Nov. 6, 1928. 1,690,710

G. F. BEACH

FURNACE

Filed June 4, 1926 3 Sheets-Sheet 1

FIG. 1.

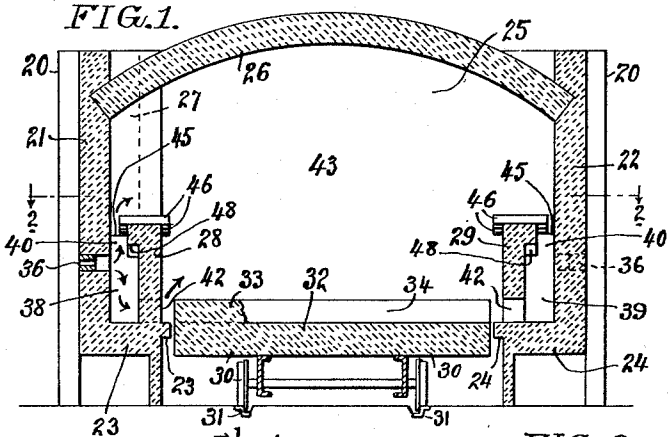


FIG. 4.

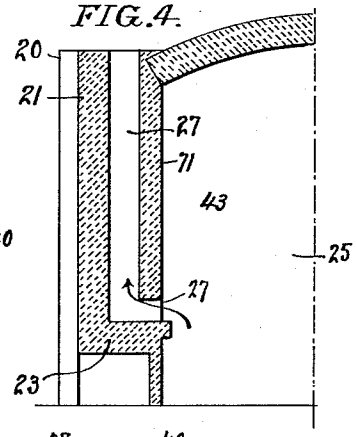


FIG. 2.

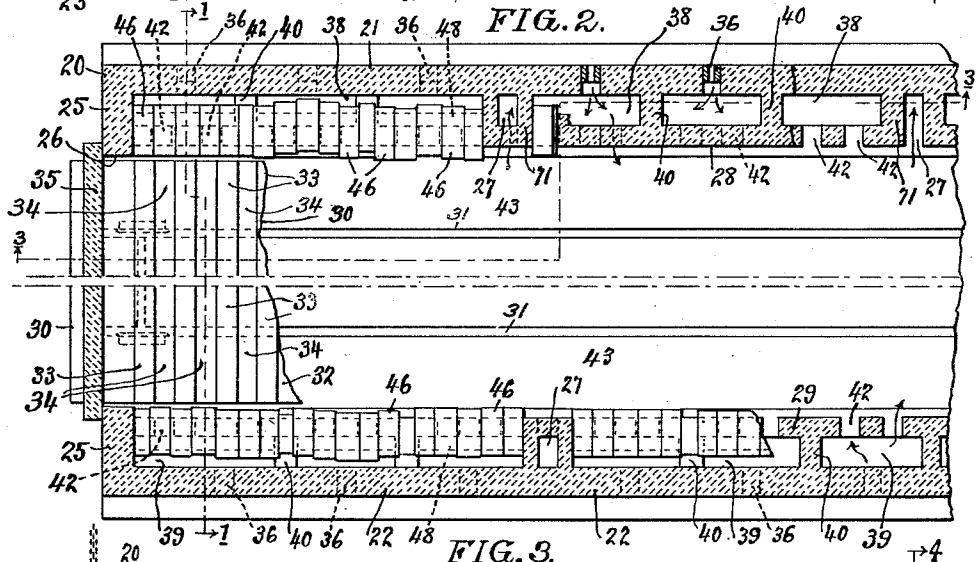
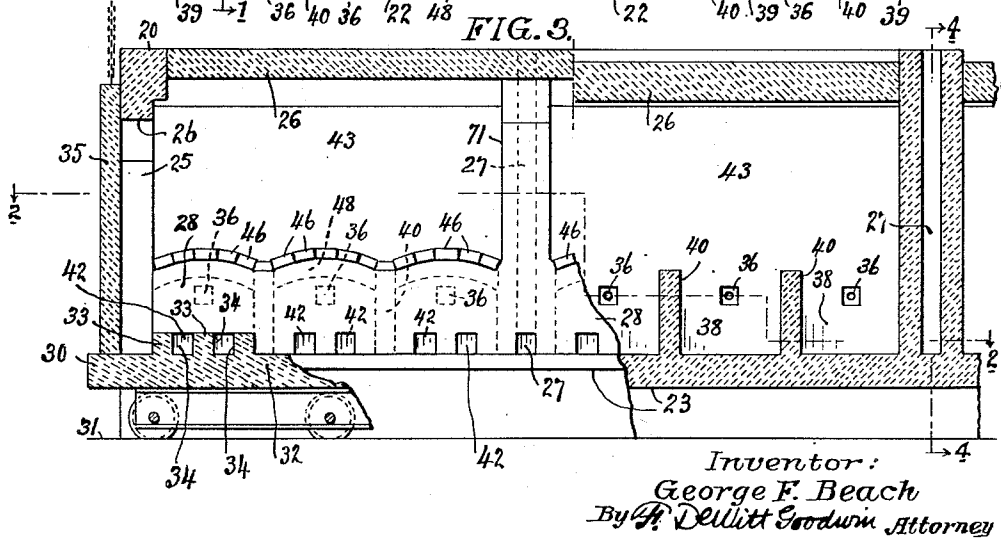


