April 17, 1951 C. F. POLLEN 2,548,908

PORT END CONSTRUCTION FOR OPEN-HEARTH FURNACES

Filed May 18, 1945 6 Sheets-Sheet 1

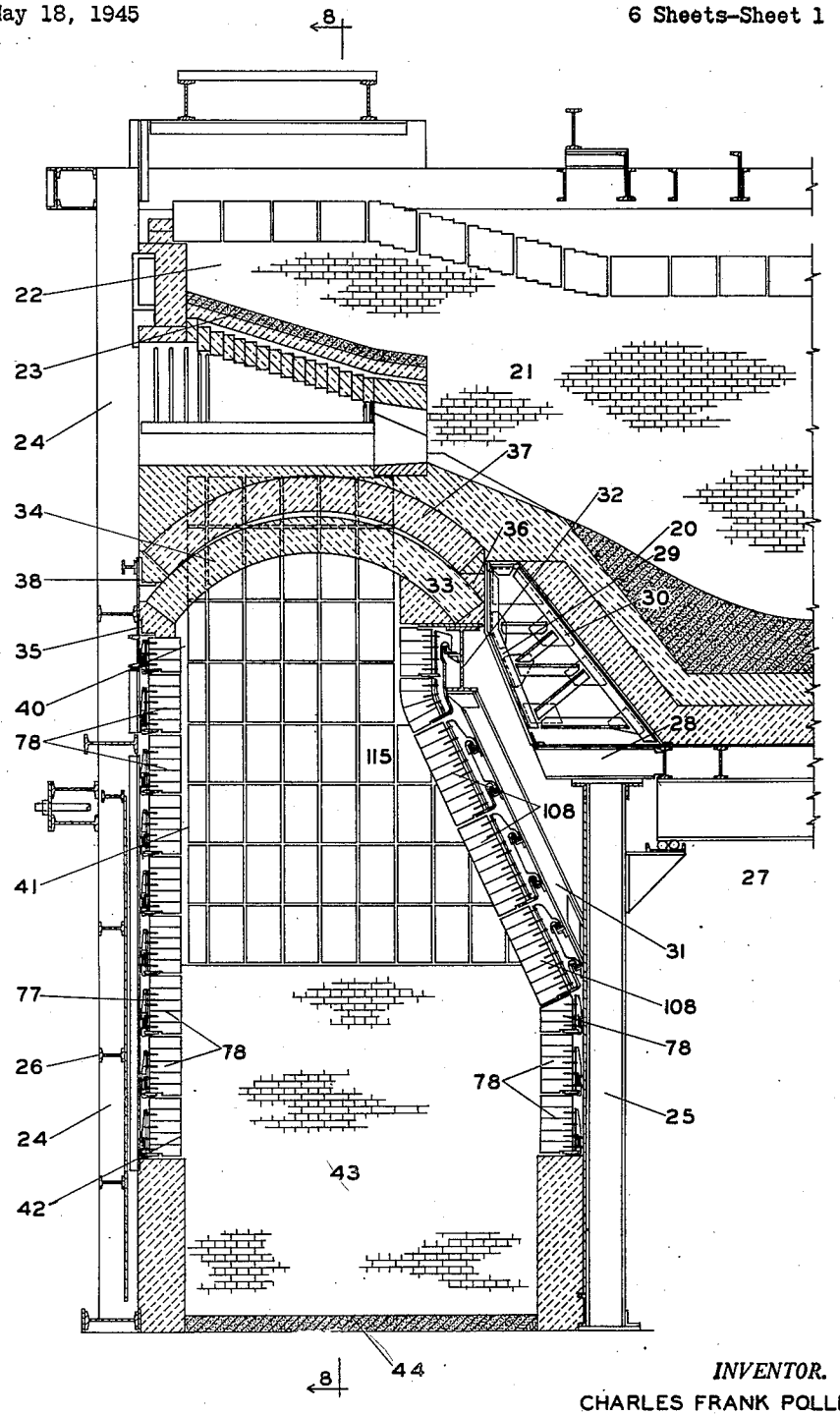


FIG. 1

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PORT END CONSTRUCTION FOR OPEN-HEARTH FURNACES

