure 4, this support comprises a pair of parallel structural members such as channels 10 and 11 placed with their backs adjacent one another and spaced sufficiently apart to define therebetween a socket-like receiving and supporting means for the upper ends of a plurality of hanger members. A plurality of superimposed rows of tubes, designated A and B, are located below and extend transverse to the parallel structural members 10 and 11. These tubes are supported in definite symmetrical spaced relationship at their ends by the tube plates of the respective header boxes in a well known manner (not shown).

We have shown a novel hanger arrangement for supporting and holding down the tubes between their end supports, comprising a plurality of separate hanger assemblies located in series in a plane transverse to the tubes to be supported. Each assembly comprises a substantially flat hanger member 12, the upper end of which is adapted to be positioned parallel with and to fit within the space or socket defined by the two parallel structural members 10 and 11. Each hanger member 12 has a reduced intermediate portion 15, the maximum cross-sectional dimension of which is less than the distance between a pair of tubes 16 of the upper row A or the distance between a pair of tubes 17 of the next lower row B. This intermediate portion 15 diverges at its lower end to form an enlarged portion comprising two opposed outwardly extending protuberances or supporting surfaces 19 and 20 thereon, each of which is complementary to corresponding surfaces 19 and 20 of adjacent hanger member 12. Two adjoining complementary outwardly extending surfaces 19 and 20 thus define a support for the tube. The reduced intermediate portion 15 is shown as extending almost to the support 10 and 11 but it is only necessary that this reduced portion 15 ex-

tend sufficiently above the protuberances 19 and 20 to permit of the lowering of the hanger to remove it as will be seen.

We have provided each hanger member 12 with a readily removable hold-down bar 21. Each hold-down bar is mounted on its respective hanger member by means of a pivot pin 22 passing through a complementary key opening in each hanger member, the pivot pin 22 being provided with a laterally spaced weighted portion 22a on one end and a keyed portion 22b on the other end, the keyed end being insertable through the complementary openings in the hold-down bar and hanger member with the weight in a raised position. Upon the insertion of the pin with the eccentric weighted portion in raised position and release of the weighted portion, a locked relationship is effected between the hold-down bar and the hanger member. A shoulder 23 is provided on the hanger member for limiting the movement of the hold-down bar about the pivot pin. It is readily apparent that this stop means may be as readily formed on the hold-down bar itself. Each hold-down bar 21 occupies a complementary relationship with respect to adjoining hold-down bars, adjoining ends 21a and 21b defining hold-down means for a tube. Additional readily removable holder means 24 are provided for attachment to the hanger members for holding the tubes of the lower row. It will be apparent that the usual roof tile 26 is fabricated around the hanger members to form a seal thereabout. It is of course necessary to make an opening about the hanger member large enough to permit its turning and withdrawal when it is to be removed and replaced by a new hanger member, this opening being again sealed upon the completion of the replacement operation.

Reference to Figure 4 shows the progressive positions occupied by a hanger bar in being removed and replaced in accordance with the teaching of our invention. This will make clear the problem involved in removing and replacing a hanger assembly under the peculiar circumstances present in a furnace construction. It is to be noted that the upper end of the hanger extends above the lower edge of its support a distance not substantially greater than the distance from the lower surface of the hanger to the next lower tube. This is quite important in effecting removal as will appear. The readily removable hold-down bar 21 is first detached from the hanger member, the additional removable holder 24 is then detached from the bottom portion of the hanger member, and the top portion of the hanger member is disconnected from its support 10, 11, as shown in development X. The hanger member 12 is then lowered to a point where the top thereof is just below the bottom edge of the support 10, 11, as shown in development Y, and the hanger member 12 is then turned through ninety degrees to withdraw the outwardly extending supporting surfaces 19, 20, from under the tubes 16, and to bring the hanger member in parallel relationship with the said tubes as shown in development Z. The hanger member may then be lowered between upper tubes 16 and lower tubes 17 and another hanger inserted in position by reversing the aforementioned steps.