FIG. 3.



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Nov. 6, 1928. 1,690,710

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FURNACE

Filed June 4, 1926 3 Sheets-Sheet 2

FIG. 5.

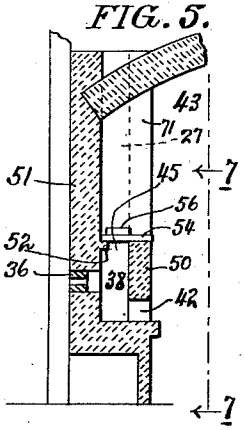


FIG. 6.

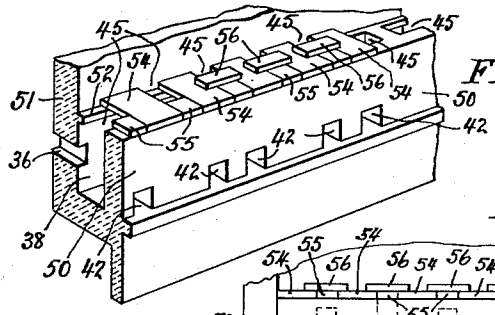


FIG. 7.

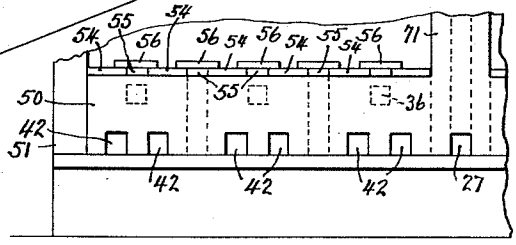


FIG. 8.

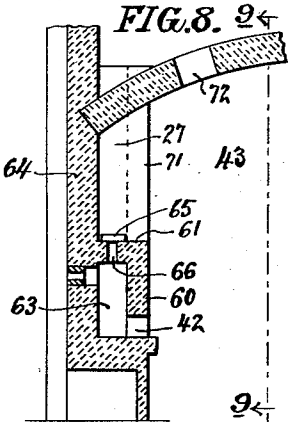


FIG. 9.

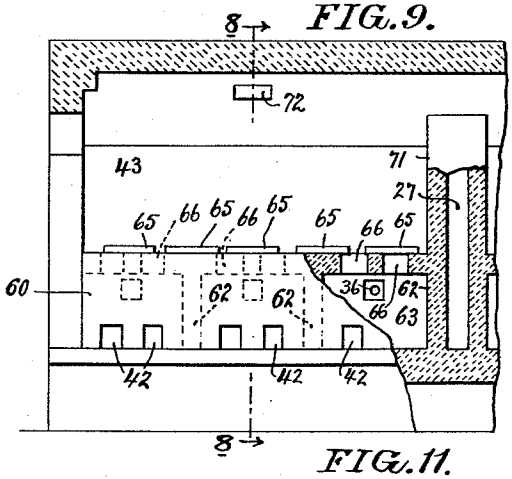


FIG. 10.

