

Nov. 10, 1931.

J. A. LODWICK

1,831,675

FURNACE WALL

Filed Dec. 3, 1927

3 Sheets-Sheet 1

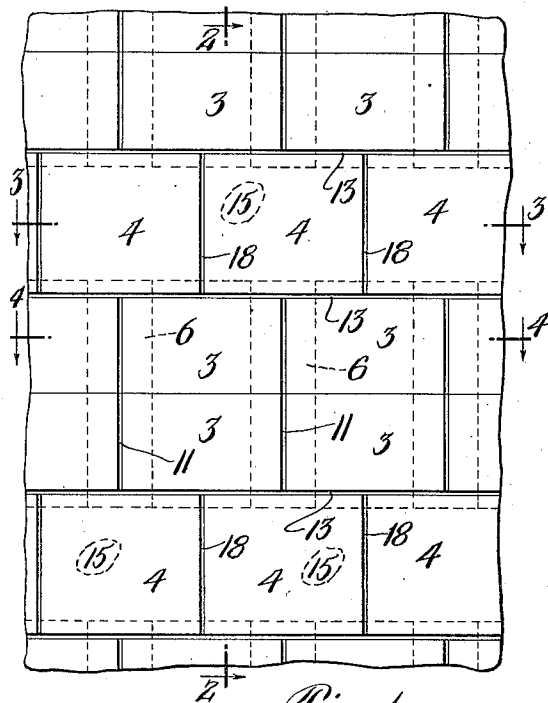


Fig. 1.

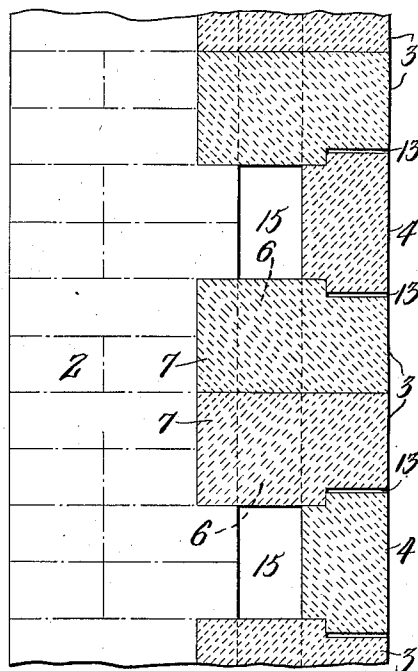


Fig. 2.

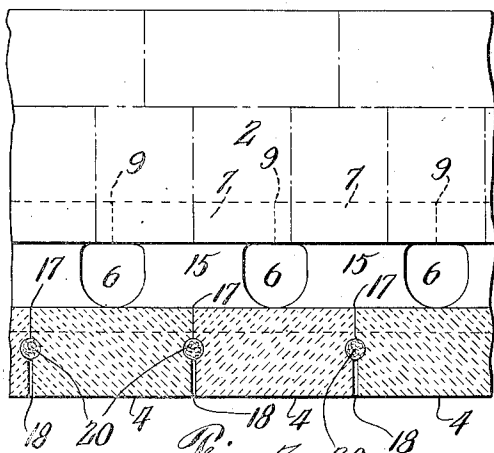


Fig. 3.

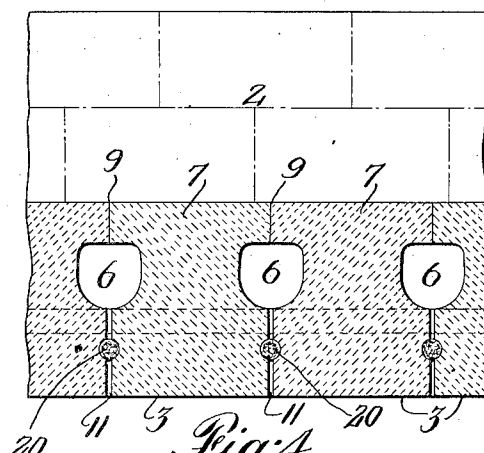


Fig. 4.

Inventor

J. A. Lodwick

By his Attorneys

Spencer & Lechner

Nov. 10, 1931.

