Feb. 6, 1934. J. M. LAMBIE 1,946,083

FURNACE WALL

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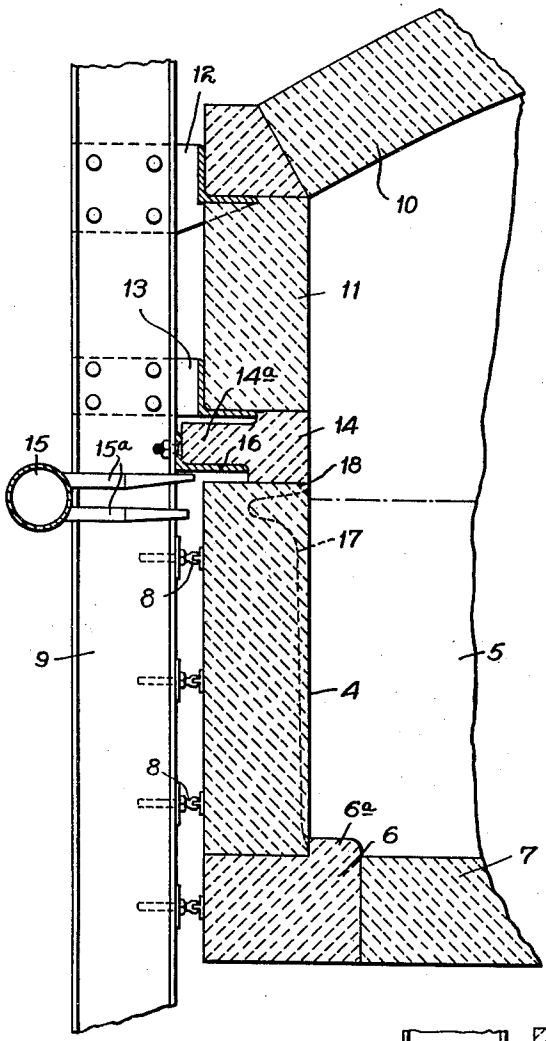


Fig. 1.

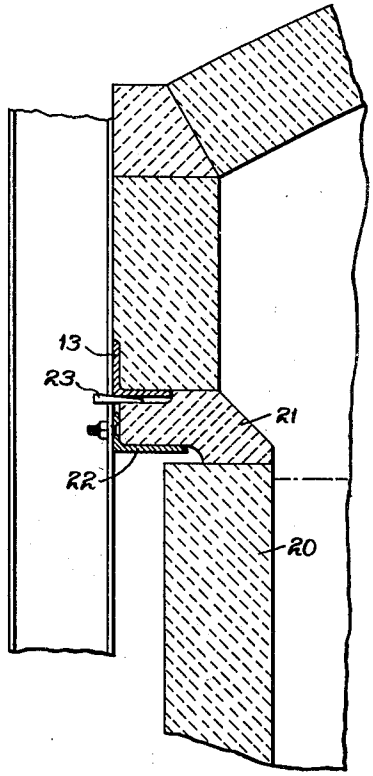


Fig. 2.

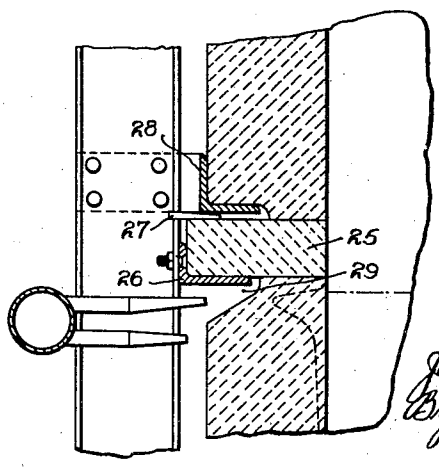


Fig. 3.

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FURNACE WALL

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3 Claims. (Cl. 263—44)

My invention relates to furnace walls, and more particularly to the walls of melting furnaces, glass tanks and the like.

What is called the "flux wall", composed of blocks which make up the lower portion of the furnace and actually contain the glass, of course, has much shorter life than the upper wall structure that has contact only with the heated gases. It has been common practice heretofore to support the wall structure independently of the flux blocks, so that when the flux blocks become eroded or eaten away by the molten glass or metal, they can be replaced without disturbing the upper structure. Usually the flux blocks are set inwardly relative to the blocks of the upper structure, a distance substantially equal to the thickness of the flux blocks; that is, the flux blocks will extend inwardly 12 inches farther than the blocks of the upper wall, so that they may be more easily replaced without disturbing the upper structure. Tuck stones are supported on the tops of the flux blocks at the lower edge of the upper wall, to seal the joint.