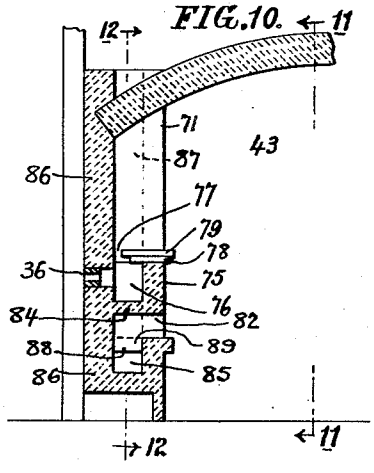
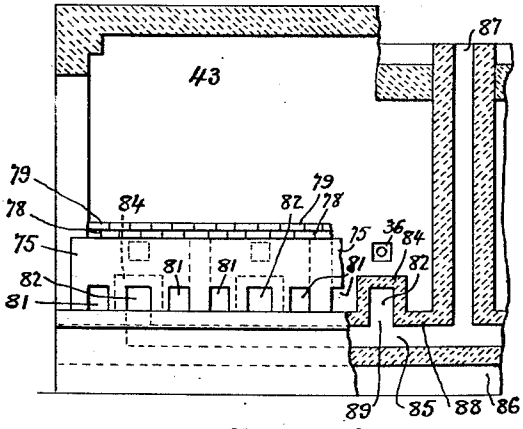


FIG. 11.



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Nov. 6, 1928. 1,690,710

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FURNACE

Filed June 4, 1926 3 Sheets-Sheet 3

FIG. 12.

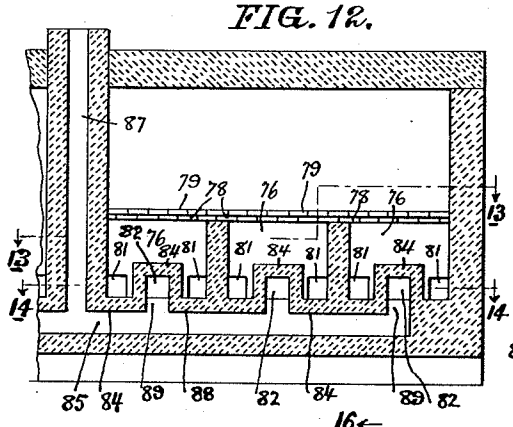


FIG. 13.

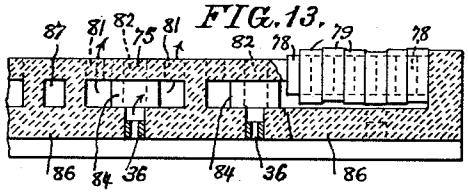


FIG. 14.

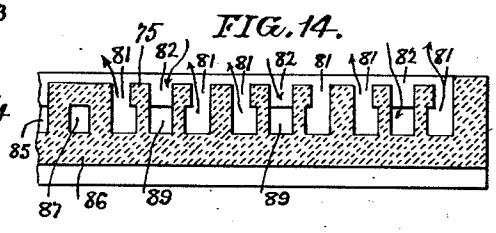


FIG. 15.

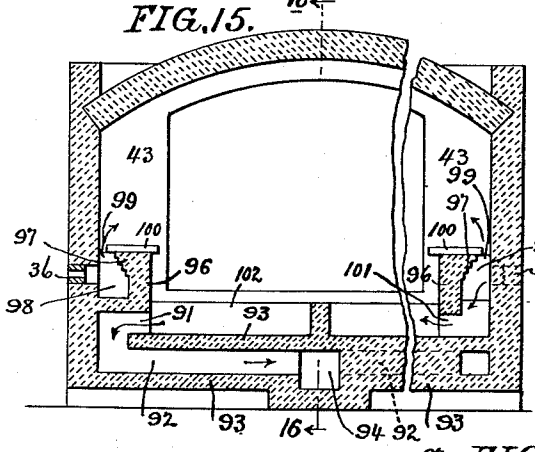


FIG. 16.