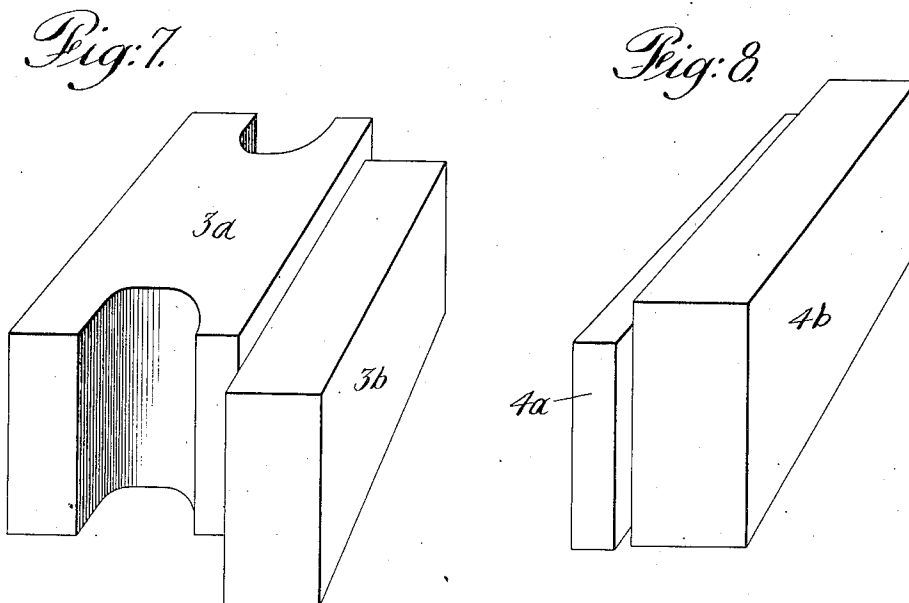
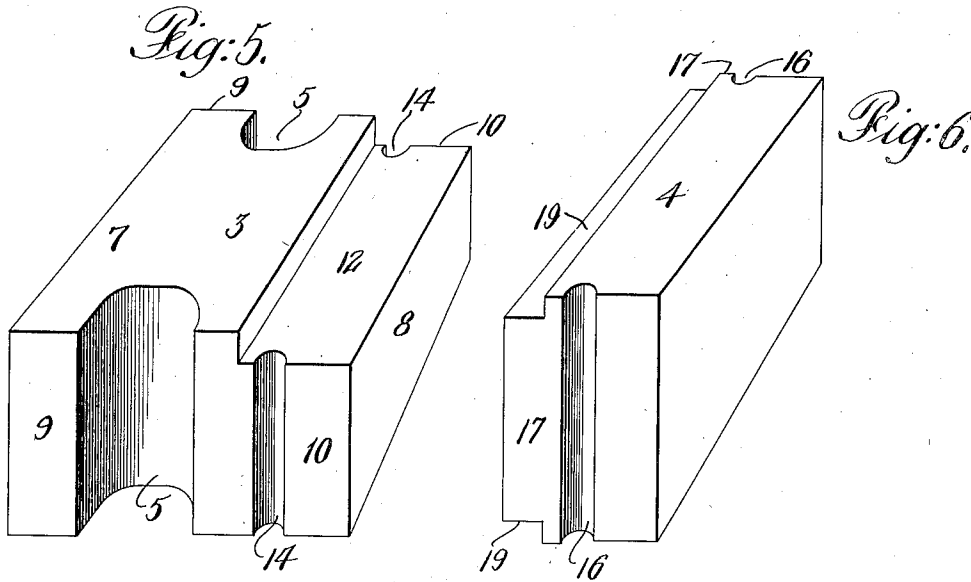
J. A. LODWICK

1,831,675

FURNACE WALL

Filed Dec. 3, 1927

3 Sheets-Sheet 2



Inventor
 Jason A. Lodwick
 By his Attorneys
 Symonds & Leclerc

Nov. 10, 1931.

J. A. LODWICK

1,831,675

FURNACE WALL

Filed Dec. 3, 1927

3 Sheets-Sheet 3

Fig: 9.

