

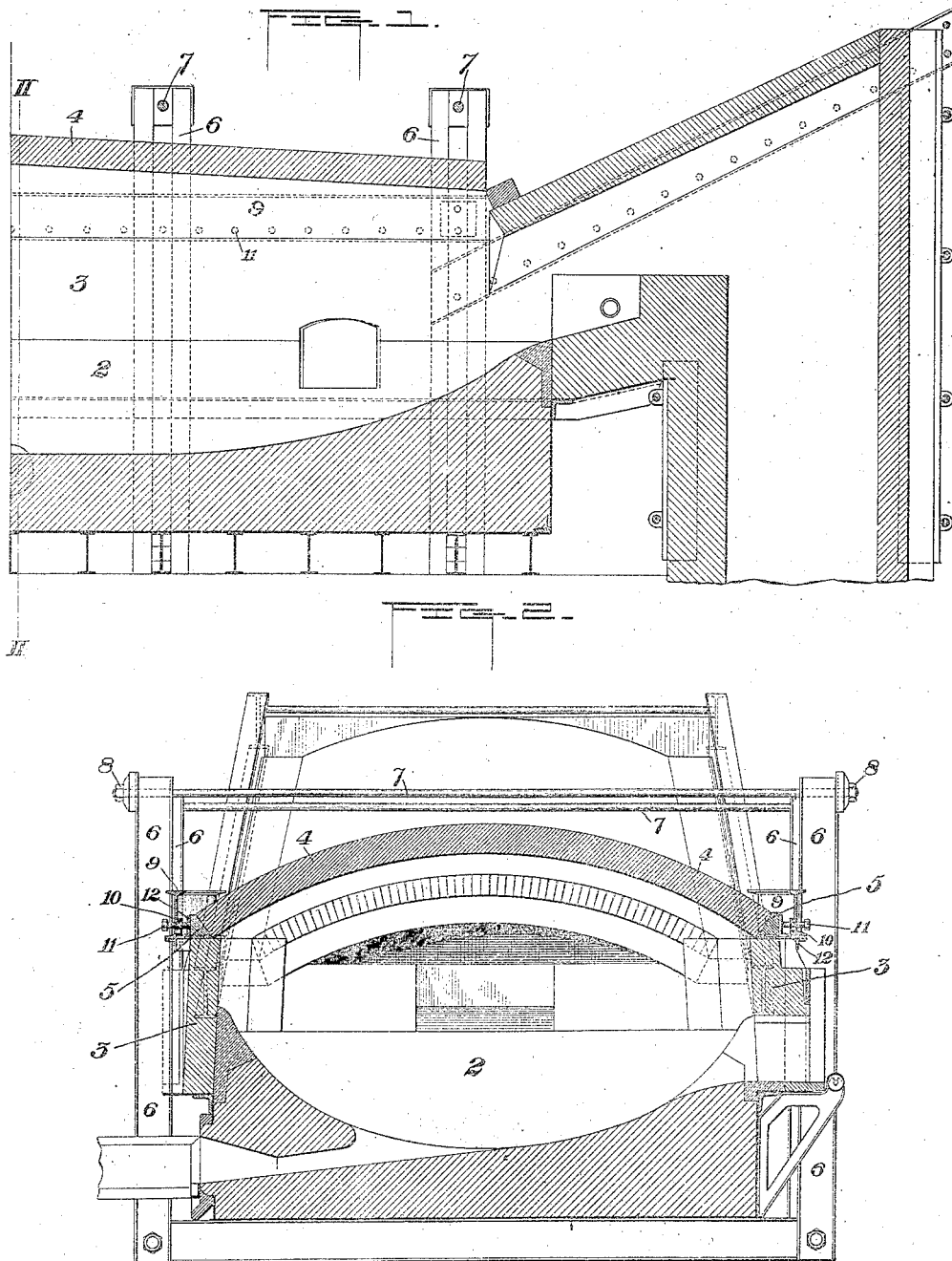
(No Model.)

4 Sheets—Sheet 1.

R. O. YOUNG.  
OPEN HEARTH FURNACE.

No. 421,220.

Patented Feb. 11, 1890.



Witnesses  
*Harry L. Gill.*  
*Henry Aiken*

Inventor  
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(No Model.)