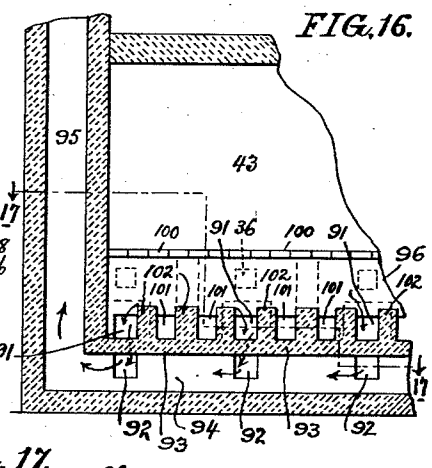
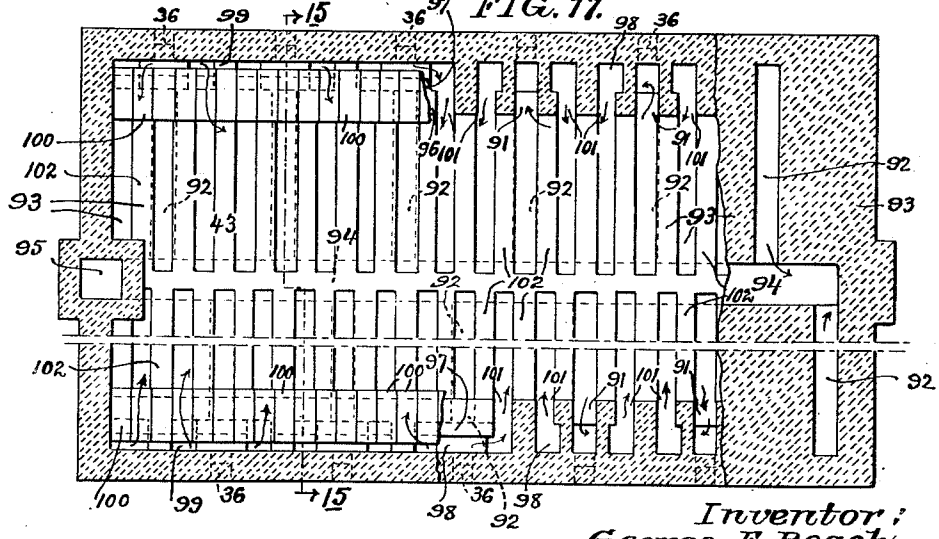


FIG. 17.



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Patented Nov. 6, 1928. 1,690,710

UNITED STATES PATENT OFFICE.

GEORGE F. BEACH, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO F. J. RYAN & COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF DELAWARE.

FURNACE.

Application filed June 4, 1926. Serial No. 113,634.

My invention relates to improvements in furnaces and particularly relates to annealing and heat treating furnaces, of the side fire type, adapted for burning oil, gas, or coal, as distinguished from electrically heated furnaces.

The object of my invention is to construct a furnace in which a more uniform distribution of heat is obtained than heretofore; a further object of my invention is to construct a furnace having fire inlet or distributing chambers provided with upper and lower outlet heat vents leading into the main heating chamber and providing means for adjusting the size of one of said heat vents, by which arrangement the temperature in different parts of the heating chamber may be controlled, and thus maintain as much heat adjacent to the hearth as immediately under the roof of the furnace; a further object of my invention is to so construct the furnace that a uniform distribution of the heat may be obtained from a single row of burners, and a still further object of my invention is to provide various novel forms of construction, and arrangements, of the heat flues, and vent flues, for carrying out my invention, as will be more fully hereinafter described and claimed.

Referring to the accompanying drawings; Fig. 1 is a transverse vertical section, as on line 1—1 of Fig. 2, of a furnace embodying my invention; Fig. 2 is a horizontal section of the furnace, as on lines 2—2, Figs. 1 and 3; Fig. 3 is a vertical longitudinal sectional view, as on line 3—3, Fig. 2; Fig. 4 is a partial transverse vertical section on line 4—4, Fig. 3; Fig. 5 is a partial transverse vertical section of a furnace showing a different construction of the bridge wall from that shown in Fig. 1; Fig. 6 is a partial perspective view of Fig. 5; Fig. 7 is a vertical longitudinal section on line 7—7, Fig. 5; Fig. 8 is a vertical sectional view similar to Fig. 5, showing a still different form of bridge wall; Fig. 9 is a vertical longitudinal sectional view on line 9—9, Fig. 8; Fig. 10 is a view similar to Fig. 5 showing a different construction for the exhaust vent flues; Fig. 11 is a vertical longitudinal section on line 11—11, Fig. 10; Fig. 12 is a partial vertical longitudinal section on line 12—12, Fig. 10; Fig. 13 is a partial horizontal section on line 13—13, Fig. 12; Fig. 14 is a partial horizontal section on line 14—14, Fig. 12; Fig. 15 is a transverse vertical section as on line 15—15, Fig. 17, of a furnace illustrating a different form of exhaust vent; Fig. 16 is a vertical longitudinal section on line 16—16, Fig. 15; and Fig. 17 is a sectional plan view on line 17—17, Fig. 16.