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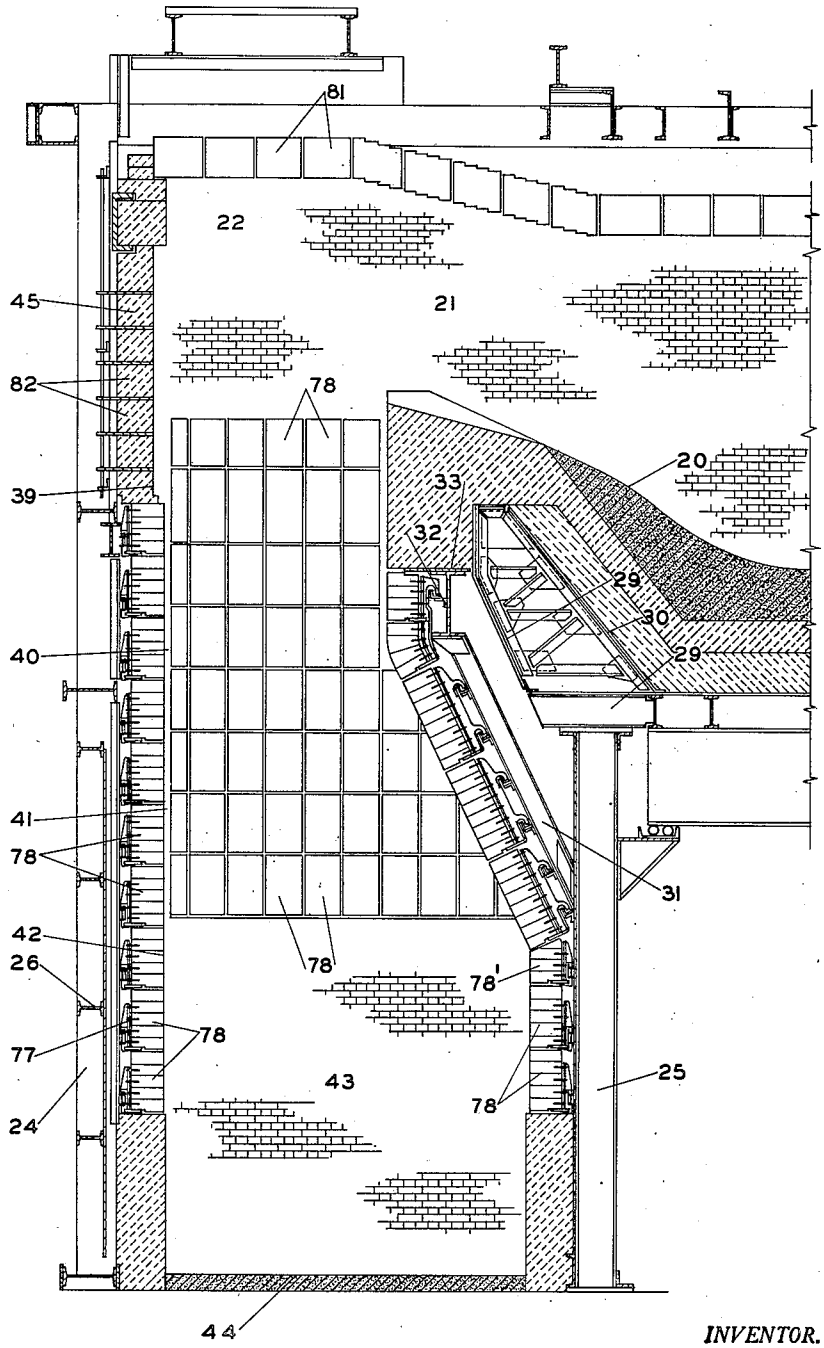


FIG. 2

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PORT END CONSTRUCTION FOR OPEN-HEARTH FURNACES

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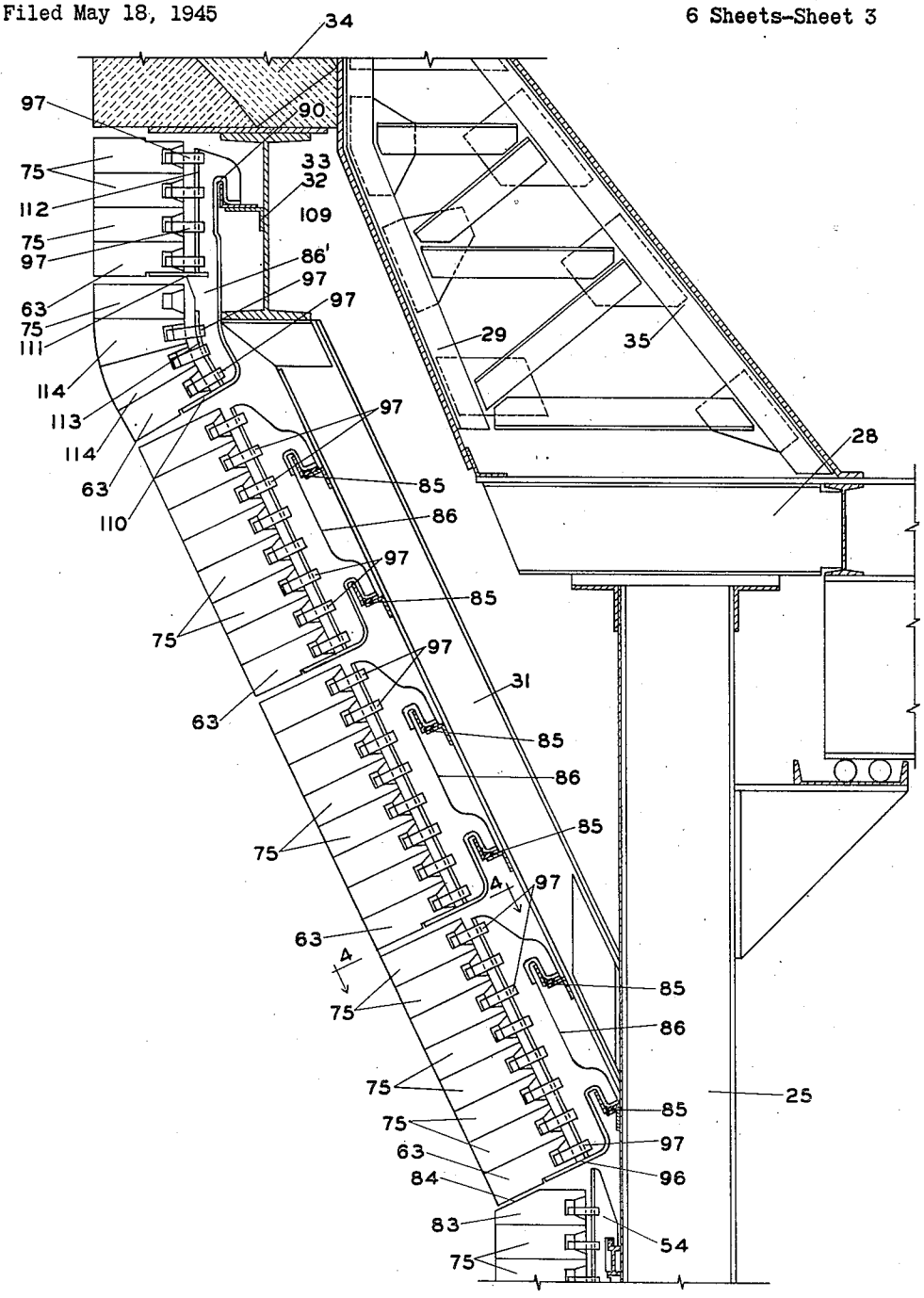