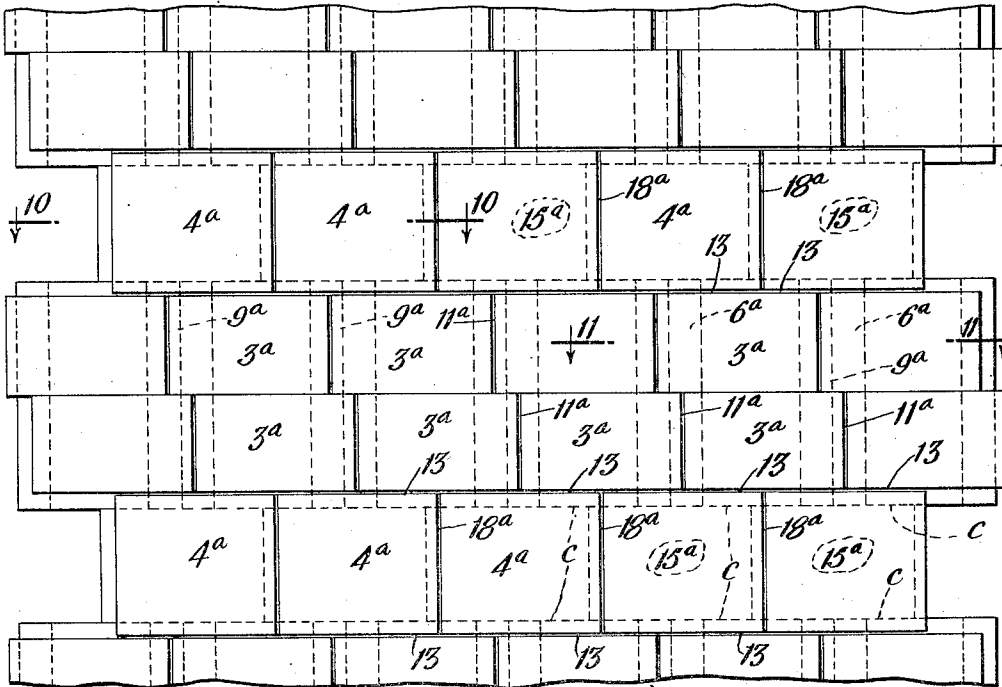


Fig: 10.

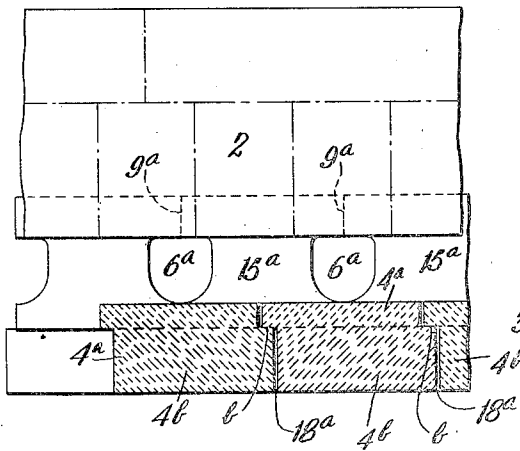
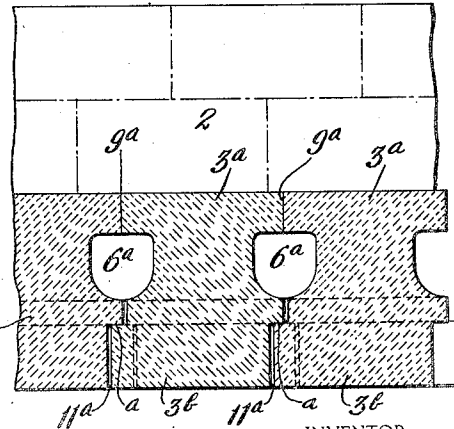


Fig: 11

INVENTOR
 22

BY *Jason A. Rodwick*
Symonowitz & Leclerc
ATTORNEYS

B

BY
Symonds & Leclerc
ATTORNEYS

ATTORNEYS

UNITED STATES PATENT OFFICE

JASON A. LODWICK, OF PELHAM MANOR, NEW YORK, ASSIGNOR TO AMERICAN ARCH
COMPANY, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE

FURNACE WALL

Application filed December 3, 1927. Serial No. 237,406.

This invention relates to furnace walls, and more particularly to air-cooled walls and bricks therefor.

It is one of the primary purposes of this invention to prevent falling-in, bowing, cracking, and spalling of refractory walls.

More specifically, it is an object of the invention to provide an improved air-cooled wall construction wherein the blocks, while constituting a substantially gas-tight refractory wall, are yet individually capable of compensating for expansion and contraction in the wall resulting from variations in temperature.

