

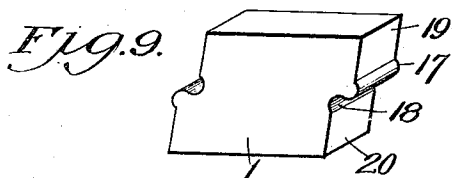
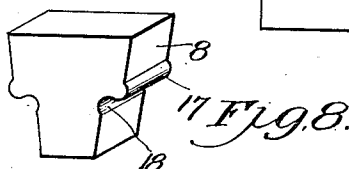
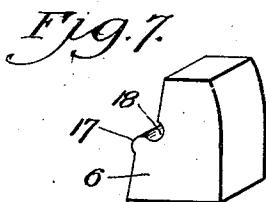
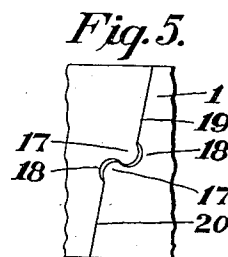
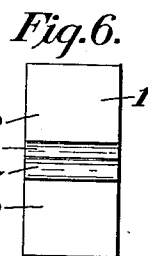
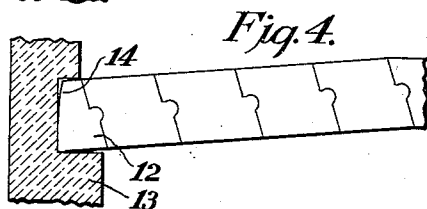
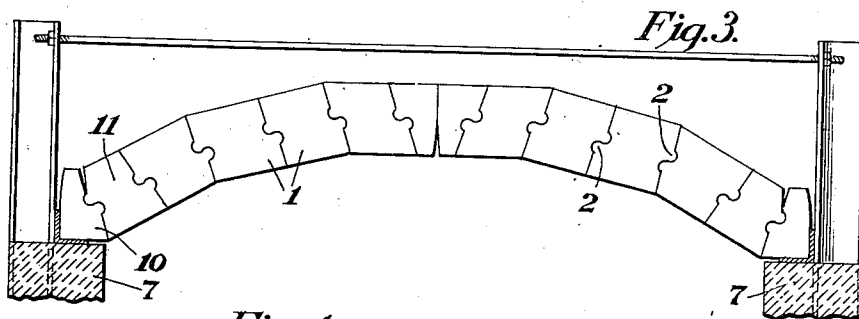
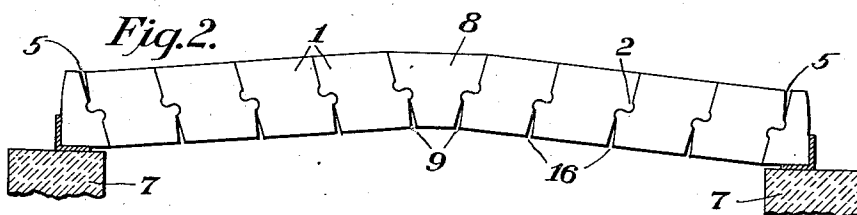
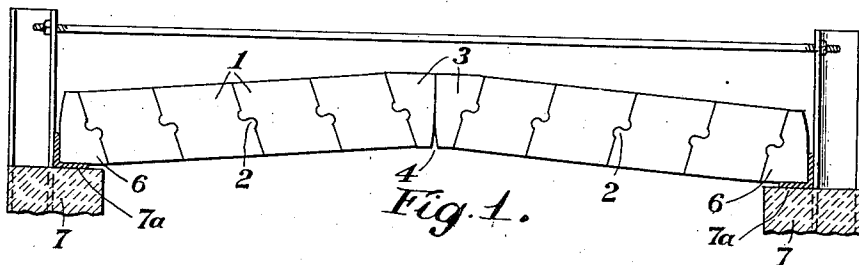
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ARCH AND ARCH BLOCK

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ARCH AND ARCH BLOCK

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11 Claims. (Cl. 72—55)

This invention relates to arches and particularly to furnace arches and similar structures exposed to extreme fluctuations in temperature, one of the objects of the invention being to produce an arch of such construction that upon expanding when subjected to heat, its upward movement to compensate for its increase in length, shall be insured before excessive pressure, leading to the spalling or fracturing of the blocks, can develop or the bulging of the sides of the furnace.

A further object of the invention is to produce an interlocked arch construction of the general character above-recited, in which the blocks are locked to the skew-backs and keys, and to each other, in such a manner that no individual block can work its way downwardly to such a degree as to be burned off and eventually fall from position.

A still further object of the invention is to produce a construction in which the heaviest pressure on the keys, which ordinarily occurs at the time of highest furnace temperature, is imposed adjacent the cooler or upper area of said keys, the construction being of such nature that upon upward movement on expansion, the tendency of the center of greater pressure to move downwardly to the hotter and consequently weaker zone is to a large extent compensated to maintain such pressure point in the cooler or upper parts of the key blocks.

