No. 898,410. PATENTED SEPT. 8, 1908.

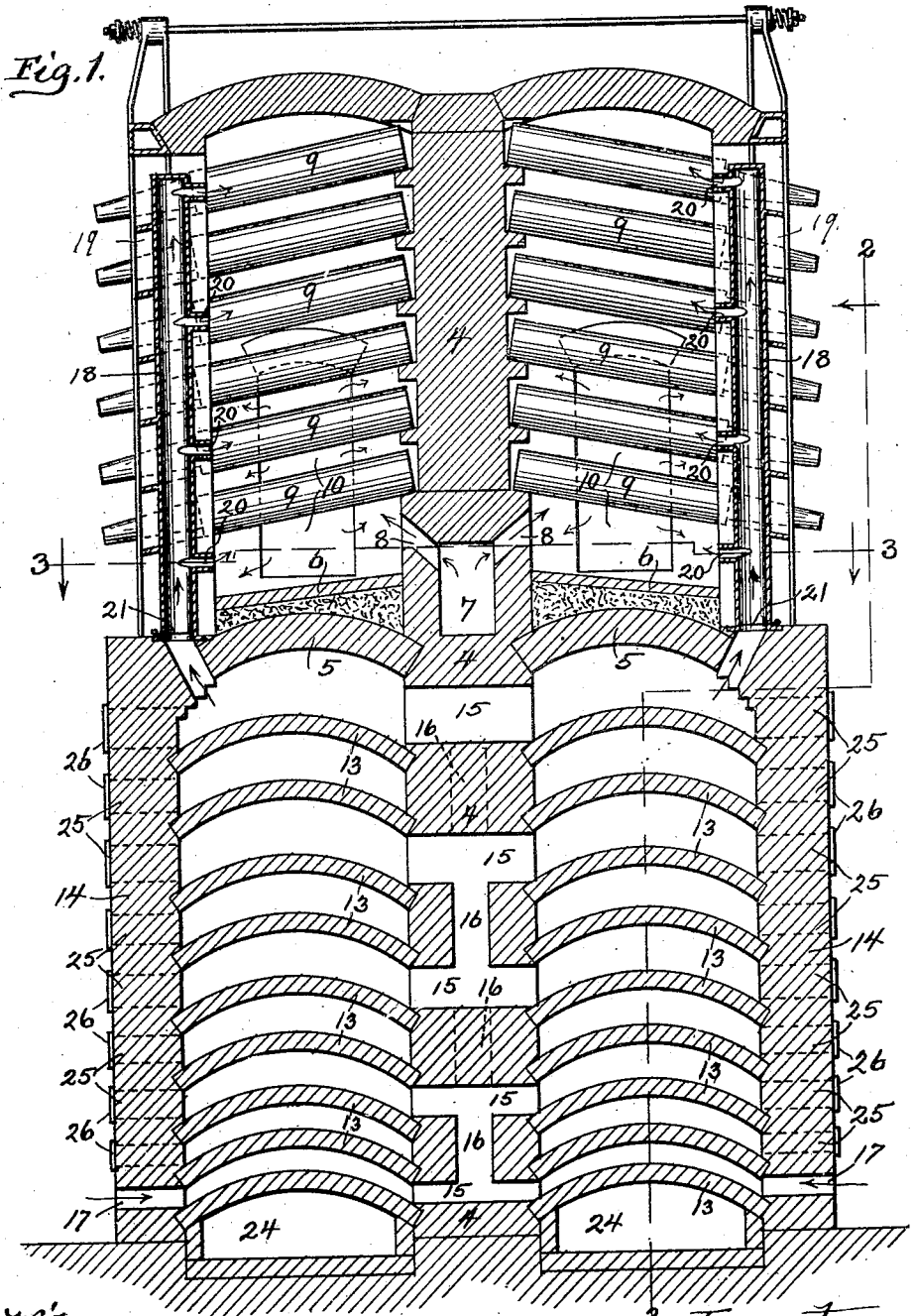
N. L. HEINZ.

RECUPERATIVE FURNACE.

