May 1, 1928. 1,667,833

J. E. BELL

TUBULAR FLUID HEATING APPARATUS

Filed March 24, 1923

Fig. 1.

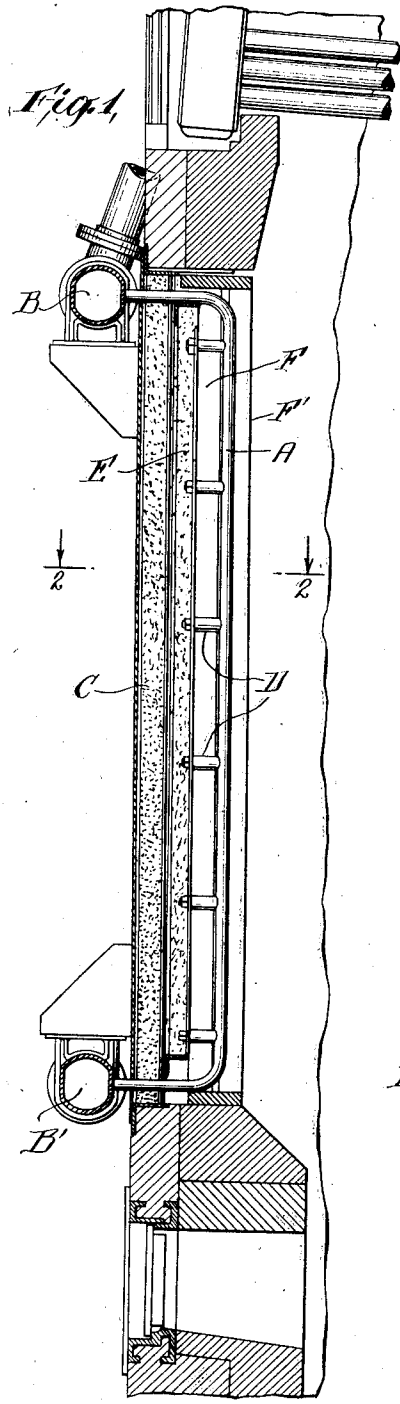


Fig. 2.

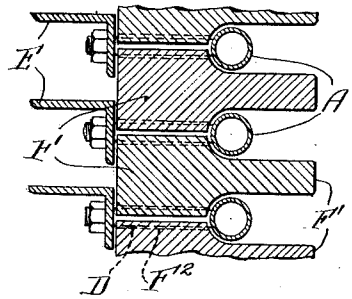
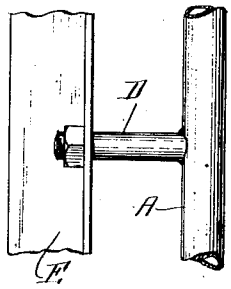


Fig. 3.



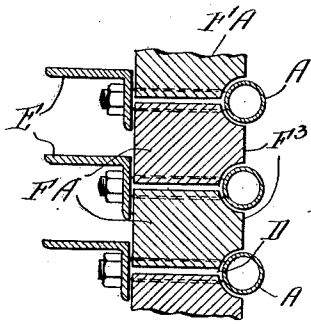


Fig. 4.

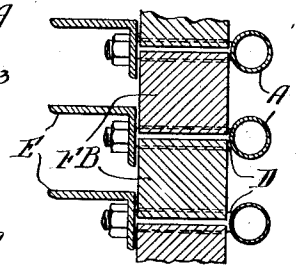


Fig. 5.

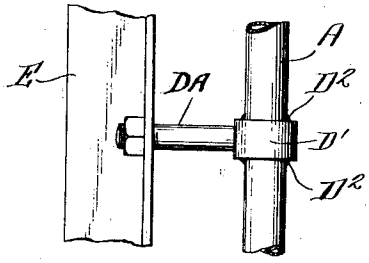


Fig. 6.

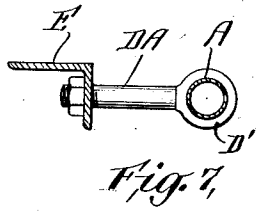


Fig. 7.

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UNITED STATES PATENT OFFICE.

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TUBULAR FLUID-HEATING APPARATUS.

Application filed March 24, 1923. Serial No. 627,426.

The general object of my present invention is to provide improved fluid heating apparatus comprising tubes exposed to high temperatures. The invention was primarily devised, and is especially adapted for use in so-called radiant heat superheaters in which the steam to be superheated is passed through tubes adjacent, or forming a portion of the boiler furnace combustion chamber wall from which the tubes receive heat wholly, or largely, by direct radiation. The specific object of the present invention is to provide improved means for supporting the heat absorbing tubes, and is intended for use with bare wrought metal tubes as distinguished from tubes enclosed in tubular cast metal sections and from hollow castings, and is characterized by the rigid attachment to the bare tubes of the supporting lugs or studs. These lugs or studs may be welded at their ends to the sides of the tubes, or they may comprise collar portions encircling the tubes, and shrunk on, or welded to the latter.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, its advantages, and specific objects attained with its use, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described preferred embodiments of my invention.