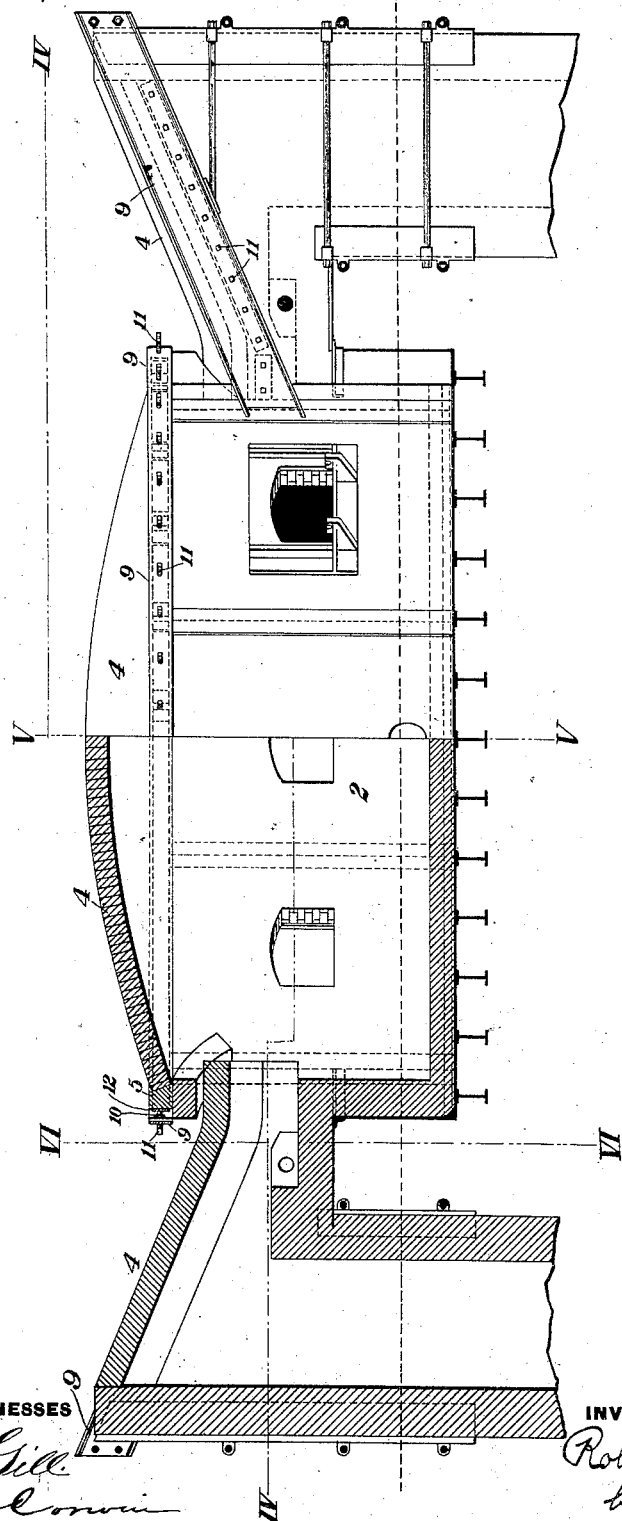
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Fig. 3.



