

April 20, 1926.

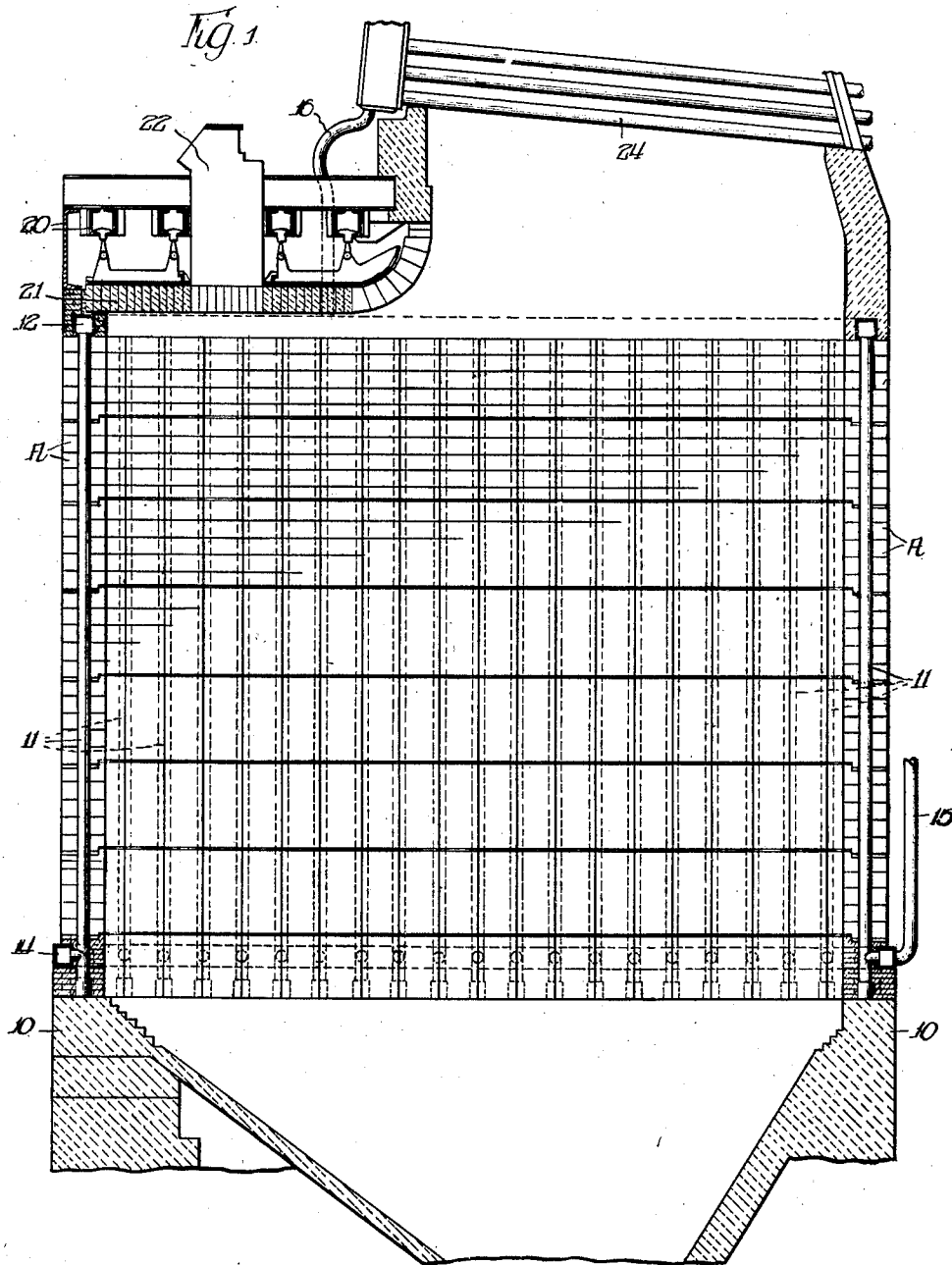
1,581,817

F. I. SHEAHAN

FURNACE WALL CONSTRUCTION

Filed March 11, 1925

2 Sheets-Sheet 1



Witness:  
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Inventor:  
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2 Sheets-Sheet 2