FIG. 3

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PORT END CONSTRUCTION FOR OPEN-HEARTH FURNACES

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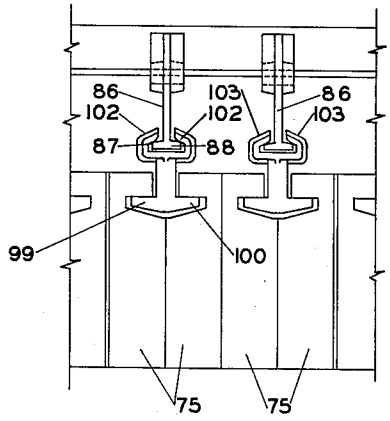


FIG. 4

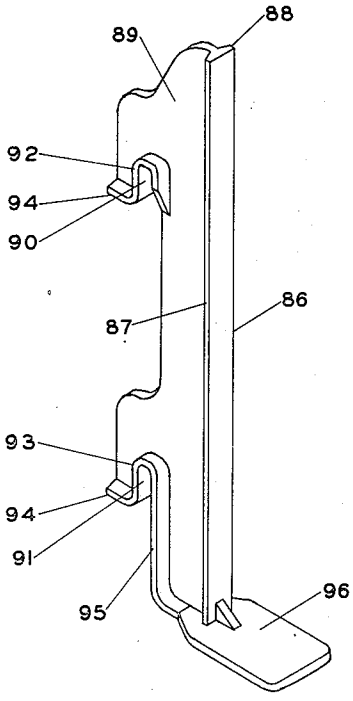


FIG. 5

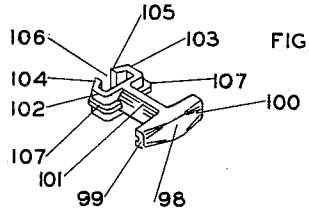


FIG. 6

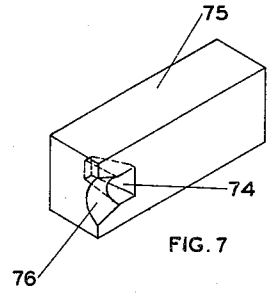


FIG. 7

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PORT END CONSTRUCTION FOR OPEN-HEARTH FURNACES

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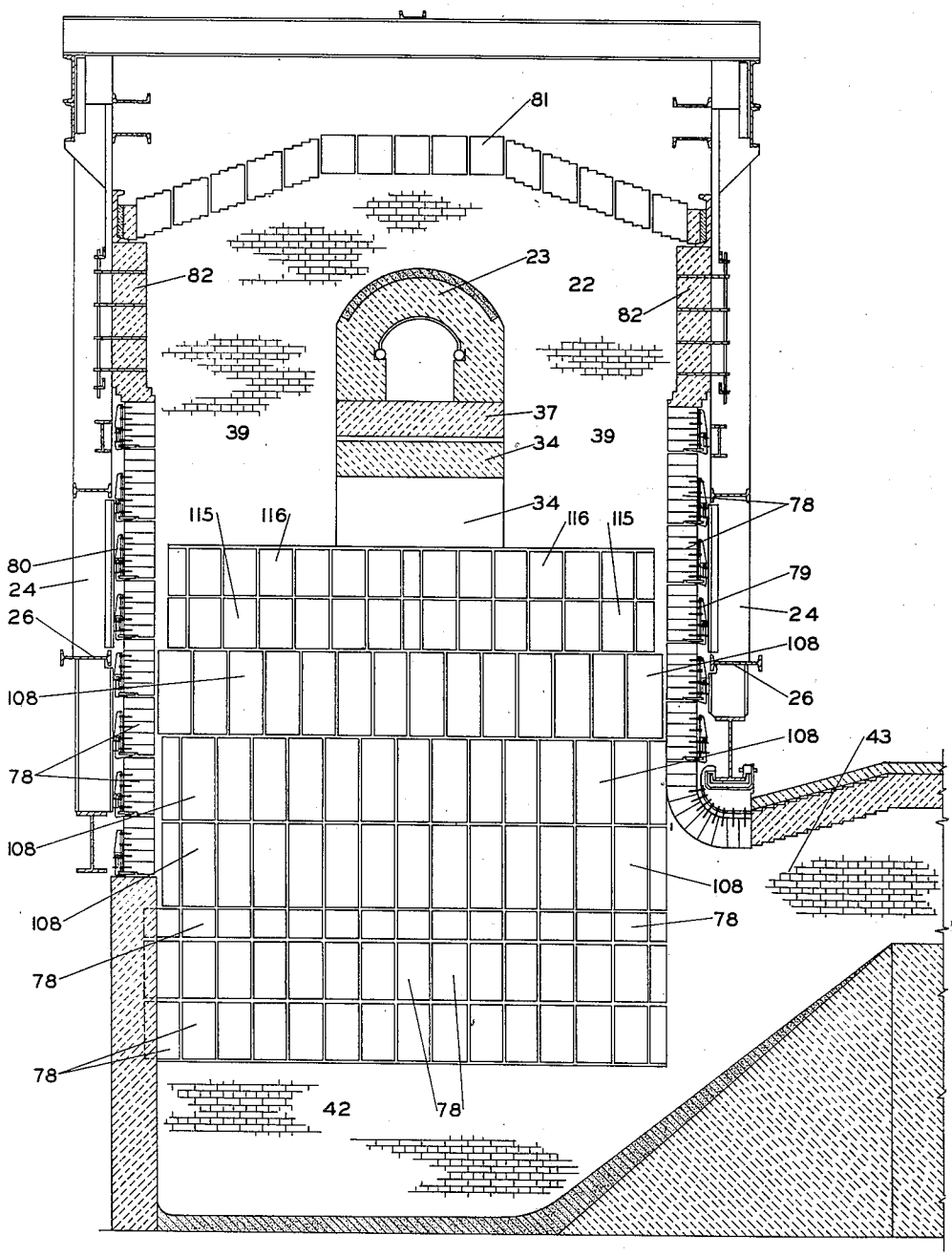


