P. ISLES.

FURNACE ARCH CONSTRUCTION.

APPLICATION FILED JAN. 25, 1910.

958,130.

Patented May 17, 1910.

3 SHEETS—SHEET 1.

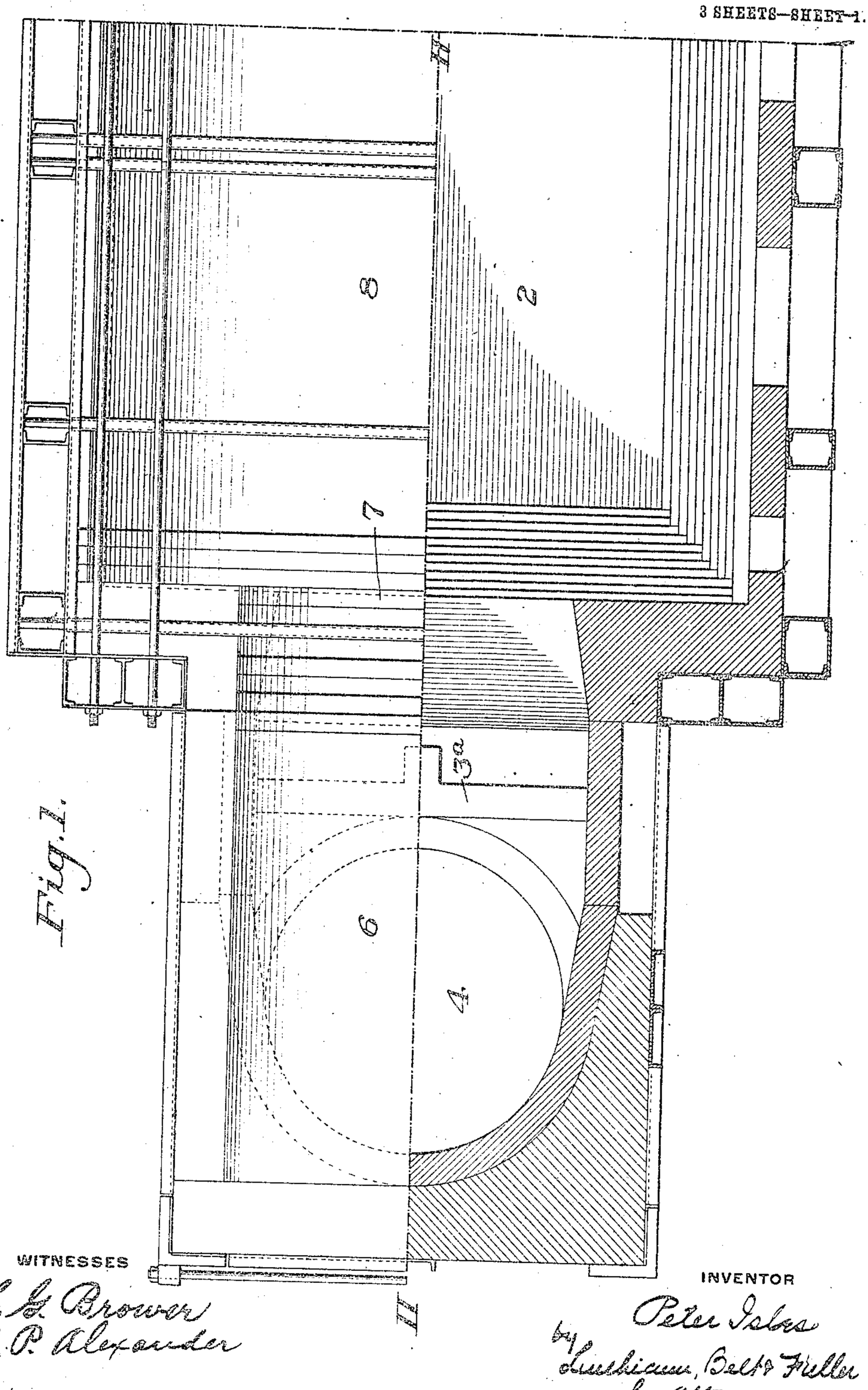

Fig. 1.