This prior practice is open to various objections. In the first place, the furnace capacity is greatly reduced by the insetting of the flux blocks; the weight of the tuck stones is imposed on the flux blocks; the flux blocks and the tuck stones are unnecessarily exposed to the heat of the gases above the molten bath, with consequent shortening of life; contamination of the glass through reaction products of the alkaline vapors in the heating gases combining with materials contained in the tuck stone and flowing down into the glass; and, since the metal line of the pool level is slightly below the tuck stone, the eating away or erosion or the upper course of flux blocks leaves unsupported ledges thereon which are broken off by the weight of the tuck stones, thus still further shortening the life of the furnace.

One object of my invention is to provide an improved manner of positioning the flux blocks and the tuck stones, so that the various objectionable features above-referred to are avoided.

Another object of my invention is to provide a tuck stone of improved form and an improved manner of supporting the same, so that it may be easily removed and so that its weight does not rest on the flux blocks.

Some of the forms which my invention may take are shown in the accompanying drawing wherein Figure 1 is a vertical sectional view through a portion of a furnace; Fig. 2 is a similar view showing a modification, and Fig. 3 shows another modification.

Referring first to Fig. 1, I show a furnace having flux blocks 4 and 5 constituting part of the side and end walls of the furnace, and bottom blocks 6 and 7. The blocks 6, upon which the walls 4 and 5 rest, have ledges 6a that extend above the lower edges of the blocks 4 and 5, to prevent upward "eating" away or erosion of the blocks by action of the molten glass, the lower inner corners of the side wall or blocks being shielded from the glass by the ledges. The blocks are held in place by suitable struts or jack bolts 8 and buck stays 9 which carry the bolts.

The upper wall or gas chamber structure consists of the usual roof 10 and side walls 11. These members are supported from the buck stays by means of angle brackets 12 and 13, in a manner well-known in the art. It will be seen that the weight of the furnace members 10 and 11 is carried by the angle brackets instead of being imposed upon the flux blocks.

Tuck stones 14 are interposed between the flux blocks and the upper wall, the tuck stones usually being positioned after the flux blocks are placed, and the tuck stones, of course, closing the clearance space which is usually required to permit of convenient installation of the flux blocks.

The tuck stones at their inner ends snugly fit the space between the upper walls 11 and the flux blocks, so that only their inner faces are exposed to the furnace heat, while their rear portions are of reduced thickness as indicated at 14a, to provide spaces between the top of the flux blocks and the underside of the tuck stones into which cooling air may be introduced from a conduit 15, through perforated pipes or nozzles 15a. The tuck stones are thereby cooled to lengthen their life, and the upper edges of the flux blocks are similarly cooled at the points where they are subjected to the greatest heat and to the erosive action of the glass, namely near the metal line, where they also have some contact with the furnace gases.

The tuck stones are supported on angles 16 which are detachably bolted to the buck stays, so that they can be readily removed to permit convenient replacement of the flux blocks and the tuck stones. These angle brackets 16 may extend substantially the length of the furnace or be made in short sections. Preferably the entire weight of the tuck stone is imposed on the angles 16.

The dotted line 17 indicates the erosive or "eating" action of the molten glass, and it will be seen that such action produces an unsup-

ported ledge at 18 in the upper portion of the flux blocks which would be broken off by the weight of the tuck stone, if the tuck stone were not independently supported by the bracket 16. Because of this tuck stone effect, the ledge 18 will remain in place, enabling the flux blocks to be continued in use for a longer period of time. When it becomes necessary to replace the flux blocks, the tuck stones may be broken loose from the upper wall and the flux blocks by a sharp chisel, pushed into the furnace and the brackets 16 removed, thus providing room for easy removal and replacement of flux blocks.