FIG. 8

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PORT END CONSTRUCTION FOR OPEN-HEARTH FURNACES

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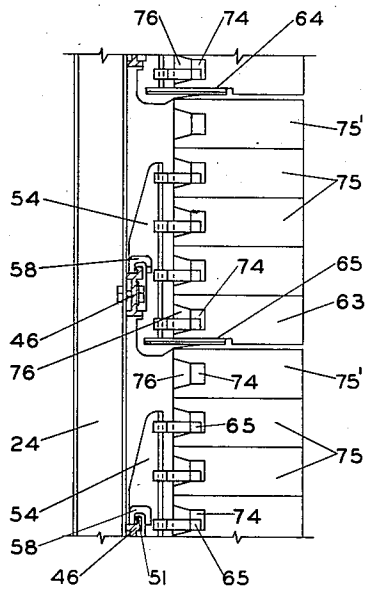


FIG. 9

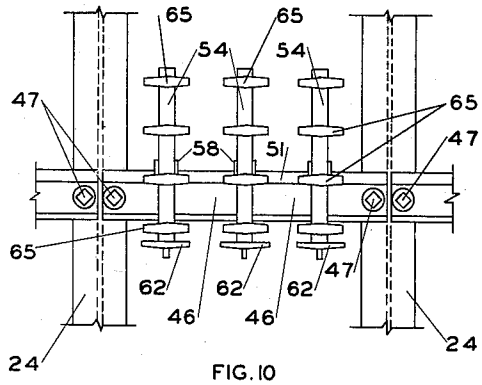


FIG. 10

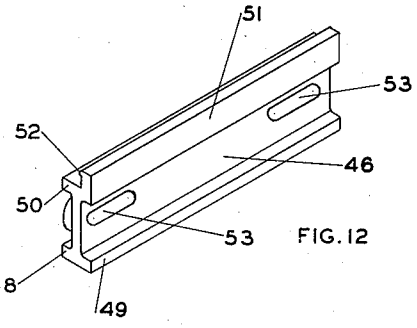


FIG. 12

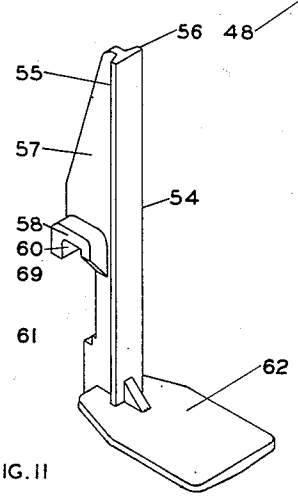


FIG. 11

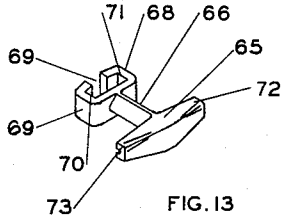


FIG. 13

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Patented Apr. 17, 1951

2,548,908

UNITED STATES PATENT OFFICE

2,548,908

PORT END CONSTRUCTION FOR OPEN-HEARTH FURNACES

Charles F. Pollen, Winnetka, Ill., assignor to M. H. Detrick Company, Chicago, Ill., a corporation of Delaware

Application May 18, 1945, Serial No. 594,454

7 Claims. (Cl. 263—15)

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My invention relates to port end construction for open hearth furnaces and particularly to the wall structure of the port chamber and the mounting for the burner supporting arch.

I have found that it is highly desirable to make the port end of an open hearth furnace with a lining made entirely of basic brick instead of the silica brick previously used. This change reduces the rate of destruction of the end wall where the hot gases from the hearth first strike it and are deflected downwardly. However, inasmuch as the basic brick is considerably heavier than silica brick, and temperatures up to 3000° Fahrenheit are encountered in the port end walls, it is desirable to have the load, due to the weight of the brick, supported from a framework including the steel buckstays outside the brick wall. The bricks heretofore have been laid so that they are under a cumulative load increasing on the lower brick as the height of the wall increases. Owing to the fact that basic bricks do not have a very high crushing strength at the temperatures encountered, this has resulted in the destructive spalling of the lower courses of the brick in the end wall.

It is accordingly a purpose of my invention to provide walls of the port end construction of an open hearth furnace, particularly in the port end chamber, that are supported at vertically spaced intervals to provide panels of desired height that are independently supported on said framework. I have found that a desirable height of panel in such a wall is about three feet, althought this can be varied as may be found desirable.

Another important feature of my invention is an improved mounting for the lower supporting arch at the port end of an open hearth furnace, whereby the high wall ordinarily provided in the throat or inlet passage of the port chamber between said arch and the burner mounting commonly known as the "doghouse," is eliminated. The elimination of the high burner supporting wall is accomplished by supporting the burner supporting arch from the buckstays independently of the walls of the port chamber at a point near the entrance end of the throat or inlet passage and by suspending the sloping arch or wall under the hearth. By so mounting the burner supporting arch, the throat or inlet portion of the port chamber is widened from immediately below the entrance thereto, the plurality of long narrow passages previously existing, due to the presence of the dividing burner supporting wall, being replaced by a single wide passage.

Due to this widening of the throat or inlet portion of the port end chamber and the downwardly widening character of said chamber at the portion thereof that joins the upper narrower portion thereof with the lower wider portion thereof, the gases passing from the open hearth into the port chamber, in which are entrained particles of various materials, are slowed down so that the rapid flow thereof previously experienced in port end chambers is reduced sufficiently that the entrained particles are largely, if not entirely, dropped from the gases onto the bottom of the port chamber and thus do not pass to the checker chamber to which the said gases are led from the port chamber to heat up the checker work for the usual heat exchange purposes.

