A. ARTHUR.

FURNACE.

APPLICATION FILED SEPT. 3, 1909.

967,876.

Patented Aug. 23, 1910.

3 SHEETS—SHEET 1.

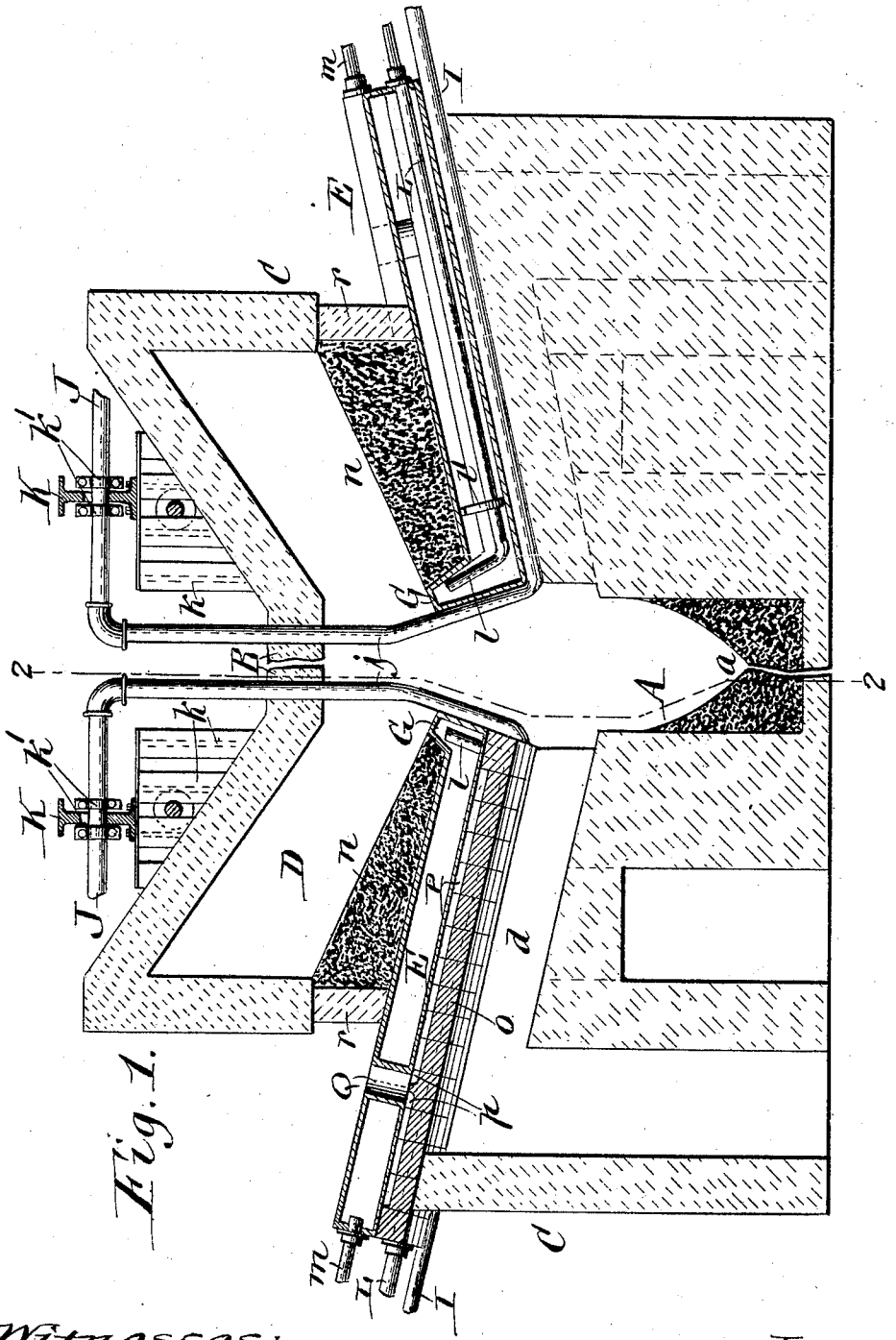

Fig. 1.

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3 SHEETS—SHEET 2.