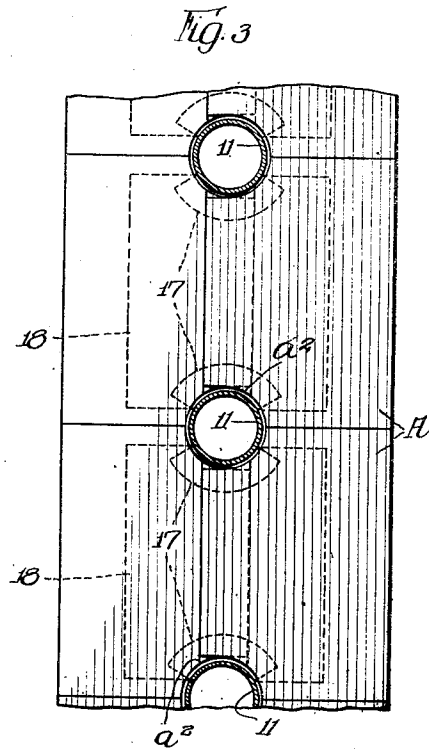
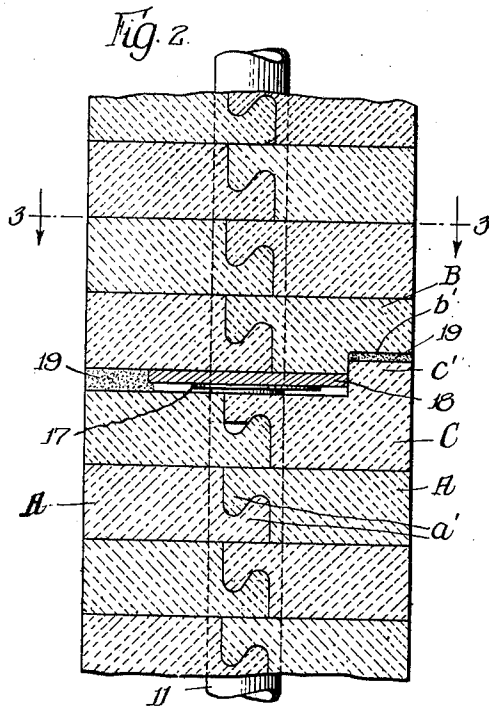


*Fig. 4.*

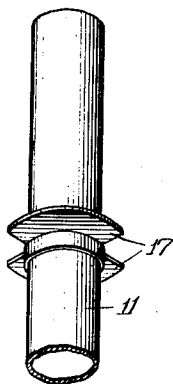
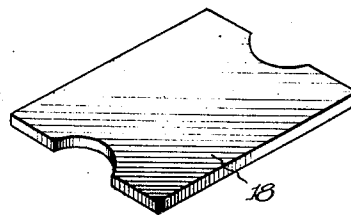


*Fig. 5.*



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# UNITED STATES PATENT OFFICE.

FRANK I. SHEAHAN, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO M. H. DETRICK COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

## FURNACE-WALL CONSTRUCTION.

Application filed March 11, 1925. Serial No. 14,848.

*To all whom it may concern:*

Be it known that I, FRANK I. SHEAHAN, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in a Furnace Wall Construction, of which the following is a specification.

This invention relates to the construction of furnaces, and pertains particularly to the construction of refractory walls which constitute the fire resisting and heat confining portions of furnace structures.

It is a well recognized circumstance, particularly as to requirements of boiler furnaces, that there is a very marked tendency toward the use of greatly increased furnace temperatures. While the advantages of high furnace temperatures have been recognized, mechanical factors, such as stoking and furnace design, have imposed limitations upon the temperatures which could be attained. Comparatively recent developments, particularly in the direction of the burning of pulverized fuel, have made it possible to attain vastly increased furnace temperatures which are much in excess of those which can be withstood effectively by refractory furnace structures heretofore commonly employed.

It is the general purpose of the present invention to provide an improved refractory wall construction which is capable of standing up under extremely high temperatures with such permanence as to render operation at such temperatures efficient and profitable, and which admits of repair with such facility as to preclude the necessity of putting the furnace out of operation for extended periods incident to the making of repairs.

Another object is the provision of a furnace wall construction which has the attributes mentioned above and which is susceptible of embodiment in a great variety of installations and different forms.

More particularly stated, one object of the invention is the provision of a wall structure in which the refractories are supported in such fashion that none of them is subjected to any great weight, and all of them are subjected to cooling influences which will prevent the temperature of the

wall being raised to a point which will result in its rapid destruction.

It is another particular object of the invention to provide a construction wherein proper accommodation is afforded for expansion under heat, without imposing destructive stresses on the structure or associated apparatus or upon the component refractories.

