June 17, 1930. L. S. ABBOTT 1,764,707

FURNACE ARCH CONSTRUCTION

Filed March 7, 1927

Fig. 1

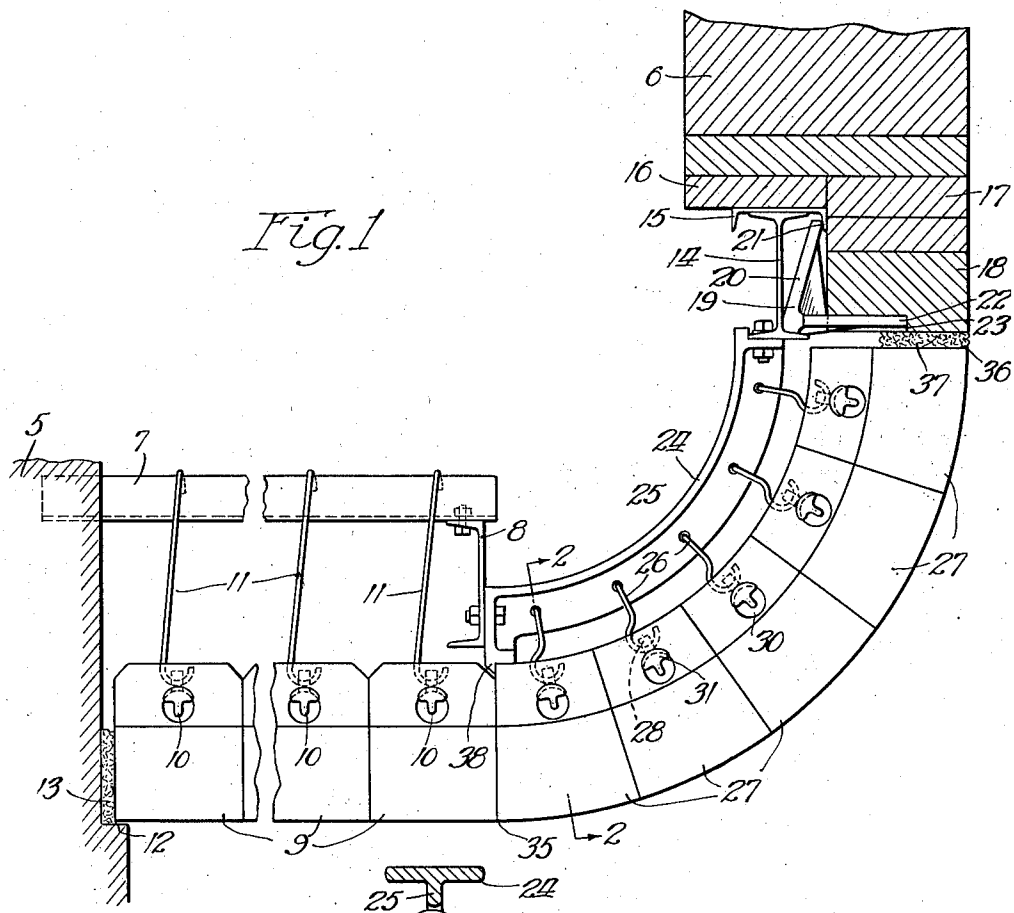
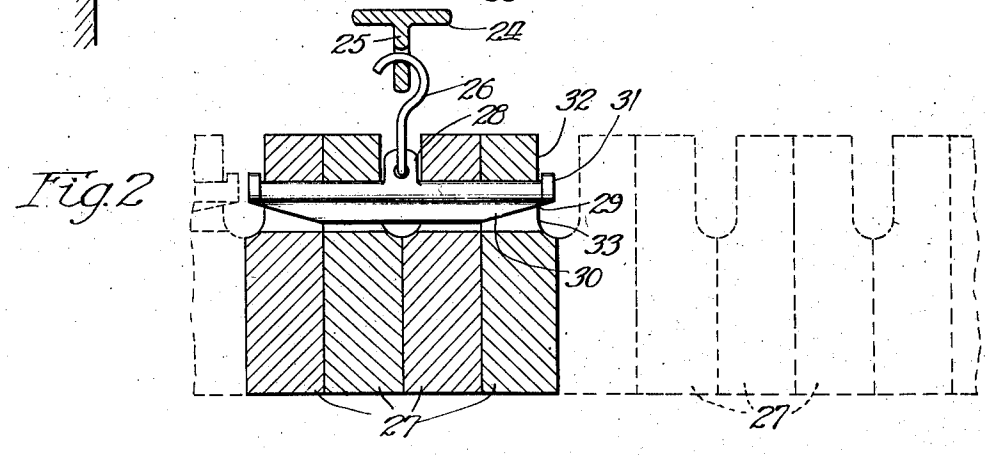


Fig. 2



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UNITED STATES PATENT OFFICE

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FURNACE-ARCH CONSTRUCTION

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My invention relates to fire arch constructions for furnaces and more particularly to a nose arch construction for connecting a flat top arch of a furnace to a vertical curtain wall.