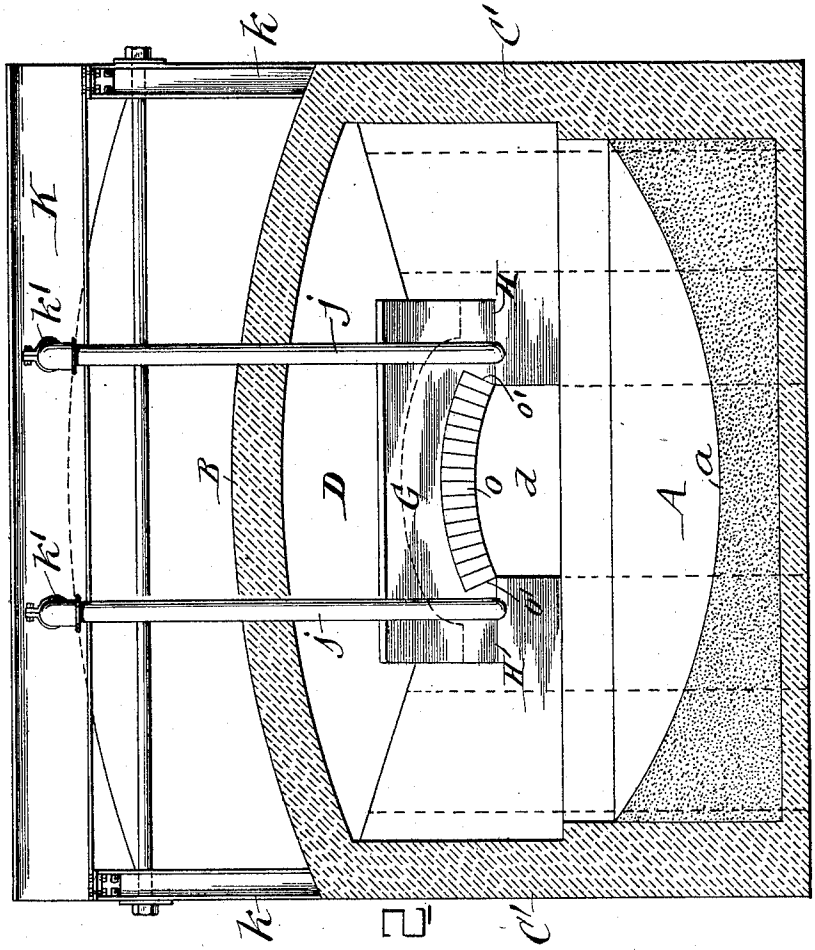

FIG. 2.

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3 SHEETS—SHEET 3.

Fig. 3.

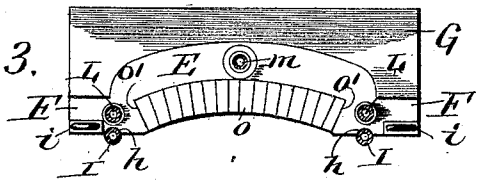


Fig. 4.

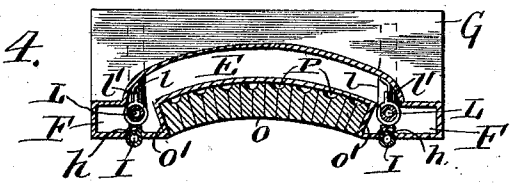


Fig. 5.

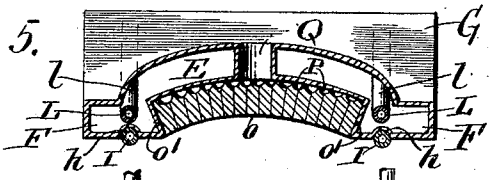
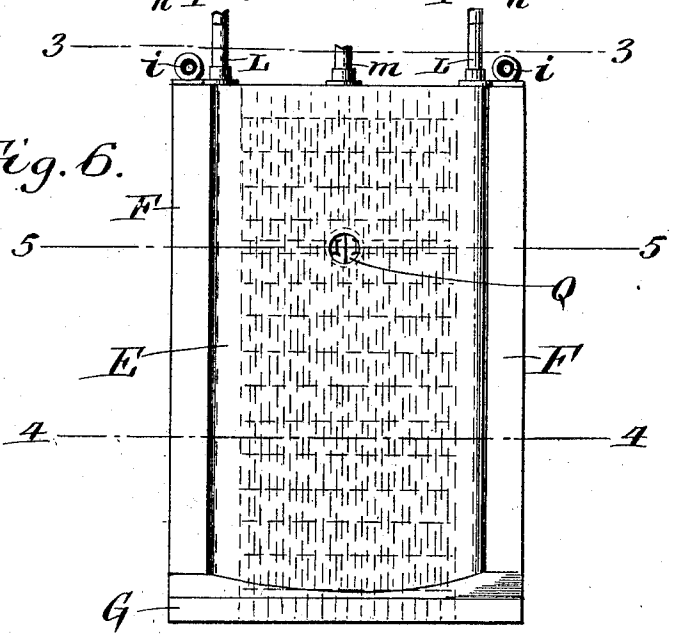


Fig. 6.



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UNITED STATES PATENT OFFICE.