Referring to Fig. 2, I show a structure similar in some respects to that of Fig. 1, but wherein the flux blocks 20 are set inwardly somewhat farther than are the flux blocks 4, and wherein tuck stones 21 are also inserted a somewhat greater distance, to completely overlie the flux blocks. The similarity between this structure and the structure of Fig. 1, resides primarily in the fact that the tuck stones are supported from the buck stays instead of resting upon the flux blocks. To this end, an angle bracket 22 is detachably bolted to the buck stays, and in case the proportions of the tuck stones are such that they tend to overbalance toward the interior of the furnace and thereby bear upon the flux blocks, wedges 23 are driven between the angle 13 and the reduced portions of the tuck stones to hold them firmly on the angles 22 and prevent tilting thereof. If desired, the anchoring wedges could also be employed in the structure of Fig. 1.

In the structure of Fig. 2, air cooling spaces are provided between the tops of the flux blocks and the under surface of the tuck stones, as in Fig. 1. The spaces above the tuck stones serve to prevent excessive heating of the angles 13.

In Fig. 3, I provide a wall construction wherein tuck stones 25 of uniform thickness are supported on angle bars 26 independently of the upper wall and the flux wall of the furnace. Wedges 27 are inserted between the upper surface of the tuck stones and the angle bars 28 that serve to support the upper furnace wall, to prevent tilting of the tuck stones inwardly. A recess 29 is provided between the under surface of the tuck stones and the top of the flux-block wall by shaping or cutting away the upper outer edges of the flux blocks, so that cooling of the flux blocks at the metal line may be effected. Likewise, since a minimum area of the tuck stones is exposed to the furnace heat and they are exposed to the cooling air at their under surfaces, the tuck stones will be maintained at a lower temperature than the furnace temperature, so that the top of the flux blocks will not be so readily heated by heat conducted through the tuck stones.

By the provision of the recess between the under side of the tuck stones and the top of the flux blocks, so that the top of the flux blocks can be cooled as well as other portions of the wall at the metal line of the furnace, the wall is more effectively maintained at a temperature whereby the rate of erosion of the flux blocks is retarded, thus resulting in longer life and service for the flux wall of the furnace.

I claim as my invention:—

1. The combination with a furnace having a lower wall structure and an independently-supported upper wall structure, of a tuck stone interposed between said structures, and means for vertically supporting the tuck stone independently of the said lower wall.

2. The combination with a furnace having a lower wall structure and an independently-supported upper wall structure, of a tuck stone interposed between said structures, and means for vertically supporting the tuck stone independently of the said lower wall, the outer portion of the tuck stone being of reduced thickness at its lower side to provide a space for the introduction of cooling fluid between said portion and the top of the lower wall.

3. The combination with a furnace having a lower wall structure and an independently-supported upper wall structure, said upper and lower wall structures being arranged in vertically-spaced relation, of a tuck stone mounted in the space between said structures, and means for vertically supporting the tuck stone independently of the said lower wall, the inner face of the tuck stone being substantially flush with the inner face of said lower wall structure.

4. The combination with a furnace having a lower wall structure and an independently-supported upper wall structure, of a tuck stone interposed between said structures, and means for vertically supporting the tuck stone independently of the said lower wall, the inner faces of said wall structures and the tuck stone being disposed in a common plane.

5. The combination with a furnace having a lower wall structure and an upper wall structure, with buck stays for supporting the upper wall structure independently of the lower wall, of a tuck stone interposed between the said structures, and a bracket detachably connected to the buck stays and supporting the tuck stone independently of the lower wall structure.

6. The combination with a furnace having a lower wall structure and an upper wall structure, with buck stays for supporting the upper wall structure independently of the lower wall, of a tuck stone interposed between the said structures, the tuck stone being of reduced thickness at its rear portion, and a bracket detachably connected to a buck stay and having a lip in supporting engagement with the underside of said reduced portion.

7. The combination with a furnace having a lower wall structure and an upper wall structure, with buck stays for supporting the upper wall structure independently of the lower wall, of a tuck stone interposed between the said structures, the tuck stone being of reduced thickness at its rear portion, and a bracket detachably connected to a buck stay and having a lip in supporting engagement with the underside of said reduced portion, the said lip being in vertically-spaced relation to the lower wall structure, to permit introduction of cooling fluid between the same.

8. The combination with a furnace having a lower wall structure and an independently-supported upper wall structure, of a tuck stone interposed between said structures and serving to seal the joint between the said wall structures, at the inner side of the furnace, the outer portion of the tuck stone at its underside and the adjacent edge of the lower wall structure being spaced apart to provide a space for a cooling medium, and means for supporting the tuck stone independently of the lower wall structure.

JAMES M. LAMBIE.