A further object of the invention is the provision of bricks for such a wall structure which, while admitting of an ample circulation of air, are nevertheless simple and rugged in contour and proportions, and, consequently, easily and cheaply manufactured and not readily broken either in handling or while in service.

How these advantages, and others which are incident to the invention or will occur to those skilled in the art, are obtained, will be evident from the following description of the present preferred embodiment of the invention, reference being had to the accompanying drawings, wherein:

Fig. 1 is an elevational view of a portion of a furnace wall illustrating an embodiment of my invention;

Fig. 2 is a vertical section taken on the line 2—2 of Fig. 1;

Fig. 3 is a horizontal section taken on the line 3—3 of Fig. 1;

Fig. 4 is a similar section on the line 4—4 of Fig. 1;

Figs. 5 and 6 are perspective views of the header and filler blocks, respectively, employed in the wall;

Figs. 7 and 8 are similar views showing a modified form of header and filler block, respectively, which may be used in a modified form of the wall;

Fig. 9 is a fragmentary elevation of a wall embodying the blocks of Figs. 7 and 8;

Fig. 10 is a section on the line 10—10 of Fig. 9, and

Fig. 11 is a section on the line 11—11 of Fig. 9.

Referring, first, to Figs. 1 to 4, it will be seen that the wall, as a whole, is built up of an outer portion 2 of any suitable construction and material, and an inner, refractory portion composed of header blocks 3 and filler blocks 4, laid in horizontal courses or rows, there being a pair of courses of header blocks 3 between adjacent courses of the filler blocks 4, the blocks of one course of each such pair being reversed or turned upside down with relation to the other course of the pair.

This construction, however, with its details, will be better understood from an inspection of Figs. 5 and 6, showing the bricks in perspective.

The header blocks 3 each have a vertical groove or recess 5 at each end, adapted, when in position in the wall, to provide vertical air channels 6 (see Figs. 3 and 4). The portion 7 of the brick, back of the grooves 5, is adapted to be bonded or tied into the outer wall structure 2 and to fit snugly at its ends 9 against adjacent header blocks or bricks (see Figs. 2 to 4), while the forward portion of the brick, from the grooves 5 to the exposed face 8, is somewhat shorter between its ends 10, so that, when the bricks are in position, as in Figs. 4, a space 11 is left between adjacent bricks to permit horizontal expansion of that portion of the bricks exposed to the intense heat of the furnace. One horizontal face of the brick 3 is flat, so that, by reversal, two horizontal courses of them may be juxtaposed, as shown in Fig. 2, while the opposite face has a step or recess 12 adjacent the front face 8, such step being of sufficient vertical depth to leave a space 13 (as shown in Fig. 2) between the bricks 3 and the filler blocks 4 to permit vertical expansion of each brick in the wall. A small groove 14 may be provided in each end of the brick for the insertion of fire clay, asbestos rope, or other compressible material 20, to seal the air passages from the furnace gases.

The filler blocks 4 (see Fig. 6) are shouldered or recessed at 19 for engagement with the header brick, and are of less thickness

or depth into the wall, than the latter, so that the horizontal air passages 15, as shown in Figs. 2 and 3, are formed by the spaces between the back of the filler blocks, the outer wall structure 2, and the adjacent courses of header brick 3. At each end of each filler block, at a point intermediate the front and back faces, a groove 16 may be provided, the length of the portion of the block in front of this point being somewhat less than the length of the portion in back thereof, so that the blocks when in place, as in Fig. 3, make contact at 17, but have a space 18 for horizontal expansion at their exposed faces where they are subjected to the heat of the furnace. Vertical expansion is provided for, as shown in Fig. 2, by the clearance 13 already referred to. The grooves 16 provide for the insertion of the compressible material 20 (see Fig. 3), just as in the case of the header brick.

It is obvious that the exposed portions of the blocks, which are subjected to great temperature, are quite free to expand in any direction without binding and without the cracking, breaking or spalling incident thereto, while the protected portions thereof, upon the very slight expansion which they undergo, tend to hold the wall firmly into its supporting structure.

