

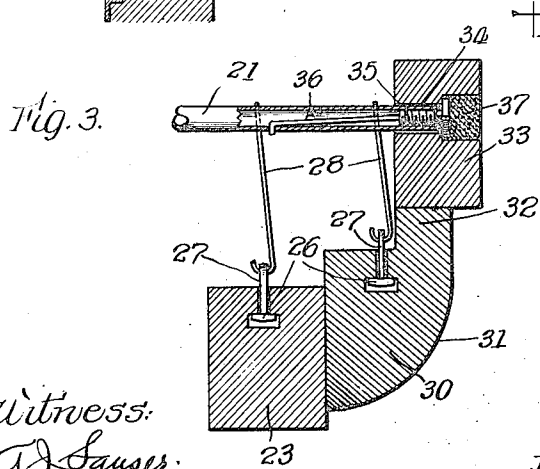
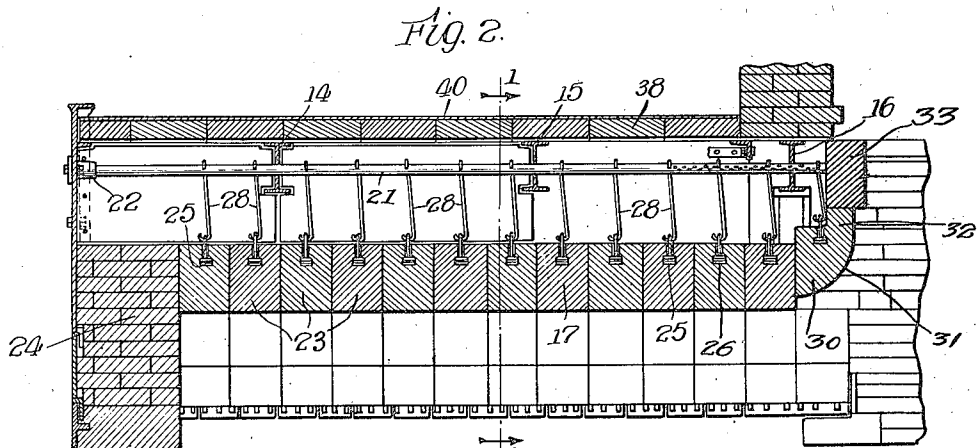
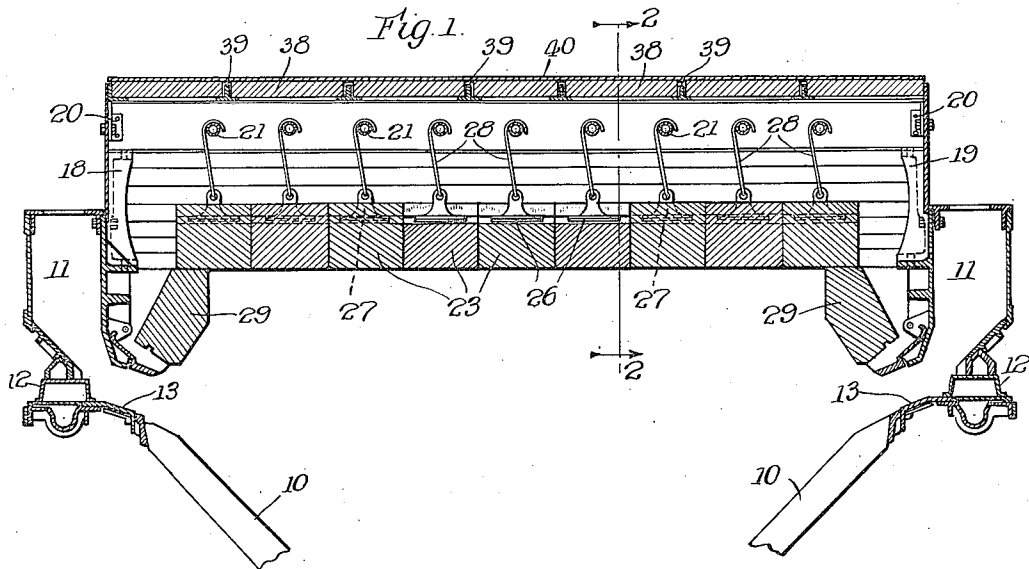
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ARCH CONSTRUCTION FOR FURNACES

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UNITED STATES PATENT OFFICE.