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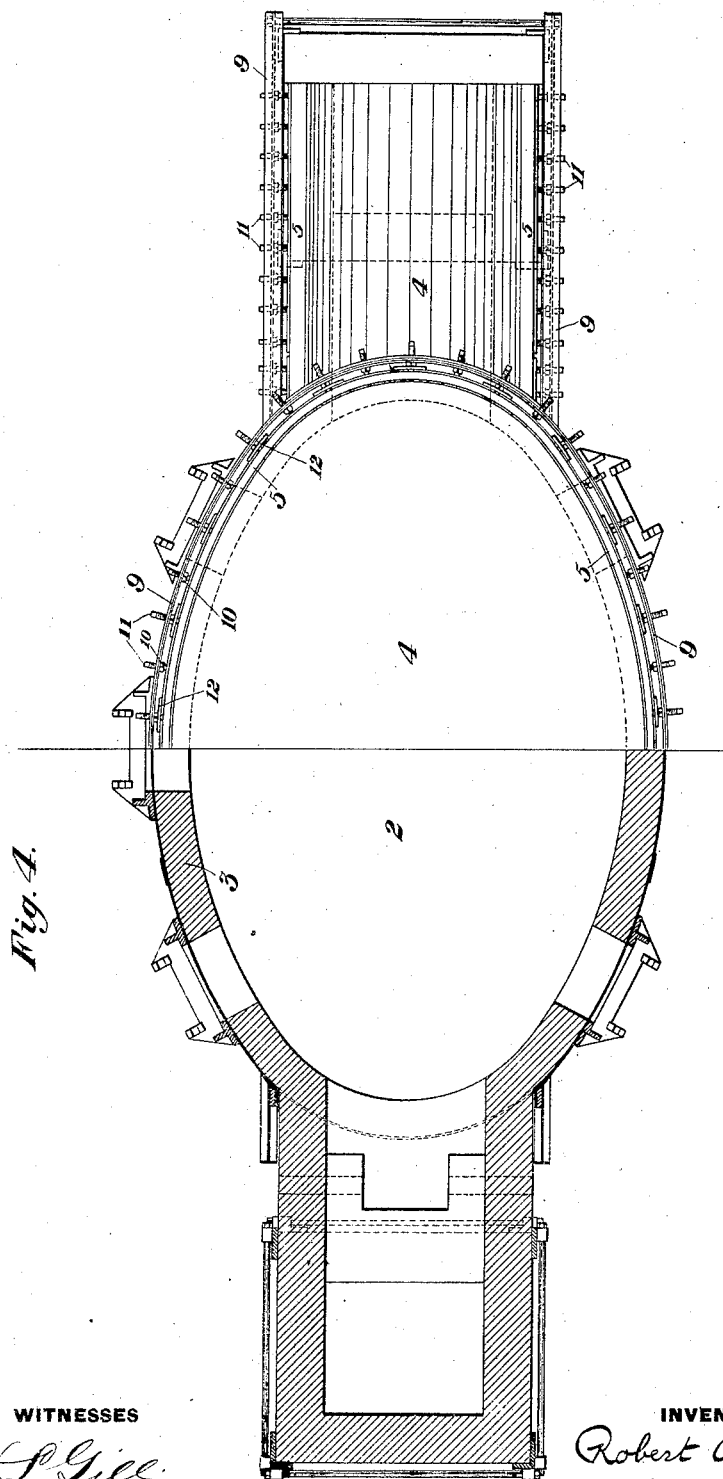
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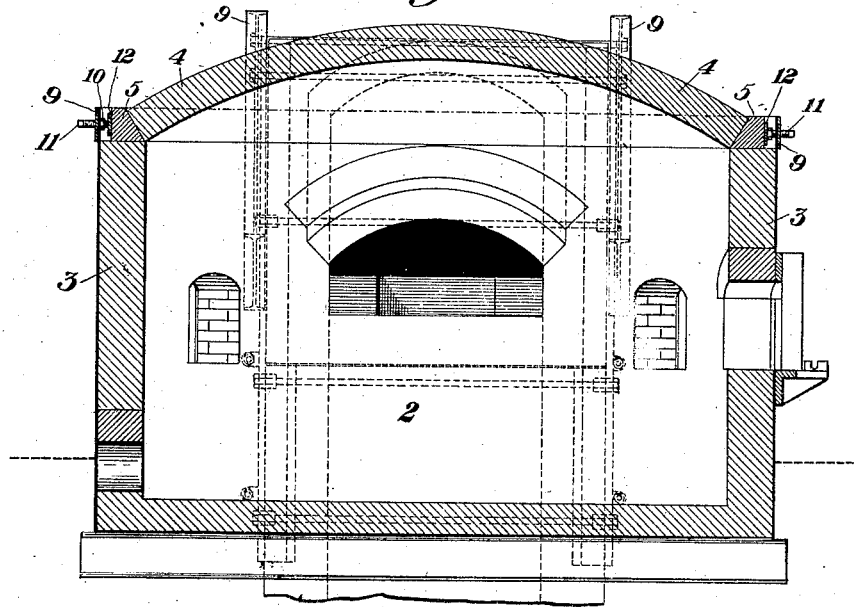
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R. O. YOUNG.  
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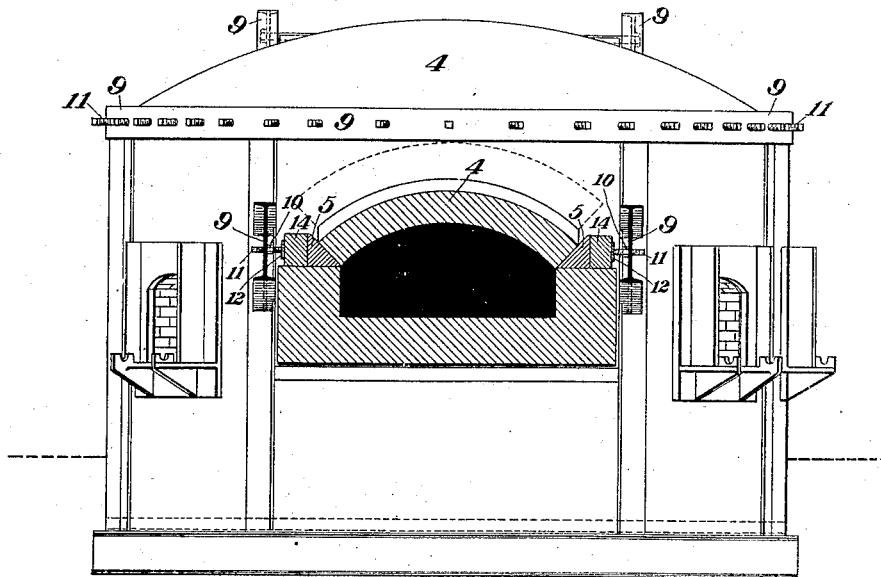
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*Fig 5*