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My port end construction for open hearth furnaces, as a result of the above pointed out features, provides longer life of the brick work, reduces the length of time required for cleaning out the port chamber or slag pocket and the checkers, produces cleaner checkers, and, due to the fact that the furnace can operate for longer periods without being cleaned, produces more steel per year than where my port end construction is not used.

Among the important advantages of my invention is the fact that due to the slowing down of the flow of the gases and the elimination of molten silica, these are reduced in temperature in the slag pocket and the slag that is deposited in the settling chamber provided in my improved port chamber is of a granular rather than of a glassy character as was the case with the silica and high temperatures encountered in the previously known port chambers.

It is a further purpose of my invention to provide means for supporting a wall made up of refractory units comprising a framework upon which hanger brackets are mounted, said framework including the buckstays ordinarily provided in port end construction for open hearth furnaces, said brackets being provided with means for connecting the same with the individual refractory units of the wall so that adjustment of the position of the members, for assembly thereof and to allow for the difference in expansion and contraction of the refractory material and the metal of the framework due to temperature changes, can take place, said units being supported in sections so that panels of a predetermined vertical height are independently supported from the framework.

It is a particular purpose of my invention to provide a port end chamber that is provided with an upper portion of substantially uniform trans-

verse section, a lower portion of substantially uniform transverse section wider than the upper portion, and a widening portion between said upper and lower portions, said widening portion having downwardly diverging walls, including a wall that is inclined so as to diverge downwardly from the opposing wall of said chamber, and to provide means for suspending the said wall of refractory material from the framework.

Other objects and advantages of my invention will appear as the description of the drawings proceeds. I desire to have it understood, however, that I do not intend to limit myself to the particular details shown or described except as defined in the claims.

In the drawings:

Fig. 1 is a view partly in elevation and partly in section of the port end of an open hearth furnace embodying my invention, taken through the burner supporting arch.

Fig. 2 is a view similar to Fig. 1, taken to one side of the burner supporting arch.

Fig. 3 is a fragmentary view partly in elevation and partly in section of a portion of the port chamber wall and arch support.

Fig. 4 is a fragmentary detail view taken substantially on the line **4**—**4** of Fig. 3.

Fig. 5 is a perspective view of one of the hanger brackets used in suspending the inclined wall portion of the port chamber.

Fig. 6 is a perspective view of the connecter used between the refractory members and the hanger.

Fig. 7 is a perspective view of one of the refractory members used in my improved port end wall construction.

Fig. 8 is a section taken substantially at right angles to Fig. 1 on the line **8**—**8** of Fig. 1.

Fig. 9 is a fragmentary view partly in elevation and partly in vertical section of a vertical wall of said port end chamber.

Fig. 10 is a fragmentary elevational view of the framework for supporting the refractory members used in Fig. 9, the refractory members being omitted, but showing the supporting hanger brackets and connecters carried thereby.

Fig. 11 is a perspective view of one of the hanger brackets used in supporting the refractory members of a vertical wall of my improved port end construction.

Fig. 12 is a perspective view of one of the transverse frame members used therein and,

Fig. 13 is a perspective view of the connecter used between the refractory elements and the supporting brackets in Fig. 11.

Referring in detail to the drawings, my improved port end construction is shown as being applied to an open hearth furnace having a hearth **20**, which is open through a wide passage **21** to a chamber **22** in which a burner mounting **23** is located, said burner mounting being of a conventional construction and being commonly known as the "doghouse."

In an open hearth furnace of the character to which my invention is applied there is a burner mounting **23** open through the passage **21** to the hearth **20** on each end of the hearth and it is customary to operate the burners, which are ordinarily oil burners, but can be any other suitable fuel burners, alternately on opposite ends of the furnace. My invention is applied to an open hearth furnace of this type in which the products of combustion in the open hearth comprising gases and entrained materials carried by said gases are discharged from the opposite end of the furnace from that at which the burner is operating, and after passing through suitable passages and chambers in that end of the furnace, pass through a checker-work in a chamber commonly called the "checker," which is utilized to heat the incoming air for supporting combustion for the burner next operating.

After heating this checker by means of these heated gases for a predetermined interval, the operation of that burner is halted and the operation of the opposite burner is started, and the air supplied to this last mentioned burner is passed through the checker that has been previously heated in the manner above set forth. When the second mentioned burner is in operation the heated gases from the furnace are supplied, in the same manner as pointed out above, to a checker associated with the port chamber at the end of the furnace at which the first burner had been operating, for the purpose of heating the air to be supplied to the first mentioned burner during its next period of operation. This alternate operation of the burners and alternate heating of the checkers by the hot gases continues throughout a run of the furnace.

The port end construction at only one end of the furnace is shown in the drawings, as the construction is the same at the opposite ends of said furnace. My invention relates only to the port end construction and only so much of the adjacent furnace structure is shown as is necessary to an understanding of the invention.

The port end of a furnace of the character referred to above is provided with frame members, including the vertical frame members or buckstays **24** and the vertical frame members **25**. Mounted on said vertical frame members **24** and connecting the same are horizontal frame members **26**. The frame members **25** have the hearth supporting beams **27** mounted thereon and framework members **28**, **29** and **30**, which are provided with suitable transversely and obliquely extending bracing members to form a support for one end of the hearth **20**. Extending obliquely from the vertical frame members or columns **25** are inclined frame members **31**, upon which the beam **32** is mounted, which has a plate **33** mounted thereon for supporting one end of the arch **34**, the other end of the arch **34** being supported on an angle **35** secured to the buckstays **24**. A support **36** for one end of a second arch **37** is provided on the beam **32**, said support being built up on the plate **33**, and the other end of the arch **37** is supported by means of the angle member **38** mounted on the buckstays **24**. The arch **37** also rests at its ends upon the arch **34**, the two arches **34** and **37** thus comprising a burner supporting arch structure, upon which the "doghouse" **23** is supported.