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ARCH CONSTRUCTION FOR FURNACES.

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To all whom it may concern:

Be it known that I, FRANK B. BIGELOW, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Arch Constructions for Furnaces, of which the following is a specification.

My invention concerns improvements in the fire-brick roofs or arches over the combustion chambers or compartments of furnaces, such as are ordinarily associated with steam-boilers for the production of heat or power. One salient feature of the invention is the supporting or suspension of the arch bricks from above by extremely simple and economical means and in such a way that they will remain in contact throughout the entire range of temperatures to which they are subjected in service, and hence prevent the production of cracks or crevices between them through which air might undesirably pass to the fuel-chamber. This suspension arrangement permits the ready insertion of a new brick to take the place of a damaged or injured one without disturbing the arch as a whole and without interfering with the other bricks.

A further leading aim of the invention is the provision of a construction of this general character which permits the replacement of one or more arch bricks without requiring the closing down of the furnace, the brick substitution being effected during the substantially normal operation of the furnace. The brick or arch supporting means may also be employed as air-conducting means, the air being delivered to the fire-chamber to facilitate the combustion and at the same time acting as a cooling medium for the support.

To those skilled in this art the manner of attaining these and various other features of novelty and advantage will be understood and appreciated from a consideration of the preferred embodiment of the invention illustrated in the accompanying drawings forming a part of this specification and described in detail below. In the various views of the drawing like reference characters refer to the same parts.

In the drawing:

Figure 1 is a partial transverse vertical section through a furnace of the "Murphy" type equipped with the improved means for

suspending the arch, this section being taken on line 1—1 of Figure 2, some of the bricks being broken away to more clearly show the hanger construction;

Figure 2 is a longitudinal vertical section on line 2—2 of Figure 1; and

Figure 3 is a fragmentary enlarged vertical section through the rear portion of the arch to show more clearly the manner of suspension and retaining in place of the rear end bricks or blocks.

The particular furnace shown, equipped with an arch embodying this invention, is one of the well-known "Murphy" type with a V-shape grate 10, opposed fuel magazines 11, 11, disposed along the sides of the fire-chamber and provided with sidewise-acting, reciprocating fuel pushers or stoking boxes 12, which feed the fuel descending from the magazines across the coking-plates 13 on to the upper portions of the grate, down which it gradually travels partly by reason of gravity and partly due to the movements of certain of the grate-bars comprising the grate, all this being old and well-known construction.

Three, or any other suitable number of spaced horizontal I-beams 14, 15, and 16 extend across the furnace above the arch which in this instance is flat, but may, of course, be of any desired shape, and are supported at their ends upon extensions 18 and 19 of the inner side-walls of the pair of magazines 11, 11 to which they may be fastened by any suitable devices such as angle brackets 20. The webs of these three supporting bars or beams are apertured in alignment at a plurality of points for the reception of a corresponding number of horizontal tubes or pipes 21, each of which extend into an apertured boss 22 in the furnace front-plate and project rearwardly beyond the innermost bar or beam 16.

The arch proper is composed of a plurality of refractory bricks or blocks 23, arranged in longitudinal and transverse rows, the bricks contacting with one another to maintain the arch substantially air-tight and contacting with the front wall 24, being thus maintained against substantial displacement, but capable of slight shifting under unequal expansion and contraction. As is shown, one supporting pipe is provided for and above each longitudinal row of bricks.