It is the purpose of this invention to provide a nose arch construction of this character which is so supported as to be free from pressure thereagainst by either the horizontal arch over the forward portion of the furnace or the curtain wall.

Nose arches of this character if made in one piece will spall or chip off and crack due to lack of elasticity which is inherent in all fire clay material. Also in the type of nose shown in the drawing where the nose extends horizontally and vertically a distance of about 2½ feet each linear foot of nose weighs about 500 pounds which would be an extremely cumbersome and unwieldly weight to put in place.

Another purpose of my invention, therefore, is to construct such a nose in a plurality of units, each composed of a plurality of small blocks which may be separated and replaced in case of damage to a unit or a block within a unit. This structure makes the nose easy to assemble in the first place and permits ready repairing and replacing. It also prolongs the life of the arch since it reduces the tendency to spall and crack.

Another object of the invention is to so support the nose construction and curtain wall independently so as to permit the two to move relative to each other under expansion and contraction of material.

A still further object of the invention is to so support the flat arch and the nose as to permit both of them to expand away from each other at their meeting point which is the point of hardest service in the use of the arch. This protects the blocks from undue pressure at this critical point due to expansion from the high temperatures in the furnace and thus prolongs their useful life.

In the drawings:

Fig. 1 is a side view partly in section illustrating the improved arch construction; and

Fig. 2 is a section on line 2—2 of Fig. 1.

Referring now in detail to the drawings, I show my improved arch structure as applied to a furnace having the forward wall 5 and the curtain wall 6. As shown, the flat arch structure is supported by a plurality of beams, one of which is illustrated at 7, these beams having one end resting upon the forward wall 5 and having the other end thereof supported by the channel iron 8 which extends transversely across the furnance and is supported by the side walls thereof in any well known manner. The bars 7 are preferably in the form of channel irons and may be welded or otherwise secured at their inner ends to the channel bar 8.

The refractory lining forming the flat arch is composed of a series of blocks 9 of refractory material which are held together by means of the supporting bars 10 and suspended on the bars 7 by the suspension rods 11 which as shown have hooked portions at the opposite ends thereof adapted to engage the bars 10 and 7 to support the refractory blocks in units. At the junction point of the flat arch at the forward wall side, I provide a shaft 12 in the forward wall and also provide a cushion of resilient material 13 between the end of the flat arch and the wall for a purpose which will presently appear. This resilient cushion may be of any heat resisting material such as asbestos fibre, mineral wool, or the like, and is provided for the purpose of permitting the flat arch when expanded due to the heat within the furnace to expand and move toward the forward wall 5 over the shaft 12.

The curtain wall is supported by means of an I-beam 14 which extends transversely of the furnace and may be anchored in the side walls thereof in any suitable manner. This I-beam as shown, has a channel bar 15 resting on the top thereof to form a wide support for the lower portion 16 of the curtain wall. This curtain wall is extended by means of refractory blocks 17 and 18 downwardly behind the I-beam 14 to form a protection therefor and these refractory blocks are supported by the angularly shaped rods

19 which are shown, have the apex of the angle resting on the lower web of the I-beam and have one arm 20 thereof engaging the web 21 and the other arm 22 projecting rearwardly into a recess 23 provided in the lower face of the refractory block 18. Thus, it will be seen that the entire weight of the curtain wall is supported by the I-beam 14 independently of any of the arch structure which will now be described.