APPLICATION FILED MAR. 16, 1908.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

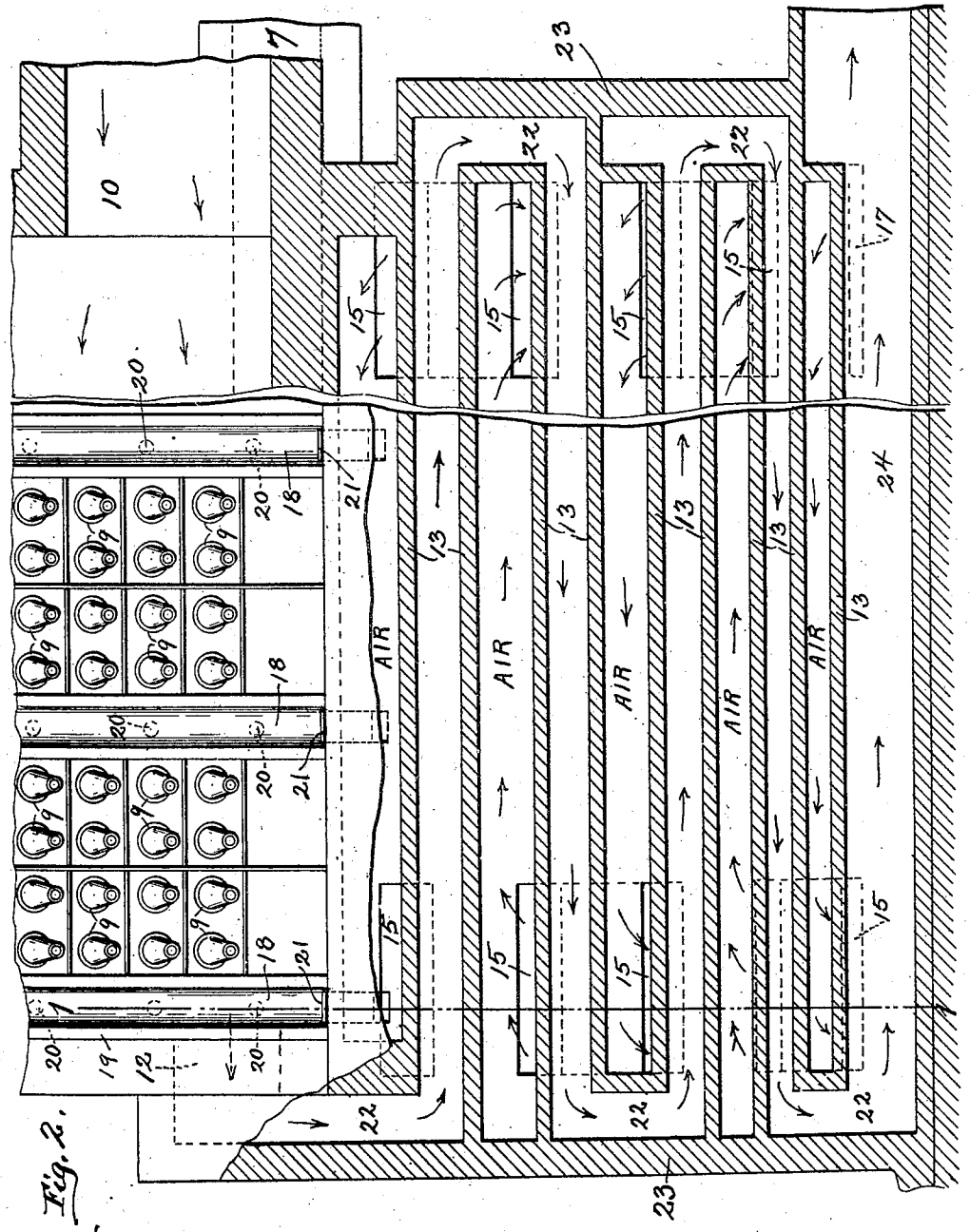

Fig. 2.