Another object of the invention is to produce an interlock between adjacent blocks of such nature that fulcrum or rocking points are provided whereby the blocks may individually, within fixed limits, adjust themselves in the arch without any danger that the blocks shall move upwardly or downwardly beyond the range fixed, and in which the interlocking lugs will not be subjected to shearing stress upon expansion.

A further object of the invention is to produce a block of such nature that a pair of interlocking blocks always bear a fulcrumed relation to each other, the interlock being so made that upon rocking movement, the interlocking lugs and sockets cooperate as inclined planes to partially disengage to relieve the lugs of undue strain.

With the general objects named in view and others as will hereinafter appear, the invention consists in certain novel and useful features of construction and organization of parts as hereinafter described and claimed; and in order that it may be fully understood, reference is to be had to the accompanying drawing, in which:—

Figure 1 illustrates an arch constructed in ac-

cordance with the invention and shows the preferred type of interlocked construction having a split key with one expansion joint at the center and a pair of expansion joints adjacent the skew-backs.

Figure 2 illustrates a construction embodying a single key block with a pair of center expansion joints.

Figure 3 illustrates a truss construction involving the use of the blocks and arch of the invention.

Figure 4 is a fragmental view to illustrate the pivoting of the skew-back to permit expansion of the arch, together with a modified interlock construction.

Figure 5 is an enlarged view to illustrate the preferred type of interlock.

Figure 6 is an end view of one of the blocks.

Figure 7 is a perspective view of one of the skew-backs, which may be used in pairs as in Figures 1 and 3 to form the key of the arch.

Figure 8 is a perspective view of a key block as used in the construction shown in Figure 2.

Figure 9 is a perspective view of the intermediate blocks of the arch.

It is well-known, either in arches laid up with mortar or with interlocked blocks, that when the arch is highly heated, expansion occurs and that this expansion must be accommodated either by outward movement of the supporting furnace walls or sides, or by an upward or downward movement of the arch. It will be evident that if downward movement of the arch occurs, the arch will fail, if it passes below the horizontal. If expansion is not accommodated, the pressure developed will result in the severance of the arch, usually along a horizontal line lying substantially midway the upper and lower faces of the blocks, the upper and lower halves of the blocks moving respectively upwardly and downwardly. However, it frequently occurs with ordinary straight-sided blocks that, due to the alternate rising and falling of the arch, some of the blocks will work their way downwardly and will have their lower ends exposed to the heat of the furnace and will be burned off, the blocks ultimately falling into the furnace. This downward movement of the blocks has been overcome by providing an interlock between adjacent blocks, but no means has been provided which positively insures an upward movement of the arch to avoid undue compressive strain leading to the rupture of the blocks, as far as I am aware, where the advantages of an interlocked block construction is employed.

In order to produce an arch so constructed that upward movement is insured and the blocks are simultaneously held against independent downward movement, 1 indicates similar arch blocks provided on their opposite ends with oppositely-facing steps or lugs 2, the arch as illustrated in Figure 1, having a pair of key blocks 3 terminating each haunch, and being provided with an upwardly converging expansion joint 4 between their abutting faces. The end blocks of each haunch as shown in Figures 2 and 3, are so positioned and constructed that expansion joints 5 are formed between them and the skew-backs 6 mounted in the furnace wall 7. In the construction illustrated in Figure 2, the two haunches are tied together by an integral key block 8, having at its opposite sides upwardly converging expansion joints 9 between it and the adjacent blocks of each haunch. In Figure 3, a truss construction is shown, there being a downwardly converging expansion joint between the skew-back 10 and the first block 11 of the haunch. In Figures 1 and 4, a skew-back 12 is illustrated as being mounted for fulcruming on the wall of the furnace, 7 and 13 respectively, in the construction as shown in Figure 4, a space 14 is left for movement of the block upon the upward movement of the arch. Figure 4 also shows a slightly different type of interlock in which the blocks 21, are formed at one end with horizontal lugs 22 dividing that end of the block into upper and lower faces 23 and 24 and projecting beyond both of said faces. The other end of each block is provided with a complementary socket 25 to receive the lug on an adjacent block.

From the above description, it will be evident, if an arch is constructed as described, that upon the heating of the blocks and their expansion, the two haunches will rock as separate units, the expansion joints tending to close, it being understood that the normal center line of pressure is from the lower rear corner of the skew-back to the upper inner corner of the key. It will thus be evident that the haunches will tend to rise and fall as units, while maintaining straight lines, as distinguished from the bowing or arching incident to constructions not provided with an interlock and the expansion joints. In some cases, expansion joints 16 may be left between adjacent blocks of the haunches, and in such constructions, the arch will commence to bow upon upward movement, rather than maintain a straight line as above described.