Of the drawings:

Fig. 1 is a vertical section of a portion of a boiler furnace wall in which a radiant heat superheater is incorporated;

Fig. 2 is a partial section on the line 2—2 of Fig. 1;

Fig. 3 is a partial section taken similarly to Fig. 1 but on a larger scale;

Figs. 4 and 5 are views taken similarly to Fig. 2, each illustrating a different modification;

Fig. 6 is a view taken similarly to Fig. 3, illustrating a modified form of tube support; and

Fig. 7 is a transverse section of the apparatus shown in Fig. 6.

In the drawings, and referring first to the construction shown in Figs. 1, 2 and 3, A are the tubes of a radiant heat superheater incorporated in the combustion chamber wall C, of a boiler furnace. The tubes A have transverse end portions which project outwardly through the furnace wall, and are connected to the superheater inlet and outlet headers B and B′, respectively. Each tube A has supporting lugs or studs D welded to it at intervals along its length. As shown these lugs or studs D, which are advantageously formed of wrought steel, are provided with reduced and threaded end portions which pass through, and are connected to tube supports E in the form of angle bars extending parallel to the tubes, there being one angle bar E back of and connected to each tube A.

To accommodate relatively longitudinal expansion and contraction of each tube and its supporting bar, the bar and tube may be rigidly clamped together by means of one of the supporting lugs or studs D and the nut threaded on its reduced end, while the reduced ends of the other lugs D of the tube pass loosely through slotted openings in the supporting bar which supports the tubes and hold it in alignment. The supporting lugs D may or may not form part of a metallic framework incorporated in or bracing the boiler housing wall and carrying the weight of the housing wall brickwork above the superheater. Ordinarily a suitable heat insulating material may be packed between and at the outer side of the bars E.

As shown in Figs. 1, 2, and 3, refractory bricks or tile parts F are arranged between the tubes A and the tube supporting bars E. These parts F are provided with so-called shadow brick extensions F′ which extend into the furnace chamber appreciably beyond the inner sides of the tubes A, so that the latter are each received in a corresponding groove in the refractory wall formed by the parts F, and the extensions F′ reduce the extent to which the tubes are exposed to, and absorb radiant heat. The brick or tile parts F are suitably notched or cut away as indicated at F^2 to provide openings for the studs D. In some cases, there is no need of having brick extensions into the furnace chamber beyond the tubes, and in such cases brick parts FA as shown in Fig. 4, or brick parts FB as shown in Fig. 5 may be employed. The brick parts FA have reduced extensions F^3 which extend to the plane of the center lines of the tubes A, while the brick parts FB are employed where it is desired to have the tubes A wholly exposed.

In some cases the wall formed by the brick parts FB may even be located at some distance away from the inner sides of the tubes A so that the latter are enveloped by the heating gases.

In lieu of welding supporting lugs D to the sides of the tubes A, as shown in Figs. 1 to 5, inclusive, supporting parts DA may be formed with collar portions D′ which encircle the tubes A as shown in Figs. 6 and 7. The collar portions D′ may be shrunk on the tubes A, or may be welded thereto as indicated at D^2.

With the described arrangements, bare tubes of wrought steel exposed to high furnace temperatures may be attached to supporting devices incorporated in a furnace wall, and the attaching provisions employed are simple and inexpensive in construction, and effective and durable in operation. The invention is obviously not restricted to use in some superheaters, but is adapted for use in oil refining apparatus and generally where it is desired to impart heat to a fluid passing through tubes heated wholly or largely by radiant heat absorbed from a furnace chamber.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a furnace the combination with the furnace housing wall, of a furnace wall superheater tube having supporting devices rigidly secured to the tube at intervals along its length and comprising bare tube sections between the supporting devices, and means mounted in said wall and engaging said devices at the side of the tube adjacent said wall to hold said tube in proximity to the inner wall of the furnace with the bare sections of the tube exposed to the heating effect of the furnace atmosphere.

2. A furnace wall superheater comprising a bare tube, and tube supporting means comprising metallic collars encircling the tube at intervals along its length and co-operating devices engaging said collars at one side of the tube for mechanically connecting the latter to a furnace wall whereby said elements may be secured against said furnace wall with the bare portions of the tube between said collars exposed to the heat of the furnace chamber and with said tube protecting said devices against excessive radiant heat absorption.

3. In a furnace, the combination with a furnace chamber wall of a tubular heating element comprising a bare tube body portion adjacent and extending alongside said wall, and supporting means secured to said body portion at intervals along its length and extending away from the side of said body portion adjacent said wall whereby the shielding effect of said body portion restricts radiant heat absorption by said means.

4. In a furnace, the combination with a furnace chamber wall of a tubular heating element comprising a bare tube body portion adjacent and extending alongside said wall, and supporting parts welded to said body portion at intervals along its length and extending away from the side of said body portion adjacent said wall whereby the shielding effect of said body portion restricts radiant heat absorption by said parts.

Signed at city of New York, in the county of New York and State of New York, this 22nd day of March, A. D. 1923.

JOHN E. BELL.