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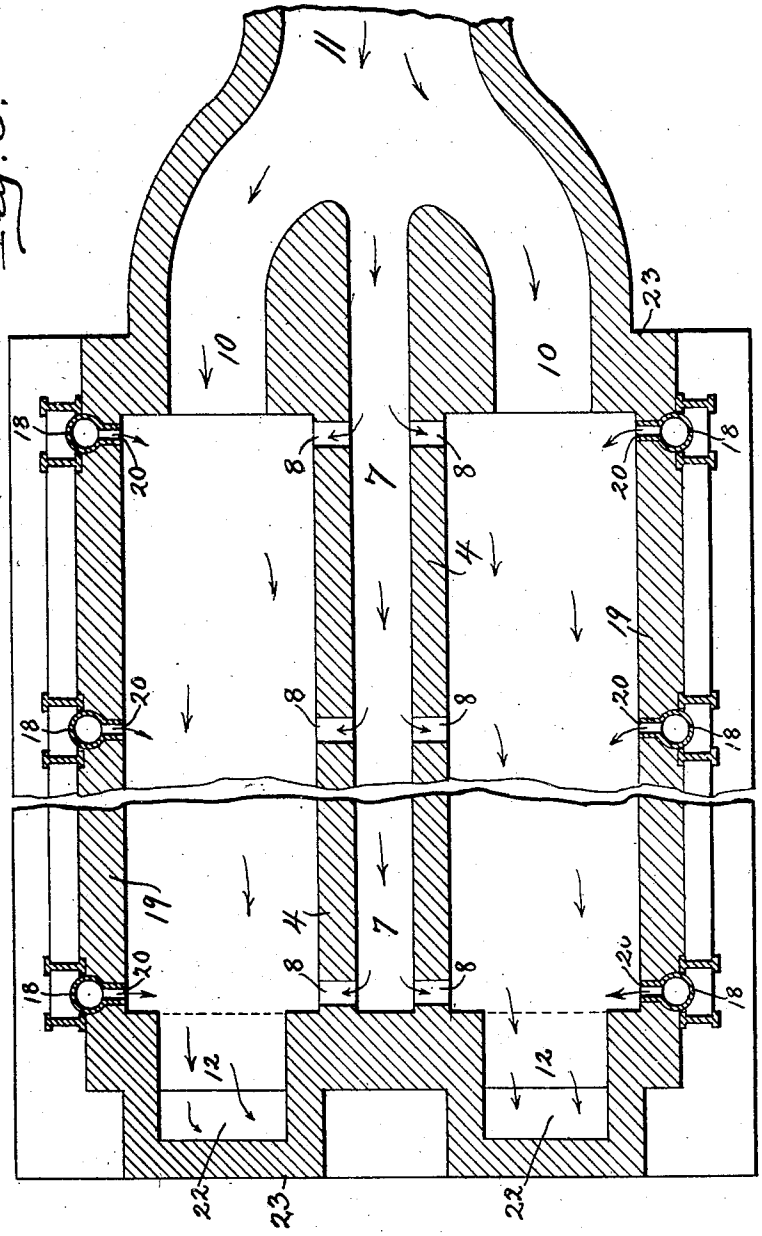
3 SHEETS—SHEET 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

NICHOLAS L. HEINZ, OF LA SALLE, ILLINOIS.

RECUPERATIVE FURNACE.

No. 898,410. Specification of Letters Patent. Patented Sept. 8, 1908.

Original application filed July 29, 1907, Serial No. 386,068. Divided and this application filed March 16, 1908. Serial No. 421,524.

To all whom it may concern:

Be it known that I, NICHOLAS L. HEINZ, of La Salle, in the county of Lasalle and State of Illinois, have invented certain new and useful Improvements in Recuperative Furnaces, of which the following is a specification.

My invention relates to furnaces having a working chamber arranged over a recuperative furnace for heating the ingoing air by means of the waste heat from the working chamber.

Among the objects of my improvements are, first, to provide an air heater immediately under the working chamber and connect it with the front thereof by valved flues for furnishing and regulating a supply of hot air in the working chamber; and, second, to afford facilities for the proper conducting of the products of combustion about a flue or chamber of the air heater for heating the air passing therein toward the working chamber.

A further object is to provide the air heater with suitable openings for cleaning the flues and passages through the same.

I attain these objects by the means illustrated in the accompanying drawings in which—

Figure 1 is a transverse, vertical section of a recuperative furnace containing my invention, the section being taken at the line 1 1 of Fig. 2. Fig. 2 is a fragmentary view partly in front elevation and partly in longitudinal section taken on the line 2 2 of Fig. 1. Fig. 3 is a fragmentary horizontal section taken on the line 3 3 of Fig. 1, showing a plan view.

Similar signs marked on the drawings refer to similar parts throughout the several views.

The working chamber and the recuperative chamber, or air heater, are divided lengthwise and centrally by a vertical wall 4, and separated horizontally by heavy arches 5 with a covering of cinder and top plates 6. At the place of the horizontal separation the vertical wall 4 is provided with a large horizontal flue 7 whose upper part rises somewhat above the bottom of the working chamber and is provided with ports 8 at intervals along the entire length which open into the lower part of the space in the working chamber on both sides of the wall 4. At one end of the working chamber and close to the bottom, it is provided with a large opening 10 on each side of the wall 4. The flue 11 leading from a gas producer (not shown) communicates with the working chamber through the openings 10 and flue 7 by its ports 8. The gas entering through the opening 10 tends to rise in the working chamber and the pressure causes it to travel horizontally through to the further end of the chamber which is provided with an opening 12 on each side of the vertical wall 4 for the letting out of the products of combustion.