The outwardly extending surfaces of the end hanger, together with the corresponding hold-down bar, may be provided with additional extensions 26 and 27, which sufficiently encompass the outside tube to retain same therein.

In Figure 2 we have shown a modification of our improved hanger assembly wherein both outwardly extending supporting surfaces, as well as the hold-down bar, have extensions 26 and 27, thereon sufficiently encompassing both tubes to retain the same therein. The hanger member is provided with an additional readily removable holder 24 for carrying an additional tube thereon.

While we have described our invention in connection with certain specific embodiments thereof, it is to be understood that these are by way of illustration rather than by way of limitation and we do not mean to be limited thereby except as indicated by the scope of the appended claims, which should be construed as broadly as the prior art will permit.

We claim:

1. In a furnace, a hanger assembly for supporting a plurality of superimposed rows of spaced tubes intermediate the ends of said tubes, a support for attachably receiving the upper ends of a plurality of hanger bars in a plane transverse to the tubes, the lower end of each hanger bar having opposed outwardly extending protuberances thereon adapted to cooperate with corresponding protuberances on adjacent hangers for carrying two tubes of the topmost row, said hanger bars each extending up between said tubes into engagement with said support, additional readily removable pendent means suspended from said hanger bars for supporting the tubes of the next lower row, said upper end of said hanger bars being made to extend a distance above the lower edge of said support when in attached position which is not substantially greater than the distance from the under side of said hanger to the said tube of the next lower row of tubes, whereby said hanger is made removable without disturbing either the tubes or adjoining hangers by first detaching it from its support and removing said last named pendent supporting means, then lowering said hanger bar until its top edge clears the bottom of its support to thus permit of rotation of said hanger to withdraw said protuberances from under the two tubes supported thereby and to bring said protuberances into parallel relation with said tubes whereby said hanger may then be lowered between the tubes of the respective rows and thus removed.

2. An arrangement for supporting a plurality of vertically disposed rows of spaced tubes in a furnace, comprising a socket-like support for non-rotatably receiving the upper ends of a plurality of substantially flat hanger bars in a plane transverse to the tubes, the lower end of each hanger bar having opposed outwardly extending protuberances cooperating with corresponding protuberances on adjacent hangers for carrying two tubes of the topmost row, each holder having additional readily removable pendent means for supporting a tube of the next lower row of tubes, said upper end of said hanger extending a distance above the lower edge of said support when in attached position which is not greater than the distance from the under side of said hanger to the said tube of the next lower row of tubes, whereby said hanger is made independently removable without disturbing any of the tubes by first detaching it from its support and removing said last named pendent supporting means, then lowering said hanger until its top edge clears the bottom of its support to thus permit rotation of said hanger about its vertical axis to withdraw said protuberances from under the two tubes sup-

ported thereby and to bring the same into parallel relation with said tubes and then lowering said hanger between said tubes to thus remove it.

3. A readily replaceable hanger for supporting and holding down a plurality of spaced tubes in the furnace, comprising a hanger member having a reduced intermediate portion joining with an enlarged lower end defining a pair of outwardly extending tube supporting surfaces for supportably engaging a pair of tubes, the upper end of said hanger member designed to be connected to a support, a readily detachable member mounted on said hanger member for limiting the vertical movement of at least one of said tubes, additional holder means detachably mounted on said large portion for holding an additional tube.

4. A readily replaceable hanger assembly for supporting and holding down a plurality of spaced tubes in a furnace, comprising a hanger member having a reduced intermediate portion, the maximum cross-sectional dimension of which is less than the distance between adjacent tubes, said reduced portion joining with an enlarged lower end defining a pair of outwardly extending surfaces for supportably engaging a pair of tubes, the upper end of said hanger member being arranged for connection to a suitable support, a readily detachable hold-down bar mounted on said hanger member by means of a single readily removable pivot pin, said pin being laterally weighted at one end and being keyed at the other end, said hanger member and said hold-down bar having corresponding keyways for the reception of said keyed pin, and stop means for limiting the movement of said hold-down bar about said pin, said hold-down bar functioning to limit the vertical movement of the tubes supported on said outwardly extending surfaces.