In the form of the invention illustrated in Figs. 7 to 11, I employ a modified form of header and filler block 3a and 4a, similar in general form to the blocks of Figs. 5 and 6, but having the face portions 3b and 4b, respectively, offset longitudinally of the brick so as to form lap or by-pass joint in the horizontal, as well as the vertical, courses, such joints being what are frequently called "broken joints", i. e. joints formed with a right-angular break. The portions 3b and 4b are, as in the other form of brick, of such dimensions relative to the rear portions as to provide the same clearance or tolerance for expansion of the bricks on the exposed side; that is, expansion spaces 13 are provided for vertical expansion, and expansion spaces 11a and 18a (between header and filler blocks, respectively) are provided for horizontal expansion. The header blocks make contact at the back at 9a (as in the first-described construction) to insure proper bonding into the supporting wall 2. In other words, as is evident from Figs. 9 to 11, the construction of blocks shown in Figs. 7 and 8 provides by-passed joints throughout the wall, both horizontally and vertically, giving absolute freedom of expansion for the fire face of each block; provides also vertical and horizontal air channels 6a and 15a (exactly similar to the channels 6 and 15 of Figs. 1 to 4); and insures against intermingling of the furnace gases and the air in the channels, by said by-passed joints, for no matter what conditions of expansion or contraction are present, the

adjacent blocks are always in sliding contact with each other. Adjacent header blocks 3a are in contact at a (Fig. 11); adjacent filler blocks 4a are in contact at b (Fig. 10); and the header blocks are in contact with the filler blocks at c (Fig. 9).

From the foregoing, it will be seen that I have provided a wall of great stability and strength, two courses of every three, of the refractory brick, being bonded into the supporting wall; a wall of substantially gas-tight unity; means for circulating air both vertically and horizontally for the preheating thereof and the cooling of the blocks; and full, adequate and complete compensation for the expansion of the individual bricks in any direction; and have accomplished the foregoing with the use of two simple forms of block, a header block and a filler block, both of which are of solid and rugged construction and easy to make, since there are no cavities or passages within the blocks themselves.

I claim:

1. A furnace wall comprising a supporting structure, and a refractory block lining bonded thereto and having means forming by-passed joints and air channel means behind said joints.

2. A furnace wall comprising a supporting structure, and a refractory block lining bonded thereto and having means forming by-passed joints and air channel means behind said joints, each block having freedom for expansion in any direction at its exposed side.

3. A furnace wall comprising a supporting structure, and a refractory block lining bonded thereto and having means forming horizontal and vertical by-passed joints and air channel means behind said joints.

4. A furnace wall comprising a supporting structure, and a refractory block lining bonded thereto and having means forming horizontal and vertical by-passed joints throughout, and air channel means behind said joints.

5. In a furnace wall structure, a supporting wall, and a refractory wall having header blocks bonded into the supporting wall and filler blocks supported by the header blocks, said refractory wall having means forming by-passed vertical and horizontal joints.

6. In a furnace wall structure, a supporting wall, and a refractory wall having courses of header blocks bonded into the supporting wall and courses of filling blocks supported between courses of the header blocks, said blocks having interengaging shoulders providing expansion spaces.

7. In a furnace wall structure, a supporting wall, and a refractory wall having courses of header blocks bonded into the supporting wall and courses of filler blocks supported between courses of the header blocks, said blocks having interengaging shoulders providing

viding expansion spaces horizontally and vertically.

8. In a furnace wall structure, a supporting wall, and a refractory wall having sources of header blocks bonded into the supporting wall and courses of filler blocks supported between courses of the header blocks, said blocks having interengaging shoulders providing expansion spaces between the blocks and sliding contact in a plane parallel to the plane of the wall.

9. In a furnace wall structure, a supporting wall, and a refractory wall having header blocks bonded into the supporting wall and filler blocks supported by the header blocks, said refractory wall having air-channels and expansion-compensating means between said channels and the side of the wall exposed to the heat of the furnace.

10. In a furnace wall structure, a supporting wall, and a refractory wall having header blocks bonded into the supporting wall and filler blocks supported by the header blocks, said refractory wall having air-channels and expansion-compensating means between said channels and the side of the wall exposed to the heat of the furnace, said means including by-passed joints providing expansion spaces between blocks.

11. In a furnace wall structure, a supporting wall, and a refractory wall having header blocks bonded into the supporting wall and filler blocks supported by the header blocks, said refractory wall having air-channels and expansion-compensating means between said channels and the side of the wall exposed to the heat of the furnace, said means including by-passed joints providing vertical and horizontal expansion spaces between blocks.