The arches **34** and **37** are of the same width, and correspond in width to the lower portion of the "doghouse" **23**, thus occupying only a portion of the width of the chamber **22** provided in the port end of the furnace beyond the hearth **20**. A passage **39** is thus provided on each side of the arched support for the doghouse, which leads into the port chamber provided in my improved port end construction. Said port chamber is of substantially the same length from top to bottom thereof as viewed in Fig. 8, but varies in width, the upper or inlet portion **40** thereof being of uniform width as viewed in Figs. 1 and 2 and having the arches **34** and **37**, together comprising the burner supporting arch, located in the upper end thereof, said passages **39** being on op-

posite sides of said arch construction in the upper end of said inlet chamber portion 40. Below the upper inlet portion 40 of the chamber a gradually widening portion 41 is provided, and the bottom portion 42 of said port chamber is of uniform horizontal cross sectional area and constitutes a settling chamber, from which a passage 43 extends laterally to the checker with which said port end chamber is associated.

By providing a support for the burner mounting 23 by means of the arch construction made up of the lower arch 34 and the upper arch 37 mounted directly thereon, a tall dividing wall in the port chamber, as ordinarily constructed, is avoided, and very short inlet passages 39 are provided leading to the single wide upper inlet portion 40 of the port end chamber, which in turn leads into the gradually downwardly widening chamber portion 41 connecting the inlet portion 40 with the settling chamber 42. The heated gases passing through the passage 21 into the space 22 at the one end of the hearth in which the burner mounting 23 is mounted, and down through the passages 39 are moving at high velocity. Upon passing through the short passages 39 into the short, much wider inlet chamber 40 the velocity of the gases is reduced, and due to the slowing up of the travel thereof the temperature thereof also is reduced as these pass from the upper portion 40 into the downwardly widening portion 41 thereof and into the lower settling portion 42 thereof. This results in the slag, carried in a molten state in the gases, deposited on the bottom or floor 44 of the settling chamber, being deposited in a granular rather than a glassy form, making the removal thereof much simpler. Also due to the slowing down of the rate of flow of the gases discharged from the hearth into the port end chamber, because of the construction above referred to, other entrained materials are not carried into the passage 43 leading to the checker, but are deposited on the floor 44 of the port end chamber, thus resulting in cleaner checkers and increasing the length of time that a furnace of this character can be operated without cleaning the checkers.

It is highly desirable to make the walls of the chamber 22 and of the chamber comprising the inlet portion 40, the downwardly widening portion 41 and the settling chamber 42 of basic brick instead of silica brick, as such basic brick will resist higher temperatures than the silica brick. This is particularly desirable at the wall portion 45 opposite the passage 21, which deflects the highly heated gases passing from the hearth downwardly into the passages 39 and into the upper portion 40 of the port end chamber. Due to the fact that basic brick does not have the high crushing strength, at the temperatures encountered, that would be necessary to support the load of the wall as ordinarily constructed, I have provided means for sectionally supporting the walls of the port end construction. Panels, of desired size, of said wall are supported from a framework, the usual buckstays being utilized as portions thereof.

Buckstays 24' connected by means of transversely extending frame members 26' constitute the vertical members of framework portions that serve to support the refractory units of the wall extending above the passage 43 leading to the checker and the wall opposite thereto, in the same manner as the buckstays 24 support the refractory units of the outer end wall of the port end of the furnace. Referring to Figs. 9 and 10, buckstays 24 are shown, to which transverse frame members 46 are secured, the same being shown as being secured by means of bolts 47 to said buckstays 24. The frame members 46 are similarly secured to the buckstays 24', and the wall panels being mounted in the same manner on the buckstays 24' as on the buckstays 24, only the mounting thereof on the buckstays 24 is shown and described in detail.

Said frame members 46 are provided with oppositely extending bottom flanges 48 and 49 extending laterally therefrom, and with a laterally extending flange 50 along the top thereof. An upstanding flange 51 having a rearwardly extending lip 52 thereon is also provided along the top portion of the frame member 46, said frame member being shown in detail in Fig. 12. The frame members 46 are secured to the vertically extending frame members 24 at predetermined spaced intervals, each of said transverse frame members 46 supporting a panel of a vertical wall of the port end chamber. Longitudinally extending slots 53 are also provided in the frame members 46 that receive the shanks of the bolts 47 securing the same to the vertical frame members 24.

Mounted on each of the frame members 46 is a plurality of supporting hanger brackets 54. One of said brackets 54 is shown in detail in Fig. 11 and comprises a vertically extending body portion provided with laterally extending flanges 55 and 56, and having a web portion 57 that gradually widens from the upper end of said body portion to a point spaced from a laterally extending reinforcing rib 58 that is provided on each side of said web portion above the recess 59 provided therein. Said ribbed portion is of a U-shaped character and said web portion is recessed at said ribbed portion to provide a socket portion 60 in said supporting bracket 54, which receives the upstanding flange 51 therein, one wall of said socket being engaged by the rib 52 on said flange, as will be obvious from Fig. 9.

The recess 59 is provided with an offset therein providing a shoulder at 61, which is engaged by the rib 49 when the bracket is assembled with the transverse frame member 46. Said bracket thus serves as a hanger that is supported by the frame member 46 and is adapted to be slid lengthwise thereof to adjust the position of the member 54 relative to said frame member. The spacing and the number of brackets between adjacent vertical frame members 24 may be varied, the number shown being merely for purposes of illustration. Said bracket is provided with a wide flat shelf portion 62, which extends laterally from the body portion 54 in the opposite direction to the web 57.