*Fig. 6.*



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## UNITED STATES PATENT OFFICE.

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## OPEN-HEARTH FURNACE.

SPECIFICATION forming part of Letters Patent No. 421,220, dated February 11, 1890.

Application filed March 20, 1889. Serial No. 304,045. (No model.)

*To all whom it may concern:*

Be it known that I, ROBERT O. YOUNG, of Homestead, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Open-Hearth Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 shows in vertical longitudinal section a metallurgical furnace of rectangular outline, the arch or roof of which is provided with my improvement. Fig. 2 is a vertical cross-section on the line II II of Fig. 1. Fig. 3 is a side elevation, partly in longitudinal section, of a round or elliptical furnace provided with my improvement. Fig. 4 is a sectional plan view, the section being on the line IV IV of Fig. 3. Fig. 5 is a vertical cross-section on the line V V of Fig. 3. Fig. 6 is a vertical cross-section on the line VI VI of Fig. 3.

Like symbols of reference indicate like parts in each.

My invention is designed to provide means for permitting expansion of the arches or roofs of furnaces under the action of the heat to which they are subjected while in use. When heat is first applied to the furnace, it causes the masonry to expand, and in order to prevent displacing or breaking of the bricks it is necessary to provide means for freely permitting such expansion. Heretofore this has been done in the use of rectangular furnaces by easing off the bolts and allowing the buck-staves to spread as the roof expands; but in thus spreading the buck-staves the vertical walls of the furnace move with the roof and are drawn out of plumb, and as it is impossible to replace them in exactly the proper vertical positions when the furnace cools the appearance and strength of the furnace are permanently impaired. This combined movement of the upright shell or wall structure and roof of the furnace in expansion and readjustment has been the characteristic of all adjusting devices heretofore employed in connection with square furnaces and in round furnaces. Although it has been the practice to employ crude expedients to permit the expansion of the roof independently of the up-

right shell or wall structure, means have never been employed for restoring the roof to its original position as the furnace cools, so that it is always weakened by cooling, sometimes so much as to fall in.

As distinguished from the prior state of the art, my invention consists in providing means interposed between the upright furnace-shell or wall structure of the furnace and the end of the arch, whereby the free expansion of the furnace-arch is permitted and its thrust taken up by the upright shell or wall structure, and whereby in cooling it may be gradually forced back into its original contracted state without disturbing the upright walls of the furnace from their vertical positions. The specific means which I prefer to employ for this purpose consist of a series of set screws or bolts, which bear against the arch, and may be retracted to permit the arch to expand or projected to force the arch again to its proper position, the only care necessary to be given to them being that of a workman, who with a wrench loosens the bolts as the heat of the furnace increases and tightens them as the furnace cools.