12. In a furnace wall structure, a supporting wall, and a refractory wall having header blocks bonded into the supporting wall and filler blocks supported by the header blocks, said refractory wall having air-channels and expansion-compensating means between said channels and the side of the wall exposed to the heat of the furnace, said means including by-passed joints providing expansion spaces between blocks and sliding contact in a plane parallel to the plane of the wall.

13. A furnace wall comprising, in combination, a supporting structure and a substantially gas-tight wall of refractory blocks supported thereby, said blocks being in relatively tight interengagement at the unexposed side but having relative clearance at the exposed side so as to be individually free to expand in a plurality of directions on their exposed side.

14. A furnace wall comprising, in combination, a supporting structure and a substantially gas-tight wall of refractory blocks supported thereby, said blocks being in relatively tight interengagement at the unexposed side but each having the portion ad-

jacent the exposed face cut away so as to be free to expand in a plurality of directions and having cooling means behind such portion.

15. A furnace wall comprising, in combination, a supporting structure and a substantially gas-tight wall of refractory blocks supported thereby, said blocks being in relatively tight interengagement at the unexposed side but each having the portion adjacent the exposed face cut away so as to be free to expand in a plurality of directions and having cooling means behind such portion, said means including horizontal and vertical air channels.

16. A furnace wall comprising, in combination, a supporting structure and a substantially gas-tight wall of refractory blocks supported thereby, said blocks being free to expand in any direction on their exposed side, together with interconnected air passages in the wall, certain of which lie in the refractory wall and certain others of which lie between the refractory blocks and the supporting structure.

17. A furnace wall comprising, in combination, a supporting structure and a substantially gas-tight wall of refractory blocks supported thereby, said blocks individually having means providing free expansion in any direction on their exposed side, together with interconnected air passages in the wall, and means preventing entry of the furnace gases thereinto.

18. In a furnace wall construction, a supporting structure, and a refractory lining supported therefrom and including pairs of courses of blocks each having a longitudinal shoulder in an edge on the side remote from the supporting structure and a course of blocks positioned between said pairs of courses and each having complementary longitudinal shoulders on the edges toward the supporting structure.

19. In a furnace wall construction, a supporting structure, and a refractory lining supported therefrom and including pairs of courses of blocks each having a longitudinal shoulder in an edge on the side remote from the supporting structure and a course of blocks positioned between said pairs of courses and each having complementary longitudinal shoulders on the edges toward the supporting structure, the blocks of one course of a pair being inverted in position with respect to the blocks of the other course of the pair.

20. In a furnace wall construction, a supporting structure, and a refractory lining supported therefrom and including pairs of courses of blocks each having a longitudinal shoulder in an edge on the side remote from the supporting structure and a course of blocks positioned between said pairs of courses and each having complementary lon-

70

75

80

85

90

95

100

105

110

115

120

125

130

5 longitudinal shoulders on the edges toward the supporting structure, said second-mentioned blocks being of less thickness than those first-mentioned, to provide air spaces between them and the supporting structure.

10 21. A refractory brick for furnace walls having a wall-engaging portion and a portion adapted to be exposed to the heat of the furnace, the latter portion having parallel sides and being of less dimension than the former in at least one direction in the plane of the wall.

15 22. A refractory brick for furnace walls having a wall-engaging portion, a portion adapted to be exposed to the heat of the furnace, and a groove in a face of the brick, lying between said portions, said latter portion being of less dimension than the first-mentioned portion in at least one direction in the plane of the wall.

20 23. A refractory block for furnace walls having a portion adapted to be exposed to the heat of the furnace and a portion of greater overall dimension in at least one direction adapted to make a substantially gas-tight fit with the wall structure, and a groove between said portions on a face of the block.

25 24. An air-cooled refractory furnace wall block having a groove at an end thereof, the distance between the parallel faces of the block on one side of the groove being less than the distance between the parallel faces on the other side of the groove.

30 25. An air-cooled refractory furnace wall block having a groove at an end thereof, the distance between the parallel faces of the block on one side of the groove being less than the distance between the parallel faces on the other side of the groove, and the body of the block having a longitudinal shoulder in an edge thereof between the nearer parallel faces.

35 40 In testimony whereof I have hereunto signed my name.

45 JASON A. LODWICK.

50

55

60

65