Another particular object is the provision of a construction which will permit and facilitate the removal and replacement of portions of the refractory structure without requiring extensive dismantling or removal of adjacent portions thereof.

A further specific object of the invention is the provision of a furnace wall structure which includes metallic structural members for supporting the refractories and wherein the construction and arrangement of parts are such as to secure maximum strength and stability for minimum weight of metal, through the provision, among other features, of a counterbalanced supporting arrangement and a particularly effective arrangement for cooling.

A still further object of the invention is the provision of a wall construction having attributes specified above and adapted to be securely maintained in proper alignment and plumb in spite of the drastic distorting tendencies produced by high temperatures.

Other and further objects of the invention will be pointed out hereinafter, indicated in the appended claims, or obvious to one skilled in the art upon an understanding of the present disclosure.

For the purpose of this application I have elected to show and describe herein certain structural embodiments of the invention, but it is to be understood that these are presented for the purpose of illustration only, and are not to be regarded as exhaustive of its forms or construed to impose any limitation on the scope of the invention which I purport to secure.

In the accompanying drawings forming a part of this specification,

Fig. 1 is a sectional elevational view of portions of a boiler furnace installation in which my invention is embodied;

Fig. 2 is a detail in the nature of a vertical section through a portion of the wall;

Fig. 3 is a detail in the nature of a horizontal section through a portion of the wall;

Fig. 4 is a detail in the nature of a perspective view of a portion of a supporting member; and

Fig. 5 is a detail in the nature of a perspective view of one of the shelf members.

The nature of the invention will be understood quite readily by reference to the illustrative embodiment. Referring to the parts as designated by their reference characters, let it be understood that the numeral 10 designates a suitable foundation portion appropriate, in the present instance, to support the furnace walls and the boiler setting. Supported on this in a collateral relationship defining the size and form of the furnace chamber, is a series of tubular column members 11 formed of pipes of the proper size and weight to carry the wall refractories. By suitable conduits, such as the headers 12 and 14, these tubular column members are connected at their upper and lower ends so as to be supplied, as by the pipe 15, with water from the boiler circulating system, and have a return connection with the same, as by means of the return pipe 16. These headers, or other appropriate means, are so arranged as to connect the tubular members securely so that they contribute to the structural stability of one another and form a substantial self-sustaining frame work. At appropriate intervals the members 11 are provided with the rests 17, which are fixedly secured in place, as by welding, and project laterally from the column members to afford supporting ledges for the brick supports 18. The latter, as best seen in Fig. 5, are flat plates preferably of metal, notched to receive portions of adjacent column members, whereby they are retained against sliding off the rests 17. The width of the supports 18 is appreciably less than the intended thickness of the refractory wall, while their length should be less than the center-to-center distance between adjacent column members. The spacing of the rests 17 is determined with reference to the thickness of the refractories which are to be employed in the wall, and the rests preferably are arranged at uniform levels, so that the brick supports 18 will be in alignment at the different levels. The spacing of the column members 11 is also made with reference to the length of the refractories, and is such that the center-to-center distance between adjacent column members is slightly greater than the length of the refractories.

The form of refractories may vary. Such as those illustrated in Figs. 2 and 3 are convenient in facilitating assembly and repair. It will be observed that the wall shown is made up, for the most part, of one form of refractories, designated A, of generally rectangular form, having one side