Each arch brick or block 23 has an under-

cut groove 25 across its top face and extended transversely of the combustion chamber and accommodating the enlarged foot 26 of an apertured supporting-shoe 27, the foot 5 being of substantially the same shape in cross-section as the groove. An eye of such shoe receives the lower bent hook end of a hanger rod 28, the upper end of which is hook-shaped and hangs on the corresponding supporting pipe 21. As is clearly shown, 10 the two hook-shaped ends of the rod are disposed in planes at right-angles to one another, the one end to hang over the supporting-pipe, the other end to engage the hanger-shoe. 15

At each side of the combustion-chamber I provide a row of arch-plate bricks 29, 29, of somewhat different construction, these rows being below the arch as shown in Figure 1, and held in position by any approved 20 means, leaving, as is customary, a series of air-passages between them and the magazines.

As is shown in Figure 2, the rear brick 30 25 of each row of the arch proper is somewhat elevated above the other brick of the arch by reason of a shorter supporting rod and is of special construction, having a rounded rear surface 31 and an upwardly extended portion 32 acting to partially close 30 the rear end of the chamber above the arch. Above the part 32 another brick or block 33 is employed, being mounted on the rear end of the corresponding pipe 21 and recessed at 34 for the reception of that part of the 35 pipe. Block 33 is held in position on the supporting tube or pipe by a cast-iron plug 35 equipped with an extension-hook 36 which by engagement with a hole in the pipe main- 40 tains the block in proper position thereon.

The space in the brick or block at the rear of the plug is sealed or filled with any suitable refractory material 37 such as a mixture of ground fire-brick and clay. The 45 members 30 and 33 completely seal the chamber above the arch referred to which is closed on top by fire-brick tile 38 carried on T-bars 39, the tile being covered by sheet-steel plates 40. The pipes or tubes 21 are 50 preferably perforated at 41 near their rear ends and thus assist in carrying air through the front plate of the furnace into the desired portion of the compartment above the arch from which, as is customary, it flows 55 down into the fire-chamber through the passages between the arch-plate bricks and the magazines. This air supplements that otherwise fed to the combustion chamber and is heated more or less as it travels through the 60 pipes and at the same time aids in keeping the pipes and hangers cool.

It will be observed that the supports for the arch-bricks, including the rear end brick 30, are above their centers of gravity, and they are arranged to contact with one an-

other when the furnace is cool. As it heats up these bricks may shift position slightly to compensate for expansion and possibly irregular heating, but they at all times maintain contact with one another, thus preserv- 70 ing the substantially air-tight construction of the arch. When the furnace cools the bricks by reason of their pivotal mountings are free to swing back into normal position maintaining contact with one another. 75

In case one of the bricks of the arch becomes injured or burned sufficiently to require replacement, the appropriate cover-plate 40 and tile 38 are lifted off, the hanger-rod 28 of the particular brick is released or 80 disconnected from the pipe and the shoe 27 and by any suitable means, such as a rod or bar, the remnants or pieces of the brick are pushed or forced downwardly into the combustion chamber from which they may be readily removed. This dislodgement of the 85 parts of the damaged brick can be accomplished without substantial trouble from the furnace heat because the gap in the arch caused by the damaged brick or the hole 90 created by the removal of the brick induces a downward flow of air through such aperture away from the workman by reason of the furnace draft. This enables the operator to carry on the replacement operation 95 without real annoyance or difficulty because of the heat of the furnace. The injured brick having been thus gotten rid of, the new brick mounted on a hanger is lowered into place and its supporting-rod hung on 100 the pipe. Then the cover tile and metal plate are replaced. This replacement operation can, therefore, be performed during the usual operation of the furnace and without disturbance of its normal functioning. 105

In case one of the bricks below one of the supporting cross I-beams is required to be replaced it may be necessary to take out an adjoining brick to enable the first one to be 110 put in place, thus necessitating the replacement of two bricks instead of one.

The substitution of new bricks for those characterized 30 and 33 may be accomplished without difficulty, the former being hung in place before the latter is secured in 115 position and held therein by its catch or hook 36.