ALEXANDER ARTHUR, OF BUFFALO, NEW YORK.

FURNACE.

967,876. Specification of Letters Patent. Patented Aug. 23, 1910.

Application filed September 3, 1909. Serial No. 516,075.

To all whom it may concern:

Be it known that I, ALEXANDER ARTHUR, a subject of the King of England, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Furnaces, of which the following is a specification.

This invention relates to furnaces and more particularly to open hearth furnaces in which the air and gas ports are separated by an arch.

The object of this invention is to provide a port arch for open hearth and other furnaces which is more durable and less expensive than those heretofore in use and which can be readily and economically repaired when necessary.

In the accompanying drawings consisting of 3 sheets: Figure 1 is a fragmentary vertical longitudinal section of an open hearth furnace the left end of the same being taken centrally through the port arch while the right end is taken through the port arch at one side of the center. Fig. 2 is a vertical transverse section in line 2—2, Fig. 1. Figs. 3, 4 and 5 are vertical transverse sections of the port arch taken in lines 3—3, 4—4 and 5—5, Fig. 6, respectively. Fig. 6 is a top plan view of the water jacket of the port arch.

Similar letters of reference indicate corresponding parts throughout the several views.

The open hearth furnace shown in the drawings for illustrating my invention comprises a furnace or heating chamber A having a hearth *a*, a roof B, end walls C, side walls C^1, a gas port *d* opening horizontally inward through each end wall into the furnace above the hearth, and an air port D also opening horizontally inward through each end wall into the furnace above the gas port. Between each pair of companion gas and air ports is arranged an arch which embodies my improvements and which is constructed as follows:—E represents a water jacket, pan or hollow chamber which is preferably constructed of boiler plate and made substantially straight lengthwise but curved upwardly crosswise and provided at its opposite longitudinal sides with flat laterally projecting hollow wings F and at its front or inner end with an upwardly projecting hollow nose G. This water jacket is arranged in one of the end walls in an inwardly inclined position, so that it forms the top of the adjacent gas port and the bottom of the adjacent air port and has its inner end arranged within the furnace while its outer end is arranged outside of the furnace, as shown in Fig. 1. The wings of the jacket overhang inwardly inclined ledges H on the end wall on opposite sides of the gas port and are provided on their undersides with longitudinal grooves *h* which engage with the upper sides of inclined tracks or guideways I arranged lengthwise on the upper side of said ledges. When moving the jacket and associated parts inwardly or forwardly through the end of the furnace in assembling the parts and when moving this jacket outwardly or backwardly for making repairs, the jacket slides on said tracks, thereby facilitating the movement of the jacket for this purpose. The outward movement of the jacket is preferably effected by connecting the shifting mechanism with eyes *i* arranged on the outer end of the jacket.

For the purpose of preventing the tracks from being burned unduly by the heat of the furnace the same are constructed in the form of pipes, so that water may be circulated through the same. The cool water is preferably admitted to the hollow tracks at the outer ends thereof and the hot water is drawn off from the same by upright delivery pipes *j*, j^1 each of which is connected at its lower end with the inner or front end of one of the hollow tracks and passes with its upper part through the roof of the furnace. Above the roof the upright pipes connect with horizontal delivery pipes J, J which are supported by passing the same through openings in a horizontal transverse girder K which connect the upper ends of upright buck stays *k* which sustain the side walls of the furnace at the outersides thereof, and providing said horizontal pipes J, J on opposite sides of the transverse girder with clamps k^1, so as to hold the same against displacement.

The water is admitted into the jacket by means of two feed or supply pipes L, L arranged lengthwise in opposite sides of the jacket and extending with their rear inlet ends through the outer or rear end of the jacket while their rear ends are provided with upwardly turned outlet nozzles *l*, *l* which extend into the hollow nose of the jacket. The inner or front parts of the water supply pipes L, L are held in place within the jacket by means of upright brackets l^1

embracing said pipes and secured to the top and bottom of the jacket. The heated water is discharged from the elevated rear end of the jacket through an outlet pipe *m* connected with the rear end wall of the jacket. By this means the water is circulated most effectively through the jacket and the same enabled to offer the maximum resistance to the destructive effects of the heat in the furnace.

On top of the jacket and extending transversely from side to side and lengthwise from the end wall of the furnace to the nose of the jacket is arranged a layer or body *n* of magnesite, chrome ore, or similar refractory material which protects this part of the jacket from the destructive action of the furnace heat. The protecting coating or lining inclines downwardly from the end wall to the nose and is held by the latter against forward or inward displacement. In order to also protect the underside of the jacket from the heat in the furnace this side is provided with a lining or facing of protecting refractory material which preferably consists of silica or fire bricks *o* arranged in the form of a curved arch which engages its top with the underside of the jacket and rests at its opposite sides against shoulders o^1 formed on the jacket adjacent to the inner sides of its wings, thereby sustaining the brick arch on the jacket.