Referring to the accompanying drawings, in which like reference characters refer to like parts, 20 represents a furnace comprising side walls 21 and 22, bottom walls 23 and 24, end walls 25, a roof 26, and bridge walls 28 and 29 extending parallel with the side walls 21 and 22. The side walls 21 and 22 are provided with exhaust vents 27, and the end wall 25 is provided with an opening, or doorway 26, through which a car 30, mounted upon rails 31, may be moved into or out of the furnace and occupy a central space formed between the horizontal walls 23 and 24, as illustrated in Fig. 1. Upon the car 30 is formed a hearth 32, which also forms the body of the car 30. Said hearth 32 is provided with transverse ribs, walls, or hearth bars 33, upon which the metal to be treated by the furnace is supported. Spaces between the transverse ribs, or walls, 33, form grooves, or passageways, 34, for the heat to be directed to the under side of the charge supported upon said ribs 33. Said ribs 33 and passageways 34, are so located upon the car that the passageways 34 will be located directly in alignment with the lower heat vents 42, formed in the bridge walls 28 and 29, when the car is in the operative position, as shown in Figs. 1 to 3, as will be more fully hereinafter described. The end wall 25 is provided with a vertically sliding door 35 adapted for closing the end opening 26 of the furnace. Said door 35 rests upon the body or hearth 32 of the car 30, as shown in Fig. 3.

Burners 36 are provided for supplying the heat to the furnace. Said burners are arranged in a single row in each of the side walls 21 and 22 and supply heat to the heat distributing chambers 38 and 39, formed between the bridge walls 28 and 29 and the side walls 21 and 22, respectively, as shown in Fig. 1. Said heat distributing chambers are separated by transverse division walls 40 forming partitions, for limiting the length of the heat distributing chambers, so

that the heat from each burner 36 may be controlled within the heat distributing chambers 38 and 39.

The bridge walls 28 and 29 are each provided with a series of heat vents 42, located immediately above the horizontal bottom walls 23 and 24, and on the same plane as the top surfaces of the body 32 of the car 30 and in alignment with the heat passageways, or grooves 34 formed between the hearth bars 33 upon the body 32 of the car, thus directing the heat through said heat vents 42 to the heating chamber 43 adjacent to the lower portion of the charge or underneath the charge, resting upon the hearth bars 33.

The heat distributing chambers 38 and 39, as shown in Figs. 1 to 3, are each provided at the top thereof with a restricted heat vent 45, which vent 45 extends the length of each heat distributing chamber formed between the transverse division walls 40, and communicates with the heating chamber 43. Upon the top of the bridge walls 28 and 29 are movably mounted tiles 46, adapted to be adjusted upon the top of the bridge wall so as to regulate the size of the heat vent 45 formed at the top of the heat distributing chambers 38 and 39, thus when it is desired to direct the heat towards a charge which does not extend to the upper portion of the heating chamber 43, but is located low upon the hearth bars 33, said tiles 46 may be adjusted to a position which will close, or partially close, the heat vents 45, thus causing the heat to pass out through the series of heat vents 42 adjacent to the charge upon the hearth bars 33. When the charge extends from the hearth bars 33 adjacent to the upper portions of the heating chamber 43, the tiles 46 may be moved so as to increase the width of the upper heat vents 45, thus allowing more heat to pass out through the vents 45 to the upper portion of the furnace, by thus providing movable tiles 46 upon the bridge wall, the size of the upper heat vents 45 may be varied so as to obtain any desired distribution of the heat from the heat distributing chambers 38 and 39 to either the upper or lower portions of the heating chamber 43 as desired.