In the construction illustrated in Figures 1 to 3 inclusive, the blocks are formed on their opposite ends with reversely facing lugs and pockets 18, preferably extending for the full width of the blocks and dividing the end surfaces into upper and lower portions 19 and 20 arranged in different planes. The interlock thus provided is generally of S-shape, so that inclined planes are provided whereby upon excessive pressure between adjacent blocks, if they are held against downward movement, the effect is for one block to ride up the incline without placing any strain on the lugs 17 tending to disrupt the same. The interlock also produces a series of ball joints, which form fulcrum points whereby the blocks may readily rock one on another to open or close the joints 16 or to adjust themselves in accordance with temperature changes. In order to accommodate some play between blocks and also to permit a reasonably accurate interlock, it will be noted by reference to Figure 5, that the arcs of the pockets and lugs are offset. This provision

must be made not only for the reason above-stated, but also on account of the fact that it is practically impossible in commercial production to form the lugs and pockets so accurately that interlocking is insured when they are not offset.

From the above description, it will be apparent that while I have described a construction embodying all of the features of advantage set forth as desirable, it is to be understood that I reserve the right to make all changes falling within the spirit of the invention and without the ambit of the prior art.

I claim:—

1. An arch composed of a plurality of blocks arranged in two haunches, the starting block of each haunch and its respective skew-back having an opening between them extending downwardly from the upper surfaces of the blocks to form an expansion joint, and each haunch having a key block in contact with the key block of the other haunch, said key blocks having an opening between them extending upwardly from the bottom faces of the blocks to form an expansion joint.

2. An arch composed of a plurality of blocks arranged in two haunches, the starting block of each haunch and its respective skew-back having an opening between them extending downwardly from the upper surfaces of the blocks to form an expansion joint, a key block connecting the haunches, said key block and the end blocks of each haunch having an opening between them extending upwardly from the bottom faces of the blocks to form expansion joints.

3. An arch composed of a plurality of blocks arranged in two haunches, each haunch having a key block in contact with the key block of the other haunch, said key blocks having an opening between them extending upwardly from the bottom faces of the blocks to form an expansion joint, and pivotally mounted skew-backs for each haunch of the arch.

4. An arch composed of a plurality of blocks arranged in two haunches, the starting block of each haunch and its respective skew-back having an opening between them extending downwardly from the upper surfaces of the blocks to form expansion joints, each haunch having a key block in contact with the key block of the other haunch, said key blocks having an opening between them extending upwardly from the bottom faces of the blocks to form an expansion joint, and all of said blocks, keys and skew-backs having their abutting faces in step-joint relation.

5. An arch composed of a plurality of blocks arranged in two haunches, each haunch having a key block in contact with the key block of the other haunch, said key blocks having an opening between them extending upwardly from the bottom faces of the blocks to form an expansion joint, pivotally mounted skew-backs for each haunch, and all of said blocks, keys and skew-backs having their abutting faces in step-joint relation.

6. An arch composed of a plurality of blocks arranged in two haunches, each haunch having a skew-back mounted for pivotal movement, a key block connecting the haunches, said key block and the end block of each haunch having openings between them to provide an expansion joint between the opposite faces of the key block and the adjacent arch end blocks, and all of said blocks, keys and skew-backs having their abutting faces in step-joint relation.

7. A block provided with a pocket and a lug

in one side wall intermediate the ends and extending for the full width of the block, the portions of said side walls of the block at opposite sides of the pocket and lug being in different
5 planes and the pocket extending toward the center of the block beyond the plane of the innermost of said side walls and the lug extending outwardly beyond the outermost of said side walls.

8. A block provided with a pocket and a lug in
10 one side wall intermediate the ends, the portions of said side walls of the block at opposite sides of the pocket and lug being in different planes and the pocket extending toward the center of the block beyond the plane of the innermost of said
15 side walls the lug extending outwardly beyond the outermost of said side walls.

9. An arch composed of a plurality of blocks arranged in two haunches, each haunch having a pivotally mounted skew-back and a plurality of
20 haunch blocks, and a key block interposed between the last block of the haunches, said key block and the adjacent haunch blocks having openings between them extending upwardly from

the bottom faces of the blocks to form expansion joints.

10. An arch composed of a plurality of blocks arranged in two haunches, the starting blocks of each haunch and their respective skew-backs
5 having openings between them extending downwardly from the upper surfaces of the blocks to form expansion joint, a key block connecting the haunches, said key block and the end block of each haunch having openings between them
10 extending upwardly from the bottom faces of the blocks to form expansion joints, and all of said blocks, key block and skew-backs having their abutting faces in step-joint relation.

11. A block provided with a lug at one of its
15 ends extending horizontally across the full width of the block and dividing the end of said block into upper and lower faces, said lug extending outwardly beyond the planes of both of said faces, and a socket in the other end of the block
20 complementary to the lug-provided end of said block.

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