5. A furnace construction including a plurality of rows of tubes, a support, a plurality of readily independently replaceable hanger assemblies for supporting and holding down said tubes, each hanger assembly comprising a hanger member having an intermediate reduced portion the maximum cross-sectional dimension of which is less than the distance between two adjacent tubes of one of said rows, said reduced portion diverging at its lower end to form an enlargement having a pair of outwardly extending surfaces, the outwardly extending surfaces of one hanger member being arranged complementary to the corresponding surfaces of adjacent hanger members to define supporting means for the tubes of one horizontal row, the other end of each hanger member being arranged for connection to said support, readily detachable hold-down members mounted on said hanger members for limiting the vertical movement of said tubes, and additional holder means detachably mounted on said hanger member for holding the tubes of a second horizontal row.

6. A furnace construction including a plurality of rows of horizontal tubes, a support, a plurality of tube hanger members depending from said support, each hanger member being enlarged at one end to form a pair of opposed complementary supporting surfaces for cooperation with corresponding surfaces in adjacent holders for supporting two of said tubes, said opposed complementary supporting surfaces converging to form a reduced intermediate portion, the maximum cross-sectional dimension of which is less than the distance between two adjacent tubes of one of said horizontal rows, the other end of said hanger member being arranged for connection with said support, a complementary readily detachable hold-down bar mounted on each of said hanger members, the hold-down bar on one hanger member being complementary to the adjacent hold-down bars, to thus define means for limiting the upward movement of the tubes, additional holding means detachably mounted on said enlarged portions of said hanger members for supporting the tubes of a second horizontal row, said reduced intermediate portion extending above said complementary supporting surfaces sufficiently to permit of removal of said hanger bar without disturbing the tubes by first removing said additional holding means, then lowering said hanger until its top edge clears its support to thus permit of rotation of said hanger about its vertical axis to withdraw the complementary supporting surfaces from under the tubes and to bring the same into parallel relation with said tubes whereupon said hanger may then be lowered between said tubes and thus withdrawn.

7. A furnace construction including a plurality of rows of horizontal tubes, a support, and a plurality of tube holders depending from said support, each holder being formed at its lower portion with a pair of opposed complementary supporting surfaces cooperating with corresponding surfaces of adjacent holders for supporting two of said tubes, said opposed complementary supporting surfaces converging to form a reduced portion, the maximum cross-sectional dimension of which is less than the distance between two adjacent tubes of one of said horizontal rows, each of said holders being of such thickness as to be readily insertable in substantially vertical position between parallel pairs of superimposed tubes to a point just below said supporting means, said reduced portion being of sufficient extent to permit the holder to then be turned through approximately ninety degrees, and raised into supporting position within said supporting means, thus bringing said complementary supporting surfaces into cooperation with corresponding surfaces of adjoining holders for supporting a parallel pair of said tubular members, each of said holders being provided with readily detachable complementary hold-down bars on adjacent ones of said holders, for maintaining said tubes in their proper position on said supporting surfaces, each holder having holding means mounted thereon for supporting one tube of a lower horizontal row of tubes, said holder means being readily detachable from said holder and from said tube.

8. A readily replaceable hanger assembly for supporting and holding down a plurality of spaced tubes in a furnace comprising a hanger member having a reduced intermediate portion, the maximum cross-sectional dimension of which is less than the distance between adjacent tubes, said reduced portion joining with an enlarged lower end defining a pair of outwardly extending tube supporting surfaces for supportably engaging a pair of tubes, the upper end of said hanger member adapted to be connected to a suitable support, a readily detachable hold-down bar mounted on said hanger member for limiting the vertical movement of said tubes, at least one of said outwardly extending surfaces and the cooperating readily detachable hold-down bar being extended to sufficiently encompass said associated tube to confine the same therebetween.

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