When the bracket members 54 are placed in position on a frame member 46 a pair of refractory units 63 are placed on the shelf-like member 62 of each of said brackets, said units being, preferably, offset at 64 on the under face thereof to accommodate the shelf-like member 62. A connecting member having a transverse head portion 65, a connecting shank portion 66, and the oppositely directed hook flanges 67 and 68 spaced from each other to provide a slot 69, is engaged with the bracket 54 at the upper end thereof and slid downwardly, the flanges 55 and 56 engaging in the recesses 70 and 71 provided by said hook flanges, so as to interlock said connecting member with said bracket 54, the arms 72 and 73 of the head portion 65 entering the tapering recesses 74 (see Fig. 7), of the refractory units to

thus prevent movement of the refractory units lengthwise of the shelf 62. The refractory unit 75 shown in Fig. 7 is of the same construction as the refractory unit 63, except for the offset 64 in the bottom face of the unit 63 to accommodate the shelf-like member 62, all the units being provided with similar recesses 74 therein and with a tapering conical groove 76 leading to the recess 74 to accommodate the shank portion 66 of the connecting member.

The two refractory units 63 placed on each of the shelf-like members 62, are arranged oppositely so that the arm 72 of the head 65 enters the recess 74 of one of said units, while the arm 73 of said head 65 enters the corresponding recess 74 of the adjacent unit. After the two units 63 have been placed on the shelf 62 and engaged with the head of the connecting member, as above described, another connecting member is assembled with the bracket 54 and a pair of the refractory units 75 is engaged therewith and placed in position with the bottom faces of said units 75 in engagement with the top faces of the units 63. This is repeated with the units 75 until the desired height of the panel is reached, and the same procedure is followed with each of the brackets mounted on the frame member 46 to complete the wall section or panel. The uppermost refractory unit 75' of each tier of refractory units in a wall panel is not connected with the brackets 54, but merely rests on the next lower unit 75, as will be obvious from Fig. 9.

A panel or section of the wall is made up of a plurality of adjacent tiers of units 63, 75 and 75' mounted on adjacent hanger members 54. In Figs. 1, 2 and 3 each panel is shown as a single unit, the separate bricks or refractory members constituting such a panel being not separately indicated therein, as the number of lines required to shown all the separate units in each panel would be confusing. The outer end wall 77 is shown as being made up of panels or sections 78, each made up of the refractory units mounted in the manner above described. The wall 79 extending upwardly from the entrance of the passage 43 into the chamber 42 is made up of similar panels or sections 78, and the wall 80 opposite thereto is also made up of similar units 78, all mounted in the same manner as above described. The walls 77, 79 and 80 have extensions 82 to the roof 81. Said extensions and said roof may also be made up of individually supported sections each made up of basic refractory units or bricks.

The wall opposite the outer end wall 77, which includes an inclined portion, has a vertical lower portion made up of sections 78 that are made up of refractory units mounted in the same manner on the columns 25 as was previously described for the units mounted on the buckstays 24.

The wall sections 78' immediately below the inclined portion of the said wall are mounted on hanger members 54, such as previously described, and comprise the refractory units 75 and 63 mounted in the same manner as previously described, and a refractory unit 83, which is similarly constructed to the unit 75, except that it has the beveled face 84, the same being mounted on the hanger member 54 in the same manner as the refractory unit 75, as will be obvious from Fig. 3.

The inclined frame member 31 has a plurality of angles 85 mounted thereon, with which the hanger brackets 86 engage in such a manner that the hanger brackets are suspended from the inclined frame member 31. The hanger brackets 86 are somewhat similar to the hanger brackets 54, having a flanged body portion providing the laterally extending flanges 87 and 88 thereon, and having a web portion 89, which is provided with socket portions 90 and 91, the edges of the web portion adjacent said socket portions being provided with the flanges 92 and 93 to reinforce said web portion 89 at said sockets 90 and 91. Said flanges 92 and 93 extend from both faces of the web 89, thus providing a wide bearing for the members with which the hook-like portions of said brackets formed at said socket portions 90 and 91 engage. The flanges comprise U-shaped portions following the outline of said socket portions, and each have rearward extensions 94 providing reinforcing means for the hook formations on the web portion 89. The flanges 93 have downward extensions 95 serving to reinforce the lower end portion of the hanger bracket 86 and extend into the shelf-like member 96 at the lower end of each of said hanger brackets 86.

The upstanding legs of the angles 85 are engaged by the hook-like portions of the hanger brackets as shown in Fig. 3, so that said hanger members 86 will be suspended from said angle members 85 and thus from the inclined frame members 31, the angles 85, of course, running from one inclined frame member 31 to another, so as to serve as transverse frame members and may span a plurality of said frame members 31, should this be desirable. When the hanger brackets are in position the flanges 94 thereon will be in engagement with the upwardly and rearwardly inclined legs of the angles 85.

A plurality of refractory units or bricks 63 and 75 are mounted on each of the hanger brackets, being suspended from the flanges 87 and 88 thereof by means of connecting members 97, one of which is shown more in detail in Fig. 6 and comprises a head portion 98 having the tapering arms 99 and 100 and a shank portion 101, which connects the head portion with the hook-like portions 102 and 103, which have inclined end portions 104 and 105 spaced from each other to provide a slot 106, said hook-like portions being provided with reinforcing ribs 107. The hook-like portions 102 and 103 are engaged with the flanges 87 and 88 on the hanger members 86 slidably engaging therewith so that the same can be moved into suitable position for engagement with the refractory units. A pair of units 63 is first mounted on the shelf portion 96 and one of said connecting members 97 is engaged therewith, the arm 99 of the head portion 98 entering the tapering socket 74 in one of said refractory members 63 and the arm 100 entering the tapering socket in the other of said refractory members 63, said members being moved laterally to engage with the arms of said head 98. Another connecter is then assembled with the flanged portion of the hanger 86 and a pair of units 75 are similarly associated with said connecting member 97 and positioned on top of the members 63. This is repeated with the members 97 and 75 until a tier of said units is mounted on the hanger bracket 86. Said units 63 and 75 will then be suspended from the hanger 86 by means of the connecting members 97 and the hanger member 86 is in turn suspended from the framework, as above pointed out. This procedure is repeated with each of the hanger members mounted between a pair of adjacent frame members 31 until a panel or wall section 108 is

completed, and each panel or wall section 108 is constructed in the same manner.