Owing to the circulation of water through the jacket the underside of the same next to the brick lining is caused to sweat and if no provision were made to lead off the moisture or vapors between the jacket and these bricks the latter would soon disintegrate and cause breaking down of the arch. To avoid this ventilating means are provided for carrying off the vapors which are generated between the jacket and lower brick facing which means preferably consist in so constructing the upper side of the brick surface as to produce a plurality of longitudinal vapor conduits P which stop short of the front and rear ends of the brick lining and one or more transverse vapor conduits *p* connecting the several longitudinal passage conduits, and providing the jacket centrally in its highest part with an upright vent conduit or passage Q which is arranged outside of the furnace and extends from the underside of the jacket to the top of the jacket and communicates at its lower end with the transverse conduit. Any vapors generated between the jacket and brick lining are conducted by the longitudinal and transverse passages P, *p* and the passage Q to the exterior of the furnace, thereby preserving the stability of the port arch and prolonging the life of the same. By closing the front ends of the passages P the heat is prevented from passing through the same and destroying the bricks and jacket when the furnace is reversed and by closing the rear end of said passages and conducting the vapor through the top of the jacket interference with the escape of the vapor by accidental closing of said passages at their outer ends is prevented.

Whenever it is desired to remove the port arch for repairs the same can be easily withdrawn from the furnace upon first breaking out that part *r* of the adjacent end furnace wall immediately above the jacket so as to provide the necessary clearance for the nose of the jacket. This part *r* of the furnace end wall is again replaced after the port arch has been replaced in its operative position.

I claim as my invention:

1. A furnace having a gas port and an air port, an arch arranged between said ports and having a water jacket provided with an arch-shaped central part and wings on opposite sides of said part which overhang ledges on the adjacent part of the furnace wall, and tracks on which said wings run for moving said arch into and out of its operative position.

2. A furnace having a gas port and an air port, an arch arranged between said ports and having a water jacket provided with an arch-shaped central part and wings on opposite sides of said part which overhang ledges on the adjacent part of the furnace wall, and tubular tracks on which said wings run and through which water is passed.

3. A furnace having a gas port and an air port, an arch arranged between said ports and having a water jacket provided with an arch-shaped central part, and wings on opposite sides of said part which overhang ledges on the adjacent part of the furnace wall and longitudinal tubular tracks which support said wings and which have upright outlet pipes extending from the front ends of said tracks upwardly through the roof of the furnace.

4. A furnace having a gas port and an air port, an arch arranged between said ports and having a water jacket provided with an arch-shaped central part, and wings on opposite sides of said part which overhang ledges on the adjacent part of the furnace wall and longitudinal tubular tracks which receive grooves on the undersides of said wings.

5. A furnace having a gas port and an air port and an arch arranged between said ports and comprising a water jacket having a hollow upwardly projecting nose at its inner end, a protecting covering arranged on said water jacket and engaging at its front end against said nose, a water inlet pipe arranged in said jacket and provided at its inner end with an upwardly turned nozzle which projects into said nose.

6. A furnace having a gas port and an air

port and an arch arranged between said ports and comprising a water jacket, and a refractory lining arranged on the underside of said jacket, the opposing sides of said jacket and lining being constructed to provide a ventilation for the vapors generated between these parts.

7. A furnace having a gas port and an air port and an arch arranged between said ports and comprising a water jacket, and a refractory lining arranged on the underside of said jacket and comprising fire bricks having their upper sides constructed to form vapor ventilating conduits.

8. A furnace having a gas port and an air port and an arch arranged between said ports and comprising a water jacket, and a refractory lining arranged on the underside of said jacket and comprising fire bricks having their upper sides constructed to form a plurality of ventilating conduits which stop short of the front and rear ends of said arch and a transverse conduit connecting the longitudinal conduits.

9. A furnace having a gas port and an air port, and an arch arranged between said ports and comprising a water jacket, and a refractory lining arranged on the underside of said jacket and comprising fire bricks having their upper sides constructed to form a plurality of longitudinal ventilating conduits which stop short of the front and rear ends of said arch and a transverse conduit connecting the longitudinal conduits and a vertical conduit extending from the bottom to the top of said jacket outside of the furnace and communicating at its lower end with said transverse conduit.

Witness my hand this 26th day of August, 1909.

ALEXANDER ARTHUR.

Witnesses:

WILLIAM G. STUART,

THEO. L. POPP.