By those skilled in this art it will be understood that many minor mechanical changes may be made in the structure pre- 120 sented without departure from the substance and essence of the invention and without the sacrifice of any of its substantial benefits and advantages. It will be furthermore appreciated that by making the hanger- 125 rods 28 of different lengths the arch may be given any contour or curvature found to be necessary or desirable.

I claim:

1. In a suspended-arch construction for 130

furnaces of the character described, the combination of a plurality of bricks constituting a portion of the arch, a plurality of independent hangers each supporting a brick of the arch from above, and a supporting-pipe above said arch and common to said hangers, substantially as described. 65

2. In a suspended-arch construction for furnaces of the character described, the combination of a plurality of bricks constituting a portion of the arch, a plurality of independent hangers each supporting a brick of the arch from above, a supporting-pipe above said arch and common to said hangers, and means to permit a cooling medium to flow through said pipe, substantially as described. 70

3. In a suspended-arch construction for furnaces of the character described, the combination of a plurality of bricks constituting the arch, a plurality of spaced supporting-pipes above the arch and adapted to convey air to assist in the combustion, and a plurality of independent hangers carried on each of said pipes and each supporting a single brick of the arch, substantially as described. 80

4. In a suspended-arch construction for furnaces of the character described, the combination of a plurality of bricks constituting the arch, a plurality of spaced supporting-pipes above the arch disposed longitudinally of the arch and adapted to convey air to assist in the combustion, and a plurality of independent hangers carried on each of said pipes and each supporting a single brick of the arch, substantially as described. 85

5. In a suspended-arch construction for furnaces of the character described, the combination of a plurality of bricks constituting the arch, a plurality of spaced supporting-pipes above the arch, a plurality of independent hangers carried on each of said pipes and each supporting a single brick of the arch, and means to convey a cooling medium through said pipes, substantially as described. 100

6. In a suspended-arch construction for furnaces of the character described, the combination of a plurality of bricks constituting the arch, a plurality of spaced perforated supporting-pipes above the arch disposed longitudinally of the arch and adapted to convey air to assist in the combustion, and a plurality of independent hangers carried on each of said pipes and each supporting a single brick of the arch, substantially as described. 105

7. In a suspended-arch construction for furnaces of the character described, the combination of a plurality of bricks constituting the arch, arranged in rows longitudinally and transversely of the arch, a supporting-member above the arch for each of such longitudinal rows, a supporting-shoe for each brick disposed transversely of the arch, a plurality of independent supporting rods each detachably connected to one of said shoes and mounted on the corresponding supporting-members and end wall bricks mounted directly on the rear ends of said supporting members, substantially as described. 110

8. In a suspended-arch construction for furnaces of the character described, the combination of a plurality of bricks constituting the arch arranged in rows longitudinally and transversely of the furnace, a supporting-member above the arch for each of such longitudinal rows, an apertured supporting-shoe for each brick disposed transversely of the arch, a plurality of supporting-rods each having hook-shaped ends at right-angles to one another, and each adapted to detachably engage one of said shoes and one of said supporting member and end wall bricks mounted directly on the rear ends of said supporting members, substantially as described. 115

9. In a suspended-arch construction for furnaces of the character described, the combination of a plurality of bricks constituting a portion of the main-body of the arch, a support above and disposed longitudinally of the arch, hangers supporting the bricks individually on and below said support, and a rear-wall brick mounted directly on said support, substantially as described. 120

10. In a suspended-arch construction for furnaces of the character described, the combination of a row of bricks constituting a portion of the arch, a support above and disposed longitudinally of said row of said bricks, hangers supporting said bricks individually on and below said support, the rearmost brick having an upward extension forming part of a back-wall, and another brick constituting a part of said wall mounted directly on said support, substantially as described. 125

11. In a suspended-arch construction for furnaces of the character described, the combination of a plurality of bricks constituting the main body of the arch, a tubular support above said bricks, hangers individually supporting the bricks on said tubular support, and a rear wall brick mounted directly on said tubular support and having means disposed inside such support for holding the brick in place, substantially as described. 130

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