WITNESSES

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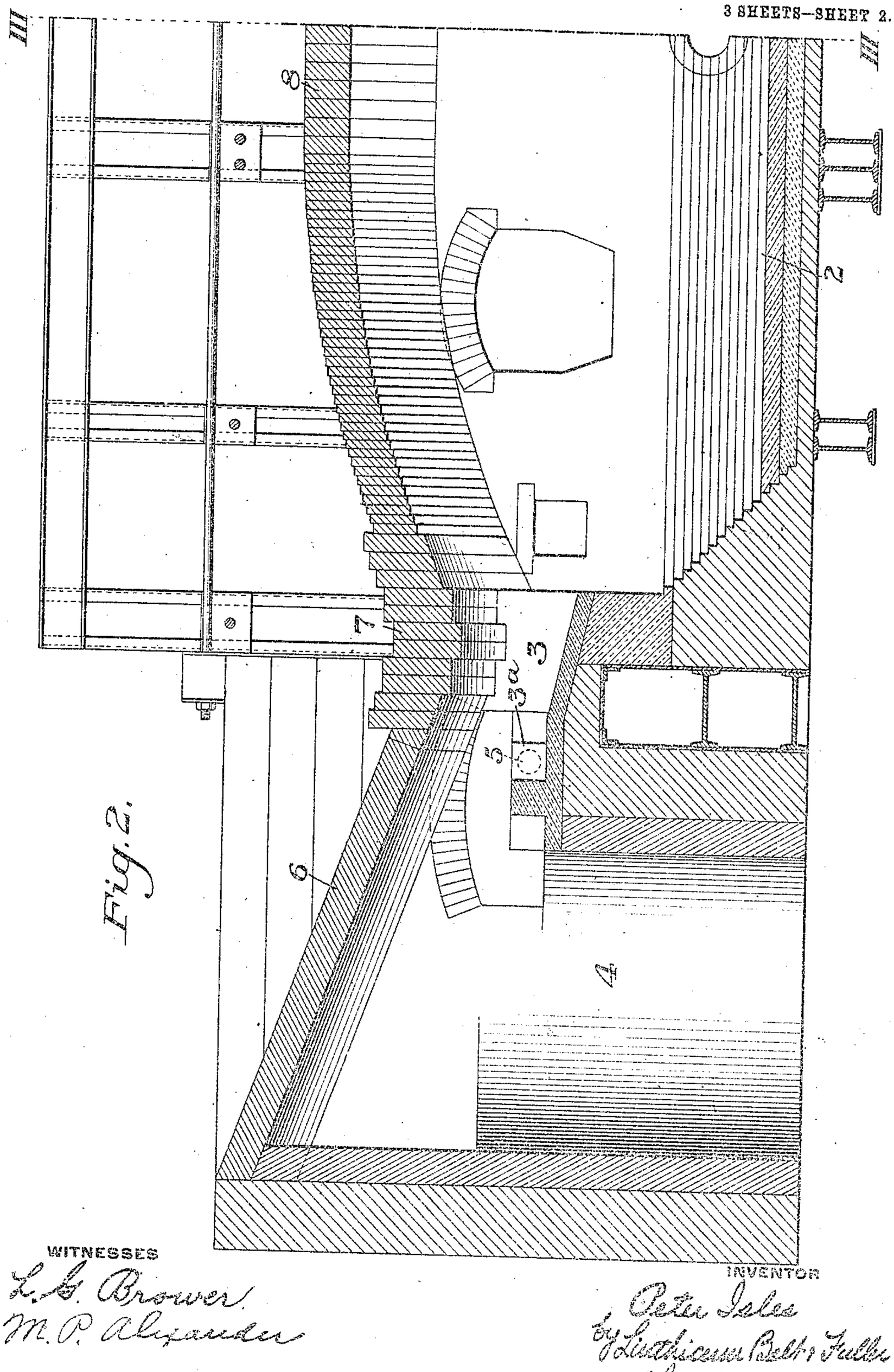

Fig. 2.