In order to provide a nose connecting the flat arch behind the curtain wall, I provide the curved bars 24 which, as shown, are bolted at one end to the channel bar 8 and at the other end to the I-beam 14. These curved bars as shown in Fig. 2 are T-shaped in cross section and the downwardly and outwardly extending web 25 thereof has a plurality of openings receiving the suspension rods 26, of which in the present instance there are five. These suspension rods as shown clearly in Fig. 2, serve as hangers for supporting the refractory bricks or blocks 27 by engaging with the apertured ears 28 in the bars 29 upon which the refractory blocks 27 rest. The bars 29 as shown in Fig. 2 are curved on their upper surfaces and are provided with a strengthening web 30 on the under side thereof and with enlargements 31 at the ends thereof which serve as stops to retain the refractory blocks 27 in place. The refractory blocks 27 as shown, are generally rectangular in form except for the offset portion 32 in one face thereof, the opposite face of the blocks being of substantially plane surface. The blocks are provided with substantially circular openings 33 extending through the upper offset portion thereof so that the same may be placed upon the supporting bar 29 and held in place thereon by the projections 31 which normally retain the blocks in the proper position, but which permit the removal thereof whenever desired.

It will be noted from Fig. 2 that each hanger bar 29 supports four blocks and forms a complete unit which may be hung on the curved bars 24 or detached therefrom as a unit. The blocks 27 as shown engage with the refractory blocks 9 at 35, and form an extension of the flat arch from this point to the lower face of the curtain wall at 36 where there is provided a cushioning material 37 of heat resisting substance such as that used at 13 between the flat arch and the forward wall 5. The point 35 is the point of hardest service when the furnace is in operation since at this point usually the greatest heat of the products of combustion is obtained and furthermore this point is completely exposed to the action of this heat.

In order to prevent undue pressure at this point due to the contraction and expansion of the flat arch and nose arch, I provide the cushions 13 and 37 which permit the two arches to expand away from each other toward the forward wall and the curtain wall respectively. Since the curtain wall itself is supported independently of the nose blocks, it exerts no pressure thereon due to its weight and the nose blocks are therefore free to expand upwardly by compressing the cushion 37. In a similar manner the flat arch is free to expand toward the forward wall by compressing the cushion 13. In order to further assure that there will be no increase in pressure at the point 35 due to the expansion of the arches under heat, I provide on the curved bars 24 at the lower end portions thereof, the stops 38 which as shown, extend downwardly and engage the vertical edge of the lower rows of blocks 27 to prevent them from moving toward the flat arch blocks. By providing this stop, the pressure at the point 35 due to the weight of the nose blocks is principally carried by it and there is very little pressure between the adjacent refractory blocks at this point. This avoids any rocking or spalling of the refractory blocks at this point which as hereinbefore stated, is subjected to the most severe service of any point in the arch.

From the above description it is thought that the nature and advantages of the invention will be clearly apparent to those skilled in the art. It is also apparent that various modifications may be made from the exact details shown and described without departing from the spirit of the invention and I wish it to understood that I do not intend to limit myself to the exact details disclosed but that I intend to avail myself of all such modifications as would occur to one skilled in this art and as would fall within the scope of the claims.

Having thus described my invention, what I desire to claim and secure by U. S. Letters Patent is:

1. In a furnace construction, a top arch extending rearwardly from the front wall of the furnace, a curtain wall spaced rearwardly of said top arch and extending transversely of the furnace above the level of said top arch, a support beam having means thereon supporting said curtain wall, a support beam for the rear end of said top arch, suspension bars supported by said beams, and a plurality of refractory tile carried by said suspension bars forming a curved arch closing the space between said top arch and curtain wall, said suspension bars having stop means thereon supporting the refractory tile at the end of said curved arch abutting said top arch.

2. In a furnace construction, a top arch extending rearwardly from the front wall of the furnace, a curtain wall spaced rearwardly of said top arch and extending trans-

versely of the furnace above the level of said top arch, a support beam having means thereon supporting said curtain wall, a support beam for the rear end of said top arch, suspension bars supported by said beams, and a plurality of refractory tile carried by said suspension bars forming a curved arch closing the space between said top arch and curtain wall, said suspension bars having stop means thereon supporting the refractory tile at the end of said curved arch abutting said top arch, and means between said curved arch and curtain wall permitting expansive movement of said curved arch away from said stop means and said top arch.

3. In a furnace having a curtain wall spaced from the front wall thereof and having a main arch and a nose arch covering the space between the front wall and the curtain wall, a support for said curtain wall comprising transverse beam means having a lower lateral flange and a top supporting flange, a layer of refractory blocks in front of said beam means in position to protect the same from the heat of the furnace, and means for supporting the blocks on said means comprising angular rods having upwardly extending portions held from movement away from said beam means and laterally extending portions supporting said blocks, the juncture of said portions resting on said lower lateral flange.

In witness whereof, I hereunto subscribe my name this 5th day of March A. D. 1927.

LYLE STOCKTON ABBOTT.