The part of the wall 4 which is below the arches 5 is provided with a series of thin arches 13 spanning the space between it and the outer side walls 14 and extending along the entire length of the working chamber, as seen in Fig. 2. The space between these arches gradually increases from the bottom upward. At opposite ends of said lower part of wall 4 are provided openings 15 through said wall. These are connected by vertical flues 16 in said wall, so that the space inclosed between the outer walls 14 and each alternate pair of the arches 13 is connected through openings 15 and flues 16 and forms a meandering flue or chamber which gradually increases in transverse area from a point near the bottom of the walls 14 to the arches 5. Through the walls 14 an opening 17 is provided near the bottom and corresponding in size with the lowermost of the openings 15, through the wall 4. The openings 17 are for the admission of air to such meandering flue or chamber which constitutes what I have above denominated an air chamber or heater immediately under the working chamber.

A series of tile flues 18 are placed in the side walls 19 of the working chamber at suitable intervals, being arranged opposite to the ports 8 of the flue 7, and connected with the air chambers immediately below the arches 5. The tile flues are provided with ports 20 of uniform size for admitting air from the air heater to the working chamber. They are also provided with valves 21 at the bottom for regulating the amount of air admitted to them. The air being thus introduced in the vertical planes occupied by the ports 8 aids in the maintenance of a uniform pressure and movement of the gases throughout all parts of the working chamber. The air heater with its valved flues 18, having ports of uniform size, thus placed in the front of the working chamber and at points in line

with the gas ports of the flue 7 constitutes the means whereby the first object mentioned above is attained.

The outlet openings 12 empty into down flues 22 in the end walls 23 of the air heating chamber, which communicate with the alternate spaces between the arches 13 and form a continuous meandering passage way for the products of combustion around on the outside of the passage way marked "Air" on the drawings. The movements of the air and the products of combustion in their respective courses through the air heater are in opposite directions as indicated by arrows, the air entering at the bottom and passing on upward into the most enlarged parts of the air chamber immediately under the arches 5. This air chamber is connected by the passages 15 immediately below said arches at the opposite ends of the furnace, as seen in Fig. 2. The air entering at the bottom is permitted to expand and caused to move onward slower as it becomes hotter and until it reaches said largest part of the air chamber; and the products of combustion passing from the working chamber enter the flue space immediately under the topmost of the thin arches 13, which forms the bottom of said largest part of the air chamber and thence passes on downward about the air passage toward and to the large flues 12 at the bottom which leads to a chimney (not shown). This construction constitutes the means whereby the second object is attained. It is distinguished from the prior art, so far as known to me, by the independent flues for the products of combustion in their air heater being connected at their upper part with the working chamber at the exit end and near the bottom through the opening 12 and being gradually diminished in cross-section area from the top part to the points where they connect with the large flues 24. These independent flues are also used in conjunction with the air flue or chamber connected by the vertical passages 16 whereby a uniform pressure of the hot air under the entire bottom of the working chamber is maintained.

Cleaning openings 25 (shown by dotted lines Fig. 1) through the side walls 14 of the air heater are provided at suitable intervals along the length of the furnace. They have doors 26 for closing them. Through these openings a rake or scraper may be introduced for reaching all horizontal parts of the interior of the air chamber and flues for the products of combustion, for the purpose of cleaning them of accumulated dust or soot.

What I claim is—

1. An air heating chamber having a vertical division wall provided with openings through it at its opposite ends and vertical flues connecting such openings, a series of arches separating the inclosed spaces at opposite sides of the division wall into alternate horizontal passages on lines between said openings through said wall, in combination with a working chamber placed upon the air heating chamber and having inlet air flues and outlet flues for the products of combustion respectively connected with the horizontal passages of the air heating chambers.

2. An air heating chamber having a vertical division wall provided with openings through it at its opposite ends and vertical flues connecting such openings, a series of arches separating the inclosed spaces at opposite sides of the division wall into alternate horizontal passages on lines between said openings through said wall, having increase in transverse area from the bottom upward, in combination with a working chamber placed upon the air heating chamber and having inlet air flues and outlet flues for the products of combustion, respectively.

3. An air heating chamber having a vertical division wall provided with openings through it at its opposite ends and vertical flues connecting such openings, a series of arches separating the inclosed spaces at opposite sides of the division wall into alternate horizontal passages on lines between said openings through said wall, having increase in transverse area from the bottom upward and cleaning openings in the outer side walls, in combination with a working chamber placed upon the air heating chambers and having inlet air flues and outlet flues for the products of combustion, respectively.

NICHOLAS L. HEINZ.

Witnesses:
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