provided with an extending ledge portion  $a'$  affording a tongue and groove, and having corner portions at the ends of such ledges notched out as at  $a^2$  so that the shortened portions may be inserted between adjacent column members 11. These A type refractories are laid in the wall with those at the outer side of the wall having their ledges  $a'$  at the bottom and those at the inner side of the wall in inverted relationship so that their ledges  $a'$  are at the top and hence may be interfitted with the mating refractories in the outer side of the wall. The refractories thus fitted together are supported in stacks of limited height on the respective brick supports 18. The lower-most inner brick of each stack preferably is of a form variant from that of the A type, and accordingly is designated by the reference character B. It has a marginal ledge corresponding to the ledge  $a'$ , and in addition, is formed along its opposite edge and side with a groove or recess  $b'$ . Likewise the uppermost inside brick is of still different form, and is designated C. This brick has a grooved ledge along its outer margin, but its tongue is of less depth than the marginal tongue of the other bricks. In addition, its inner upper side is provided with the upstanding portion  $c'$ , which is designed to overlap the inner margin of the brick support 18 and be received in the groove  $b'$  of the brick B of the superjacent stack. The vertical spacing of the rests 17 is such as to leave an expansion space between the bricks in superjacent stacks, and this space is filled with a compressible refractory material, such as asbestos, to form the expansion joints 19. In the building up of a wall section, after the brick support 18 has been put in place, first an outside A type brick is laid thereon, then the inside B type brick, which is interlocked with the A brick, and then on these are placed successively the requisite number of outside and inside A type brick, interlocked by their tongue and groove ledges as illustrated. When thus interlocked, all of the bricks in the sections are retained in the proper position in the wall by the support afforded by the member 18 and the anchorage afforded by the members 11, which prevent the bricks shifting out of the plane of the wall. The proper spacing of the members 11 leaves an adequate freedom between the ends of refractories in juxtaposed stacks to accommodate the lineal expansion. As has been mentioned above, the anchor tongue of the C type brick is not so high as the others, although of the same width, so that it may have retentive engagement with the tongue of an A type brick. Thus the C type brick is effectively retained against dislodgment, but, upon removal of the packing 19 above it, may be lifted up to disengage it from its mating A type brick and permit

its withdrawal inwardly. This leaves the mating outside brick free for withdrawal outwardly, after which the subjacent bricks may be removed alternately until the bottom of the stack is reached. In this fashion refractories in any stack may be removed and replaced without requiring removal or displacement of any brick in any other stack.

It will be observed that by this supporting arrangement, all of the wall refractories are carried in counterbalanced relationship on the column members 11, by virtue of which arrangement the column members are subjected simply to vertical loads. Thus the amount of material requisite in the columns to carry the walls is reduced to a minimum. Effective safeguard against their distortion by heat is afforded by the arrangement for circulating water through them, their upright arrangement contributing advantageously to this operation. The continuous cooling effect to which the members 11 are thus subjected influences also the supports 18 and the wall refractories, with the result that the temperature of those parts may be kept down while permitting the temperature of gases in the furnace chamber to attain an extremely high degree. Thus the slagging off of the refractories is minimized and other destructive influences, such as sudden changes of temperature sometimes induced by injection of cold air, are precluded, with the result that the life of the refractories is substantially increased.

In order to relieve the wall structure of the weight of the top arch, or associated apparatus, it is preferable that the arch supporting beams 20 be carried independently on structural column members at the sides of the furnace walls, the arch 21 being suspended from such beams in flexible association with the latter. Associated apparatus such as the fuel feeding nozzles 22 and the boiler parts 24 preferably are likewise supported.

What I claim is:

1. A furnace wall structure comprising tubular column members, wall sections independently supported thereon in collateral and superimposed relationship, and connections for circulating water through the column members.

2. A furnace wall structure comprising tubular column members, brick supports carried thereby at different elevations, refractory wall sections independently supported on the respective supports, and connections for circulating water through the column members.

3. A furnace wall structure comprising tubular column members, refractories car-

ried thereby in independently supported wall sections, said refractories having engagement with the column members preventing displacement of the refractories out of the plane of the wall.

4. A furnace wall structure comprising collaterally associated tubular column members, refractories supported thereon in counterbalanced relationship, and connections for circulating water through the column members.

5. A furnace wall structure comprising tubular column members in collateral disposal, brick supports carried by adjacent column members, refractories independently supported on the respective supports and connections for circulating water through the column members.

6. A furnace wall structure comprising tubular column members, brick supports carried thereby at different elevations, refractories supported independently on respective supports and encompassing the column members and connections for circulating the water through the column members.

7. A furnace wall structure comprising column members, brick supports shiftably supported thereon at different elevations and refractories arranged in independently supported sections on the supports.

8. A furnace wall structure comprising collateral column members, brick supports carried thereby, and refractories supported by said supports, said refractories being interlocked between the column members and overlapping inner and outer portions thereof.

9. A furnace wall structure comprising collateral column members, brick supports carried thereby, and refractories carried on said supports and interlocked to prevent their displacement.

10. A furnace wall structure comprising column members, brick supports carried thereby, and refractories arranged at the inner and outer sides of the column members and interlocked between them.

11. A furnace wall structure comprising column members and refractory wall sections carried thereon in counterpoised relationship.

12. In furnace wall structure, column members, rests secured thereto, supports movably supported on the rests, and refractories arranged in counterbalanced relationship on the supports to form independently movable wall sections.

In testimony whereof I have hereunto subscribed my name.

FRANK I. SHEAHAN.