The bridge walls 28 and 29 as shown in Fig. 1, are each provided with an extension portion 48, adapted to overhang the heat distributing chambers 38 and 39 and support the tiles 46 which are loosely mounted thereon. The upper surface of the bridge wall 28 is thus increased in width by the extension 48 so that a tile of standard length may be supported and balanced thereon when moved into a position to close the vent 45, thus avoiding the necessity of reducing the width of the heat distributing chambers 38 and 39. The top surface of the bridge walls 28 and 29 are arched, as shown in Fig. 3, and the surface of the projection 48 upon said bridge wall is formed with the same curvature as the top surface of the bridge wall. The tiles 46 are loosely placed transversely upon said curved surface of the bridge walls, as shown in Figs. 2 and 3, and may be adjusted transversely upon the bridge walls to vary the size of the heat vents 45, as shown in Figs. 1 and 2.

Figs. 5, 6 and 7 illustrate a furnace having a bridge wall 50 provided with a straight or horizontal top surface, which permits the tiles to be laid in a straight line along the top surface of the bridge wall, as shown in Fig. 7. The inner surface of the side walls 51 may be formed of brick work having a corbeled portion forming a projection 52, as shown in Figs. 5 and 6, which projection overhangs the heat distributing chamber 38. Said projection 52 is located on the same horizontal plane as the top of the bridge wall 50, and forms a support for one end of the tiles 54 which are also supported at their opposite ends upon the bridge wall 50. The tiles 54 are arranged upon the bridge wall 50 and the support 52, so as to reduce, or regulate, the size of the upper heat vent 45, through which the heat passes from the distributing chamber 38 to the upper portion of the heating chamber 43. Between the tiles 54 are placed spacing tiles 55 for positioning the tiles 54 at uniform distances throughout the length of the distributing chambers 38. Supported upon the tiles 54 are tiles 56 adapted for further closing, or partially closing, the spaces between the tiles 54, thus providing means for regulating the size of the upper heat vents 45 when it is desired to direct the greater part of the heat from the distributing chamber 38 through the lower heat vents 42 to the lower portion of the heating chamber 43. By this construction the upper heat vents 45 may have a greater width than that shown in Fig. 1, in which the extension portion 48 of the bridge wall forms a greater obstruction for the heat when it is desired to utilize the full capacity of the upper heat vents 45. By supporting both ends of the tiles 54, as shown in Figs. 5 and 6, the tiles are less likely to crack and break, due to the extreme heat, than they are when supported at one end only, as shown in Fig. 1.

Figs. 8 and 9 illustrate a form of my improved furnace in which the bridge wall 60 is provided with a top wall 61 extending horizontally over the heat distributing chamber 63. Said top wall 61 is also built integral with the side wall 64 of the furnace and also with the transverse walls 62 which separate the adjacent distributing chambers 63. The top wall 61 is provided with a series of vertical openings from the distributing chamber 63 to the upper portion of the heating chamber 43.

Upon the top surface of said wall 61 are loosely placed tiles 65 which are adapted to cover or partially cover the heat vents 66 adapted for varying the size of said vents for regulating the volume of heat which may pass to the upper portion of the heating chamber 43. By reducing the size of the heat vents 66 with said tiles 65, the heat from the heat distributing chamber 63 may be directed through the lower heat vents 42 into the lower portion of the heating chamber 43. Said top wall 61 may be either of flat construction, as shown in Figs. 7 and 8, or of arched construction similar to that shown in Fig. 3.

The forms of furnaces shown in Figs. 1 to 9, inclusive, have exhaust vents 27 formed by the vertical flue walls 71 formed upon the walls 21, 22, 51 and 64, and are adapted for carrying off the products of combustion. Figs. 8 and 9 also show an exhaust vent 72 formed in the roof of the furnace.