My invention, broadly considered, is not, however, limited specifically to the use of such screws, since other equivalent mechanical devices—such as wedges or the like—capable of movement in both directions may be substituted therefor.

Referring now to the figures on the first sheet of the drawings, 2 represents the hearth of the furnace; 3, the side walls; 4, one of the arches, the heels of which are supported by courses of skewback bricks. 5 and 6 are the vertical buck-staves, which are connected at their ends by stay-rods 7 and nuts 8. These buck-staves form part of the upright shell or wall structure of the furnace and serve to brace the brick portion thereof. Between the buck-staves and the heels of the furnace-arch are interposed metal beams 9, on the inner sides of which are nuts 10, and a series of bolts 11 pass through the beams and nuts and at their inner ends bear against plates 12 on the outside of the skewbacks.

In completing the building of the furnace the set-bolts are projected inwardly, so that their ends shall bear against the plate 12 and

shall press them firmly against the skewbacks. When the furnace is started in operation and the arch spreads under the influence of the heat, the screws should be gradually retracted, so as to allow free outward movement of the end bricks 5 on the side walls. The letting out of the bolts is continued so long as the arch continues to expand, and as the furnace cools the bolts are screwed inwardly, thus pressing against the plates 12, forcing the bricks 5 inwardly on the side walls and holding the masonry of the arch compactly in position. In this way the contraction or expansion of the arch may be followed up by the set-bolts without disturbing the side walls or moving the buck-staves, and I am therefore enabled to preserve the shape and strength of the furnace intact for a long time.

Figs. 3, 4, 5, and 6 illustrate the application of my improvement to round or elliptical furnaces. With such furnaces it is not customary to use buck-staves such as those shown in Figs. 1 and 2. The outer edge or heel of the furnace arch or crown 4 is supported by a course of the skewback bricks 5, which are set on top of the vertical furnace-wall. A metal band 9 (which corresponds in function to the beams 9 of Figs. 1 and 2) encircles the furnace at the plane of the skewback bricks, and is supported by being attached to the metal shell in which the furnace is encased. Said band thus forms part of the upright shell or wall structure of the furnace. The bolts 11 pass through the band 9 and through nuts 10 on the inner side thereof, and at their inner ends bear against the plates 12 on the outside of the skewback. The arches of the flues at the ends of the furnace are arranged in like manner to the arches of the rectangular furnace shown in Figs. 1 and 2; (see Fig. 6,) the adjusting-bolts passing through metal beams 9, which form part of the wall structure and bearing against the skewback bricks 5 at the heels of the arch. As shown in Fig. 6, these bolts do not bear di-

rectly on the skewbacks, but upon interposed bricks 14.

The advantages of my invention will be appreciated by those skilled in the art. The improvement is simple in construction and is very efficient in its action.

All the arches of the furnace may be supplied with the set-bolts or their equivalents; or, if desired, less than the whole number of arches may be so constructed, or one side only of one arch may be provided with the bolts.

What I claim is—

1. The combination, with the furnace-arch and the upright shell or wall structure of the furnace, of interposed adjusting mechanism which bears on the arch and on said upright shell or wall structure, said adjusting mechanism being movable to permit of expansion of the arch and on contraction of the arch movable to draw it together independently of the side walls, substantially as and for the purposes described.

2. The combination of the furnace-walls and the brace therefor, an arch supported by the walls and movable thereon at the ends, and adjusting mechanism—such as set-bolts—interposed between the brace and the arch and bearing on the latter, said adjusting mechanism being movable to permit expansion of the arch and to compress the same on its contraction, substantially as and for the purposes described.

3. The combination of the furnace-arch and its side walls, buck-staves which brace the side walls, a plate or beam between the buck-staves and the arch, and set-screws passing through the beams and bearing on a plate at the end of the arch, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 9th day of March, A. D. 1889.

ROBERT O. YOUNG.

Witnesses:

W. H. CORBETT,  
H. L. KIRKWOOD.