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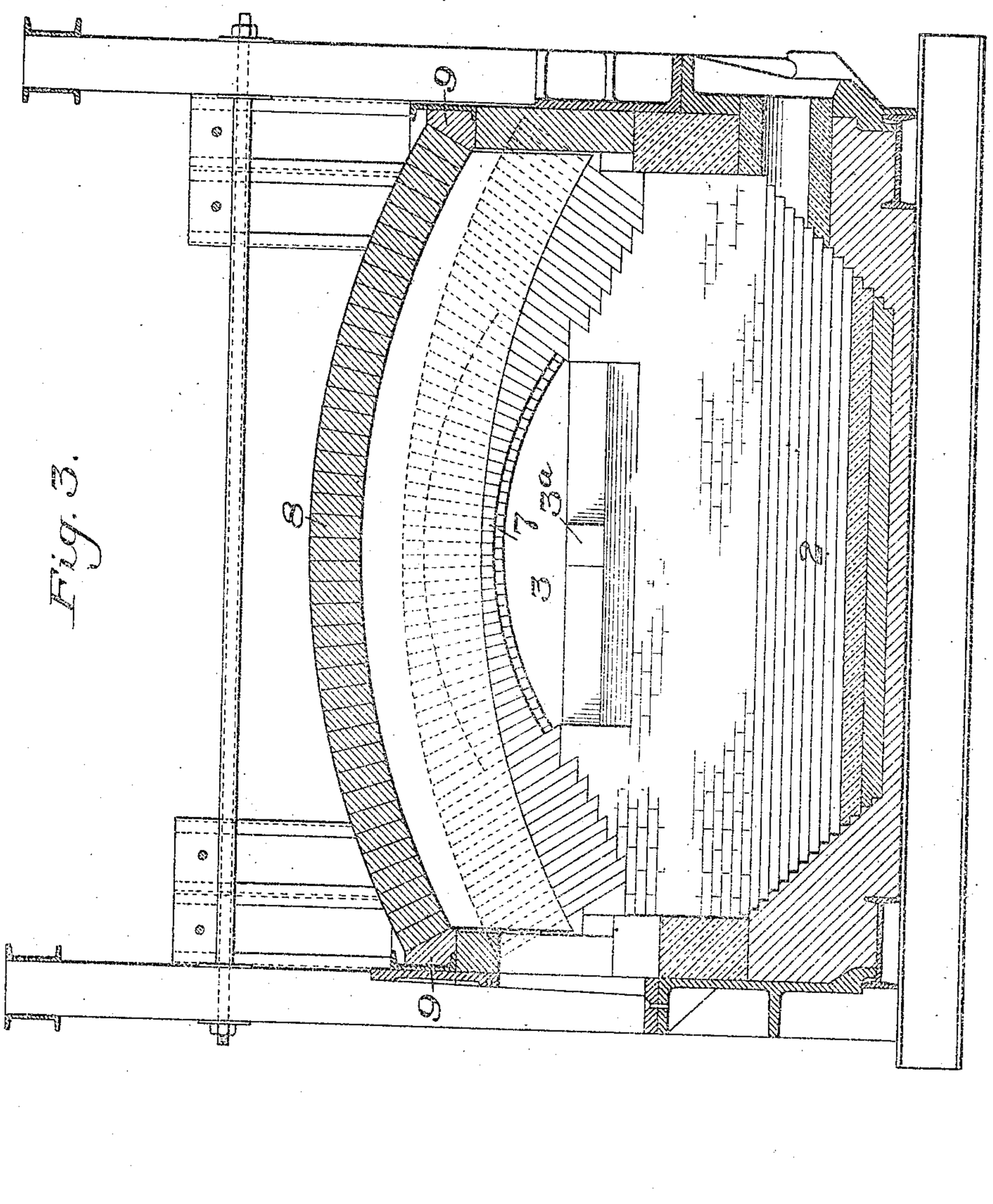
3 SHEETS—SHEET 3.

Fig. 3.



WITNESSES

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UNITED STATES PATENT OFFICE.

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FURNACE-ARCH CONSTRUCTION.

958,130. Specification of Letters Patent. Patented May 17, 1910.

Application filed January 25, 1910. Serial No. 540,062.

To all whom it may concern:

Be it known that I, PETER ISLES, of Swissvale, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Furnace-Arch Construction, 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 is a plan view, partly in section, of one end of a regenerative furnace having a port arch constructed and arranged in accordance with my invention. Fig. 2 is a sectional side elevation of the same, on the line II—II of Fig. 1. Fig. 3 is a sectional end view on the line III—III of Fig. 2, showing in elevation the gas and air ports and the port construction forming my invention.

This invention relates to improvements in furnace arches and more particularly to the port arch and the end wall construction of regenerative heating or melting furnaces.

The object of the invention is to provide a construction which will withstand the intense heat of a regenerative furnace for a longer period of time than has heretofore been possible, and a construction in which the making of repairs to the end wall construction is facilitated, the life of the end wall is lengthened and the liability of delays in the operation of the furnace caused by caving in of the arches is largely overcome.

In the drawings, 2 represents the hearth of an open hearth furnace which is connected through the port opening 3 with the regenerator flues 4. The furnace as shown is arranged to use natural gas which it is not necessary to regenerate and the gas, therefore, is led into the furnace through opening 5 in the opposite side walls of the furnace, although my invention is not limited to such use but can be used with furnaces using producer gases. The furnace is provided with the usual surrounding metal framework or shell, which, not forming part of my invention, need not be further described, other than that it is one of several well-known constructions of such surrounding framework employed with such furnaces.

Another object of the invention is to provide a novel end wall construction through which the gas and air ports extend into the furnace, in the use of which damage to the end wall caused by the intense heat and by splashing of the bath in the furnace, is reduced to a minimum and the life of the end wall of the furnace and of the furnace lining is very largely increased.

As is shown in Figs. 1, 2 and 3, the roof of the furnace is arched transversely and also curves downwardly from the center of its length toward its ends, the arched roof over the port 3 being at the lowest point of the furnace roof. The roof over the regenerator flues 4 is also arched and is inclined downwardly and inwardly toward the furnace.