Figs. 10 to 14 illustrate a furnace having a bridge wall 75 forming a distributing chamber 76 having an upper heat vent 77 provided with adjustable tiles 78 and 79 adapted for varying the size of the upper heat vents 77. Said bridge wall 75 may be constructed with vertical sides, instead of being corbeled, and one or more loose tiles 78, varying in size, are provided for better supporting the top tiles 79 which are of greater length than the supporting tiles 78, so that the end of the upper tiles 79 may be placed adjacent to the side wall 86 to close the vent 77. The supporting tiles 78 provide additional supporting means for the overhanging ends of the top upper tiles 79, thus reducing the possibility of the latter breaking off due to the intense heat in the distributing chambers 76. The tiles 78 and 79 may be readily removed when it is desired to allow a great amount of heat to pass out of the upper vents 77.

The bridge wall 75 is provided with lower heat vents 81 leading from the heat distributing chamber 76 into the lower portion of the heating chamber 43. The bridge wall 75 is also provided with an exhaust vent 82, positioned between the heat vents 81. A transverse flue wall 84 encases the exhaust vent 82 and separates said vent 82 from the distributing chamber 76. The vent 82 communicates with a horizontal passageway or flue 85 formed longitudinally along the side wall 86 and communicates with a vertical exhaust flue 87. The horizontal flue 85 extends below the horizontal wall 88 which separates said vent 81 from the distributing chambers 76. Said wall 88 is provided with vertical openings 89 forming a communicating passageway from the vent 82 to the horizontal flue 85.

The form of furnace illustrated in Figs. 15 to 17, embodies a general construction similar to the form shown in Figs. 10 to 14, with the exception that the exhaust vent 91 communicates with a transverse horizontal flue 92, formed in the bottom wall 93 of the furnace. Said transverse flues 92 communicate with a flue 94, extending horizontally throughout the longitudinal center line of the furnace. The end of the flue 94 communicates with a vertical flue 95 adapted for carrying off the products of combustion from all of the transverse flues 92, which are connected, as shown in Fig. 17, with the central flue 94. The bottom wall 93, in the form of furnace illustrated in Figs. 15 to 17, forms the hearth of the furnace, as distinguished from the furnaces illustrated in Figs. 1 to 14, in which the hearth is mounted upon a car adapted to be moved into and out of the furnace for carrying the charge of metal which is to be treated.

Figs. 15 to 17 also show a bridge wall 96 provided with a corbeled portion 97, overhanging the distributing chamber 98, and forming an additional support for the adjustable tiles 100 adapted for regulating the upper heat vent 99 leading into the heating chamber 43. The bridge wall 96 is also provided with lower heat vents 101 through which the heat from the distributing chamber 98 and the burner 36 may be directed to the lower portion of the heating chamber 43 adjacent to the surface of the hearth 93. Upon the latter are formed ribs, or walls 102.

The various forms of furnaces above described embody the novel features of my invention and illustrate how changes in construction may be made in the furnaces without departing from my invention.

I claim:—

1. In a furnace of the character described, a casing forming a heating chamber, a heat distributing chamber within said casing having upper and lower heat vents communicating with the heating chamber, means for supplying heat to said distributing chamber and movable means located at the outlet of the upper heat vent for adjusting the size of the upper heat vent.

2. In a furnace of the character described, a casing forming a heating chamber, heat distributing chambers arranged in a row extending parallel with a side wall of the casing, a single burner for supplying heat to each distributing chamber, said distributing chambers each having upper and lower heat vents and movable means located at the outlet of the upper heat vent for adjusting the size of said upper heat vents.

3. In a furnace of the character described, walls forming a main casing including a heating chamber, a bridge wall within the casing located in spaced relation with a vertical wall of the casing forming a heat distributing chamber, means for directing heat into said distributing chamber, said heat

distributing chamber having upper and lower heat vents communicating with said heating chamber and a row of tiles adjustably supported adjacent to the upper one of said heat vents, said row of tiles extending throughout the length of said upper heat vent adapted for varying the size of said upper heat vent.

4. In a furnace of the character described, walls forming a main casing including a heating chamber, a bridge wall within the casing located in spaced relation with a vertical wall of the casing forming a heat distributing chamber, means for directing heat into said distributing chamber, said distributing chamber having upper and lower heat vents communicating with said heating chamber, a row of tiles adjustably positioned upon the bridge wall having portions extending over the upper heat vent adapted for varying the size of said upper heat vent, and means located adjacent to the top plane of the bridge wall forming additional support for said overhanging portions of the tiles.