Brackets 86', similar to the brackets 86 but having only one socket portion 90 for receiving the angle member 109, are provided for supporting the refractory units at the junction of the upper inlet portion of the port end chamber and the widening portion having the inclined wall made up of the panels 108 above described. Said brackets 86' have a pair of shelf-like members 110 and 111, similar to the shelf-like member 96, and are provided with a straight flanged portion 112 and a curved flanged portion 113, with which the connecting elements 97 are engaged in a similar manner to that above described, to mount the refractory units on said hanger bracket 86'. Said refractory units comprise units 63, such as previously described, mounted on the shelf-like member 110, and the unit 75, such as that previously described, with wedge shaped units 114 interposed therebetween, said units, preferably, having curved end walls to provide a smooth connection between the vertical and inclined walls at the upper end of said inclined wall. The panels or sections made up of the above referred to units are indicated by the numeral 115 in the drawings. The straight flanged portion 112 of the bracket 86' has mounted thereon the refractory members 63 and 75, the units 63 being mounted on the shelf-like member 111 in a similar manner to that described in connection with the shelf-like member 62, and the units 75 being mounted in superimposed relation on the members 63 and connected with the bracket 86' by means of the members 97 in substantially the same manner as the members 75 are connected with the hanger brackets 54, the panels or wall sections formed in this manner being indicated by the numeral 116 in the drawings.

It will accordingly be seen that the wall having the inclined portion has said inclined portion made up of refractory units that are suspended from the framework, and vertical wall portions that are sectionally supported on said framework. By suspending said inclined wall below the hearth in this manner and supporting the burner supporting arch from the buckstays the high burner supporting wall previously necessary is eliminated. Due to the tapering end portions or arms on the heads of the connecting members and the tapering socket portions 74, provided in the bricks or refractory elements, of which the walls are built, the refractory elements and connecting members are readily assembled with each other and with their exposed faces in alignment. It will be noted that there is sufficient looseness of fit of the metallic parts in the bricks or refractory elements to provide for the difference in the co-efficient of expansion of these parts and that the mounting of the panels or sections is such that sufficient spacing is provided between the uppermost unit of each panel or section and the lowermost unit of the next higher panel or section, and also between adjacent panels or sections to allow for expansion as the temperature of the wall rises.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In an open hearth furnace, walls defining a port chamber comprising an upper vertically extending inlet passage, an arch supported independently of the walls of the port chamber traversing said inlet passage only near its upper end, a lower settling chamber appreciably wider than said inlet passage, and a downwardly widening chamber portion between said inlet passage and settling chamber said port chamber being free of all obstructions below said arch.

2. In an open hearth furnace, walls defining a port chamber comprising an upper vertically extending inlet passage, an arch supported independently of the walls of the port chamber traversing said inlet passage near its upper end, a lower settling chamber appreciably wider than said inlet passage, and a downwardly flaring chamber portion between said inlet passage and settling chamber, said inlet passage being of the full cross sectional extent of said port chamber and unobstructed from near its upper end to said flaring portion, whereby flow of gases and entained material through said port chamber is retarded, said port chamber having a discharge passage leading laterally from said settling chamber above the bottom thereof.

3. In an open hearth furnace, walls defining a port chamber open at its upper end and having a lateral discharge opening in the lower portion thereof, an arch supported independently of the walls of the port chamber extending across said chamber near its upper end, the walls of said chamber extending to provide a single, unobstructed passage through said chamber widening below said arch to reduce the rate of flow of gases and entrained material after entering said chamber and before reaching said discharge opening.

4. In an open hearth furnace, a framework, an arch, a burner mounting supported by said arch, vertical frame members, a transverse frame member supporting one end of said arch, said arch being supported at its other end by said framework, said framework being the sole support of said arch, inclined frame members extending between said vertical frame members and said transverse member, and port chamber walls supported at vertically spaced intervals by said framework, including an inclined portion suspended from said inclined frame members, said arch being at the upper end of said port chamber and the lower ends of said arch being spaced a substantial distance above the upper end of said inclined wall portion.

5. In an open hearth furnace, sectional walls of refractory material defining a port chamber comprising an upper short, wide inlet passage, a lower settling chamber appreciably wider than said inlet passage, and a downwardly widening portion between said inlet passage and settling chamber much longer than said inlet passage, a framework individually supporting the sections of said walls, an arch near the top of said inlet passage supported solely by said framework, and a burner mounting supported by said arch, said arch being located entirely above said widening portion with its lower ends adjacent the top of said widening portion, and said chamber being free of all obstructions between said walls below said arch.

6. In an open hearth furnace, a framework, an arch carried by said framework, a burner mounting on said arch, walls comprising refractory units defining a port chamber and means on said framework for supporting said units at vertically spaced intervals, said arch being supported independently of said units by said framework.

7. In an open hearth furnace, a port chamber having pairs of opposed walls, the walls of one pair comprising a vertical wall extending to the bottom of said chamber and a vertical wall having a passage therethrough opening laterally into

said chamber above the bottom thereof, the walls of the other pair comprising a vertical wall extending to the bottom of said chamber and a wall having an upper vertical portion, a lower vertical portion and an inclined sectionally suspended wall portion between said upper and lower vertical portions longer than said upper vertical portion diverging downwardly from the opposed wall of said pair, said inclined suspended wall portion terminating at its bottom end adjacent the upper margin of said lateral passage, the space between said walls within said chamber being clear of all obstructions from above the top of said inclined wall to the bottom of said chamber.

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