Instead of keeping the roof 6 of the regenerator flues entirely independent of the furnace roof, as has been done heretofore, this roof is built into and its end thrust is resisted by the brick work in the roof or covering 7 over the inlet ports 3. The longitudinal thrust of the roof 8 over the furnace proper in the opposite direction is also resisted by the brick work of the roof 7, the thrust of the flue roof 6 largely balancing that of the furnace roof 7. It will be noted that the joints between the brick work in the roof 7 and also in the roof 8 extend vertically.

The furnace roof 8 is arched transversely and the thrust of the arched roof is taken by the skew-backs 9 through which the thrust is transmitted to the metal shell of the furnace, this construction being clearly shown in Fig. 3.

Heretofore in the construction of the end walls of furnaces which divide regenerator flues from the furnace chamber and through which wall the gas and air inlet ports extend, the arch or roof over the ports has been built so as to spring from a skew-back located at the end of the arch, the vertical face of the skew-back forming the end surface of the port openings. In the operation of such furnaces, the intense heat and, in open hearth furnaces the splashing of the fluid bath on the end walls has been very destructive to these walls, burning away the walls between the skew-back and the intersection of the side walls with the end wall of the furnace in which the arch is built. When the brick work in this end wall is destroyed in this manner, the thrust of the arch tends to destroy the arch and caving in of these arches frequently necessitates the shutting down of the furnace for repairs.

In my improved construction, the thrust of the arch is extended or carried to a point

on the end wall where the metal shell and the side wall of the furnace take the thrust of the arch, instead of being transmitted through the dividing wall of refractory material in which the ports are located. In this way the wall can be very largely destroyed without the arch necessarily being greatly weakened, and, it not being necessary to resist the thrust of the arch as heretofore, this arch and end wall can be easily and quickly repaired by applying new plastic refractory material which is dried in place thereon to the worn or burned-away portions of the end walls.

It will be seen by reference to Figs. 2 and 3 that the joints between the bricks in the port arch extend radially and as the joints approach the sides of the furnace, extend radially, the radial joints in the end wall radiating from the center from which the curve of the arch is struck for an increasingly greater distance downwardly and outwardly into the end wall of the furnace, this construction also facilitating the making of repairs and increasing the life of the arch and end wall.

In the operation of the furnaces, the air enters the furnace from the flues 4 through the port 3 and the gas is introduced through the openings 5 in the side walls at the end of the furnace, shown dotted in Fig. 2. The partition 3^a in the middle of the length of the port opening deflects the incoming gas and directs it through the port opening 3 where it is mixed with the incoming heated air and burns. The products of combustion or burned gases pass out through a similar port opening 3 and flues 4 on the opposite end of the furnace, the gases being caused to pass alternately in opposite directions across the length of the furnace from opposite ends of the furnace in the usual manner.

Modifications in the construction and arrangement of the parts may be made without departing from my invention.

I claim:

1. In a regenerative furnace, a furnace end wall having inlet and outlet ports therein connecting the furnace and the regenerators, and an arched roof over said ports, the radial joints in said arch radiating from the center of the arch and extending to the side walls of the furnace; substantially as described.

2. In a regenerative furnace, a furnace end wall having inlet and outlet ports therein connecting the furnace and the furnace flues, and an arched wall over said ports, the radial joints in said arch radiating and extending beyond and below the curved roof surface defining the top of the inlet port opening; substantially as described.

3. In a regenerative furnace, a furnace end wall having inlet ports thereto, an arched roof over said inlet ports, the radial joints in said arch radiating from the center of the arch and extending beyond the inner surface of the side walls of said furnace and extending below the spring of the arch, a downwardly and inwardly inclined arched roof over the furnace flues engaging with said port roof and a downwardly and outwardly inclined furnace roof engaging with the opposite side of said port roof; substantially as described.

4. In a regenerative furnace, a furnace end wall having inlet ports thereto, an arched roof over said inlet ports, the radial joints in said arch extending at least to the inner surface of the side walls of said furnace and extending below the spring of the arch and radiating from the center of the spring of the arch, a downwardly and inwardly inclined arched roof over the furnace flues engaging with said port roof and a downwardly and outwardly inclined furnace roof engaging with the opposite side of said port roof; substantially as described.

5. In a regenerative furnace, a furnace end wall having inlet ports thereto, an arched roof over said inlet ports, said arch extending beyond the inner surface of the side walls of said furnace, the joints in said end wall extending radially from the center of the spring of said arch; substantially as described.

In testimony whereof, I have hereunto set my hand.

PETER ISLES.

Witnesses:
R. H. Stevens,
R. F. Gellert.