5. In a furnace of the character described, walls forming a main casing including a heating chamber, a bridge wall within the casing located in spaced relation with a vertical wall of the casing forming a heat distributing chamber, means for directing heat into said distributing chamber, said distributing chamber having upper and lower heat vents communicating with said heating chamber, a member forming a rigid portion of the furnace extending over said upper heat vent, said member located adjacent to the upper portion of the bridge wall, and tiles loosely positioned upon said member adapted for varying the size of the upper heat vent.

6. In a furnace of the character described, side and top walls forming a main casing including a heating chamber, a bridge wall within the casing located in spaced relation with a vertical side wall of the casing and extending parallel thereto forming a heat distributing chamber having an upper heat vent, means for supplying heat to said distributing chamber, a projection formed upon the side wall of the casing adjacent to the top portion of said bridge wall, tiles adjustably supported upon said projection and upon the top of the bridge wall, adapted for varying the size of said upper heat vent, and said bridge wall having a heat vent formed therein located at the lower portion of the heat distributing chamber.

7. In a furnace of the character described, walls forming a main casing including a heating chamber, a bridge wall within the casing located in spaced relation with a vertical wall of the casing and extending parallel thereto, transverse vertical walls extending between said vertical wall of the casing and said bridge wall forming a series of heat distributing chambers separated by said transverse walls, means for supplying heat to said distributing chambers, said bridge wall having a heat vent formed therethrough located at the lower portion of said distributing chambers communicating with said heating chamber, and a series of tiles adjustably positioned transversely upon the bridge wall having one end of the tiles projecting over the edge of the bridge wall for varying the size of the space formed between the top of the bridge wall and said vertical wall of the casing whereby a restricted heat vent is provided at the upper portion of said distributing chambers.

8. In a furnace of the character described, walls forming a main casing including a heating chamber, a bridge wall within the casing located in spaced relation with a vertical wall of the casing forming a heat distributing chamber, means for directing heat into said distributing chamber, said distributing chamber having upper and lower heat vents communicating with said heating chamber, a layer of tiles loosely positioned adjacent to the top of the bridge wall adapted to restrict said upper heat vent, and a second layer of tiles loosely positioned upon the first mentioned layer of tiles adapted to further restrict said upper heat vent.

9. In a furnace of the character described, a casing having vertical walls, a roof, horizontal walls extending along opposite vertical walls, a hearth located between said horizontal walls, a bridge wall supported upon a horizontal wall and terminating midway between said horizontal wall and said roof, said bridge wall positioned parallel with and in spaced relation with a vertical side wall of the casing forming a heat distributing chamber, means for supplying heat to said distributing chamber, said bridge wall having heat vents formed therethrough forming a communication between the lower part of the heat distributing chamber and the heating chamber adjacent to said hearth, and a layer of tiles loosely positioned adjacent to the top of the bridge wall adapted for varying the size of the heat vent at the upper portion of the heat distributing chamber.

10. In a furnace of the character described, walls forming a main casing including a heating chamber, a bridge wall within the casing located in spaced relation with a vertical wall of the casing forming a heat distributing chamber, means for directing heat through said vertical wall of the casing into said distributing chamber, said heat distributing chamber having an upper heat vent and lower heat vents communicating with the heating chamber, and means for varying the size of the upper heat vent, a hearth positioned within the heating cham-

ber on a plane parallel with the lower portion of said lower heat vents, and hearth bars upon said hearth so positioned that the spaces between adjacent bars will align with said lower heat vents.

11. In a furnace of the character described, walls forming a main casing including a heating chamber, a bridge wall within the casing located in spaced relation with a vertical wall of the casing forming a heat distributing chamber, means for directing heat through said vertical wall of the casing into said distributing chamber, said heat distributing chamber having an upper heat vent and a lower heat vent communicating with the heating chamber, said bridge wall having an exhaust vent formed therein, a wall separating said exhaust vent from the heat distributing chamber, and said casing having an exhaust flue with which said exhaust vent communicates.

In testimony whereof I affix my signature.

GEORGE F. BEACH.